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HP-2017-000085 and HP-2019-000019

**IN THE HIGH COURT OF JUSTICE**  
**BUSINESS AND PROPERTY COURTS OF ENGLAND AND WALES**  
**INTELLECTUAL PROPERTY LIST (ChD)**  
**PATENTS COURT**

**21 February 2025**

Before:

**MR JUSTICE LEECH**

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**BETWEEN:**

**LUFTHANSA TECHNIK AG**  
**(a company incorporated under the laws of**  
**Germany)**

**Claimant**

– and –

**(1) ASTRONICS ADVANCED ELECTRONIC**  
**SYSTEMS**  
**(a company incorporated in the state of**  
**Washington USA)**  
**(2) SAFRAN SEATS GB ZODIAC SEATS UK**  
**LIMITED)**

**Defendants**

**AND BETWEEN:**

**LUFTHANSA TECHNIK AG**  
**(a company incorporated under the laws of**  
**Germany)**

**Claimant**

– and –

**PANASONIC AVIONICS CORPORATION**  
**(a company incorporated in the state of**  
**Delaware USA)**

**Defendants**

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**MR HUGO CUDDIGAN KC, MR CHRISTOPHER HALL and MS MIRUNA BERCARIU** (instructed by **Jones Day**) appeared on behalf of the Claimant in both claims.

**MR TIMOTHY HOWE KC, MR PIERS ACLAND KC, MR MILES COPELAND and MR JEREMY HEALD** appeared on behalf of the Defendants in both claims (instructed by **Hogan Lovells International LLP** in Claim No. HP 2017 000085 and **Pinsent Masons LLP** in Claim No. HP 2019 000019)

Hearing dates: 3-4, 7-10, 14-16 and 22-24 October 2024

Judgment circulated: 3 February 2025

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## **APPROVED JUDGMENT**

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**There are two versions of this judgment. The full and unredacted version has been made available to the parties and their legal advisers only and should be made available only to those who have been included at the appropriate level of confidentiality in the Confidentiality Order which the Court has made. The redacted version is published on the National Archives website. Both versions were handed down on Friday 21 February 2025 12 noon.**

**Mr Justice Leech:**

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## **I. Preliminary Matters**

1. On 22 July 2020 Morgan J handed down a reserved judgment (the “**Liability Judgment**”) in which he held that certain claims of the patent in suit EP(UK) 0,881,145 B1 (the “**Patent**”) were valid and declared that the Defendants (“**Astronics**” and “**Safran**” in the first action and “**Panasonic**” in the second action and together the “**Defendants**”) had infringed it: see [2020] EWHC 1968 (Pat). He ordered an inquiry as to the damage which Lufthansa had suffered or, at its option, an account of profits: see his Order dated 22 July 2020 (the “**Liability Order**”), paragraph 8. On 22 September 2022 the Claimant (“**Lufthansa**”) ultimately elected for an account of profits (the “**Account**”).
2. On 14 January 2022 the Court of Appeal dismissed the Defendants’ appeal against the Liability Judgment: see [2022] EWCA Civ 20. Birss LJ (with whom Moylan LJ and Sir Nicholas agreed) gave the leading judgment (the “**Appeal Judgment**”). Since then the parties have made two more visits to the Court of Appeal. On 1 November 2023 the Court allowed an appeal against the decision of Mr Recorder Douglas Campbell refusing relief against sanctions in relation to Panasonic’s *Island Records* disclosure: see [2023] EWCA Civ 1273. On 9 November 2023 the Court dismissed an appeal against the same judge’s refusal to permit Lufthansa to pursue certain issues which Morgan J had adjourned: see [2023] EWCA 1306.
3. The Defendants are liable for different periods and on different bases under the Liability Judgment. On 22 May 2018 the Patent expired and as a consequence of the different dates on which Lufthansa issued the separate claims, Astronics and Safran are liable to account to Lufthansa for the profits which they derived from the Patent for the period between 29 December 2011 and 22 May 2018 and Panasonic is liable to account for the profits for

the period between 13 May 2013 and 22 May 2018. I will use the term the “**Relevant Period**” to refer to the relevant period for each Defendant. But where I use that term in the context of all three Defendants, I intend to refer to the longer period applicable to Astronics and Safran. Morgan J also held that Panasonic was liable under section 60(1)(a) of the Patents Act 1977 (the “**PA 1977**”) by reason of a common design although he left unresolved certain issues and, in particular, whether Panasonic was liable for indirect infringement under section 60(2).

4. This is my reserved judgment following the taking of the Account, which involved a full trial with oral evidence from both lay and expert witnesses. Unusually, I was also required to determine what precisely Morgan J had decided in the Liability Judgment and also the scope of the Liability Order which was amended under the slip rule in an Order dated 18 May 2023 made by Mr Recorder Douglas Campbell KC, sitting as a Deputy Judge of the High Court. For this purpose, it is necessary for me to set out and consider the factual and technical background to the Patent and the invention which it embodies together with the activities of the Defendants which amounted to infringement (or which were said to amount to infringement for the purposes of the Account).
5. There are a number of preliminary matters with which I must deal before I set out the background to the Account and I address the relevant issues. I begin with my assessment of the witnesses. I found all of the lay witnesses to be reliable and doing their best to assist the Court. It was unnecessary for me to resolve any issues by reference to a direct conflict of evidence or the credibility and reliability of those witnesses. There were differences between the experts in all disciplines. But again it was unnecessary for me to resolve those issues by reference to their overall reliability or independence. It is unnecessary for me to set out in a separate section my assessment of the individual witnesses and I refer to their evidence at convenient points in this judgment and then deal with aspects of it in resolving the substantive issues.
6. The parties raised a large number of complex issues (factual, technical and legal). It was inevitable that their cases would develop in ways which sometimes strayed outside the four corners of their statements of case. Both sides took a significant number of pleading points often protesting about the unfairness of permitting the other side to advance a new case or to rely on evidence. Given that both sides were guilty of similar conduct and were represented by heavy and experienced teams of counsel and solicitors, these protestations

were wearing slightly thin by the end of a long and demanding trial. Nevertheless, I have resolved all of the procedural points and pleading points on the merits. But I wish to record that this has increased considerably the length of this judgment and that a more cooperative attitude would have reduced the burden on the Court.

7. Subject to this criticism (which I consider to be minor in context) I am grateful to counsel, solicitors and their respective teams for the assistance which they gave and I commend them for the quality and thoroughness of their submissions (both oral and written). Moreover, despite the tenor of some of the correspondence I wish to record that the trial was conducted with good humour and courtesy on all sides. Finally, I do not downplay in any way the performance of leading counsel. But I would like to single out the performance of junior counsel in the present case and the value of the recent practice of encouraging junior counsel to take on a decent share of the oral advocacy.
8. This leaves one procedural issue which was left outstanding at the conclusion of the trial. On 10 September 2024 I listed the PTR in the Account during the vacation for the parties' convenience. To resolve a procedural dispute over the inclusion of documents in the trial bundles, I made an Order that the parties were free to include any documents in their disclosure documents in trial bundles F and G but I also ordered them to identify those documents upon which they relied for the truth of their contents at the same time:

“6. The parties are free to select for inclusion in bundles F and G any documents disclosed in or for the purposes of these proceedings. If either party wishes to rely upon any document in bundles F and G as evidence of the matters stated they shall identify such matters relied upon at the time of proposing the inclusion of the document into the bundle or, if already proposed to be included, by Friday 13 September 2024.”
9. Both parties provided rolling lists of documents to Opus for inclusion in Bundles F and G. On 5 October 2024 the Defendants served a second notice pursuant to section 2 of the Civil Evidence Act (the “CEA”) (the “**Second CEA Notice**”) and on 10 October 2024 they served a third notice pursuant to the CEA (the “**Third CEA Notice**”). On 14 October 2024 the Defendants issued and served two Application Notices seeking an extension of time for service of both notices.
10. Lufthansa opposed both applications on the basis that they were made very late. In a witness statement dated 20 October 2024 Mr Alastair McCulloch, the lead partner from

Jones Day, set out the reasons for doing so and in a Skeleton Argument dated 24 October 2024 the Lufthansa team relied on that witness statement but also took particular exception to documents relating to the transfer of assets by Astronics' corporate predecessor to the present Claimant. Lufthansa took the point that they would have wanted to cross-examine the CEO of Astronics about them. They also objected to the Defendants' relying on minutes of meetings of the JAA (as I define it below). The JAA is a regulatory body responsible for the certification of products for use on aircraft. Lufthansa opposed the application to extend time on the basis that those documents should have been put to Mr Dieter Mosebach, who gave both lay and expert evidence on its behalf, and who was present at some of those meetings.

11. In the event, I did not hear or determine either application before the end of the trial. The timetable was extremely tight and in the course of oral Closing Submissions Mr Hugo Cuddigan KC, Lufthansa's leading counsel, agreed that I should read all of the documents *de bene esse* and then decide what weight I should attach to them. I am grateful to him for that concession which has made my task considerably easier. Having considered those documents and determined the issues to which they are relevant, I extend time for the service of both the Second and Third CEA Notices and I give permission to the Defendants to rely on the documents referred to in each notice. I briefly express my reasons for doing so:
  - (1) Lufthansa objected to five documents relating to the transfer of assets to Astronics on the basis that the Defendants had not disclosed them at all in these proceedings and that it was prejudiced because they had been produced after Mr Jouper had given evidence in relation to that issue. I accept that these documents were disclosed very late. But it would have been unfair to Mr Jouper to exclude them because they confirmed his evidence and resolved an ambiguity in his favour.
  - (2) Further, the documents speak for themselves and a number of them are public documents. It is difficult to see what questions Mr Cuddigan would have been able to put either to Mr Jouper or to a witness who was personally involved in the negotiations for the sale of the relevant business which would have cast any doubt on their contents. Indeed, he could have applied to recall Mr Jouper to deal with them if he had wished to and I would have permitted him to do so.

- (3) But in any event, there is no prejudice to Lufthansa. Although I have determined the specific factual issue to which these documents went in the Defendants' favour, I have determined the overall issue in favour of Lufthansa. Moreover, I am far from satisfied that Lufthansa would have had to give credit for a substantial amount or that this issue would have had a significant effect on the ultimate outcome of the Account.
- (4) Lufthansa accepted that I had a very broad discretion to permit late hearsay notices but objected to the Defendants relying on the remaining documents for the truth of their contents on the basis that the CEA Notices were served "hopelessly out of time" and Lufthansa had been prejudiced for very similar reasons.
- (5) I reject those submissions. I effectively extended time for the service of CEA notices until 13 September 2024 and I am not satisfied that Lufthansa suffered any real prejudice as a consequence of the late notification to Opus to include the relevant documents in the trial bundle. Further, there was no obligation on the Defendants to put any of the documents to Mr Mosebach given that he chose not to give any evidence about the relevant meetings and the documents were put to Mr Jürgen Repenning, the witness who chose to give evidence about this issue.
- (6) But in any event, there was no prejudice to Lufthansa in relation to these documents either. Minutes are usually the best evidence of important meetings and it would have been very difficult for Lufthansa to ask me to make findings of fact about what took place at those meetings whilst at the same time resisting disclosure of the minutes. Furthermore, the factual issue between the parties was very limited indeed and, although I accepted the minutes of the relevant meetings as accurate (contrary to Lufthansa's submission), I decided the overall question of factual causation in Lufthansa's favour.

## **II. Background**

### **A. The EmPower DC**

#### *(1) The first ISPS*

12. Electrical power supplies are typically characterized by reference to their voltage,



measured in volts, whether they provide Alternating Current (“**AC**”) or Direct Current (“**DC**”) and, in the case of AC power, the frequency at which the current alternates, measured in Hertz (Hz). Various electrical components may be used to convert the voltage, the type of current and the frequency. The main power supply of an aircraft is generated by a generator or alternator driven by the engines and is typically 120V/400Hz AC.

13. In 1994 Astronics began work on a new project to develop an in-seat power system or systems (an “**ISPS**” or “**ISPSS**” in the plural). Its purpose was to provide power to passengers at their seats to enable them to use and charge a personal electronic device (“**PED**”). In simple terms, the ISPS involved a power unit, connecting cables and an outlet or plug. Mr Jeffrey Jouper, Astronics’ Chief Engineer, who designed and developed the first generation ISPS gave the following unchallenged evidence in his fourth witness statement dated 17 May 2024 (“**Jouper 4**”):

“The initial in-seat power system design was completed by late 1994. At that point the design only consisted of the power unit (which in the commercialized finished system was referred to as the ISPS), connecting cables and the outlets. The power unit was a compact power supply designed to fit in the profile of the passenger seat leg to reduce passenger space intrusion. The power to be supplied to the outlet was direct current (DC) power at 15 Volts. The initial design used an outlet referred to as a cigarette lighter outlet. This is the standardized outlet design that was used in cars at the time (the automotive outlet voltage range is 11-16V). When combined with a matching plug, it allowed users to plug in small electronic devices in their car so they could be operated or charged. At that time, laptop manufacturers offered adapters for use with their devices so that users could charge their laptop from the cigarette lighter outlet in their car.”

(2) *The GD AES Patents*

14. In late 1994 the design team at Astronics attended a meeting with representatives of Boeing, who liked the product but raised concerns over the drain which the ISPS could impose on an aircraft’s power supply. This led the team to develop a power management system which introduced a power distribution circuit which became known as a master control unit, “**MCU**”, which was designed to monitor the amount of power drawn by individual units and prevent units not in use from drawing power from the aircraft’s power supply until additional power was available. Astronics protected its power management invention in a series of patents (the “**GD AES Patents**”) including US

5,754,445 (“**US 445**”) (which was filed on 20 December 1995 and expired on December 2015).

15. In February 1996 Astronics launched an ISPS commercially and it was known internally as the “EmPower Classic DC” (the “**EmPower DC**”). It consisted of an MCU (part no. 1067) connected by power cables to an ISPS (part no. 1067) which was fitted under aircraft seats and converted the main aircraft power supply of 115V/400Hz to a DC 15V output voltage which it supplied to outlet unit (part no. 1069) which housed an outlet for a cigarette lighter plug. The disadvantage of the first EmPower system was that the passenger needed a special adapter and charging cable. But Astronics later developed another type of unit (part no. 1075) which housed a different type of outlet. This outlet was compatible with a special adaptor known as a “hypertronics connector” and involved the use of a two-pin plug.

(3) *Regulatory Approval*

16. All equipment installed and operated on civil aircraft must be certified by the relevant national or regional regulatory and certification authorities. In the US the relevant authority is the Federal Aviation Administration (the “**FAA**”). In Europe the relevant authority was initially the Joint Aviation Authorities (the “**JAA**”), which was a body of national authorities, and then in 2003 the European Union Aviation Safety Agency (the “**EASA**”) became the regulator. In the UK the relevant authority was the Civil Aviation Authority (the “**CAA**”) and in Germany it was the Luftfahrt-Bundesamt (the “**LBA**”). In the normal course, a supplier or manufacturer would obtain certification from its own national authority and certification by other authorities would be based on the initial certification by the national authority. Astronics and its predecessor, Olin Aerospace Company (“**Olin**”), were US companies and primarily looked to obtain certification from the FAA.
17. The Defendants called Mr Douglas Barovsky to give evidence in relation to the certification and approval process and, in particular, the process adopted by the FAA. Mr Barovsky had acted as a “**Designated Engineering Representative**” or “**DER**” who had managed certification programs on behalf of Boeing. Larger companies in the aviation sector would have a DER whose role was to represent the FAA and who owed an overriding duty to the FAA (although an employee of the company). Lufthansa called

Mr Repenning to give evidence in relation to the certification and approval process and, more particularly, the process in Europe.

18. Mr Barovsky explained that the certification process involved a series of steps resulting in the issue of a “**Type Certificate**” or “**TC**” for a new aircraft and a “**Supplemental Type Certificate**” or “**STC**” for additions and modifications made to an existing aircraft. He also explained that in order to obtain a TC or STC a manufacturer or installer had to establish the design of its components complied with the relevant Federal Aviation Requirement (“**FAR**”), which were mandatory but broad in nature and did not generally prescribe specific methods or mechanisms for compliance. However, he also gave evidence that the FAA issued more detailed guidance (including memoranda and advisory circulars) which provided guidance to assist manufacturers and installers to comply with the mandatory FARs.
19. Mr Jouper’s evidence was that there was no FAA guidance in place for in-seat power when Olin developed the EmPower DC system and that he and Mr Carl Lund, Astronics’ DER, worked together to comply with the FAA’s general safety guidance and that he and Mr Darrell Hambley (also of Olin) wrote an initial draft of a detailed memorandum on in-seat power which the FAA modified and adopted. On 6 June 1996 the FAA published that draft guidance under the heading “Guidance Regarding the Installation of In-Seat Power Supply Systems (ISPSS) for Portable Electronic Devices (PED)” addressed to “All Aircraft Certification Offices”. It stated as follows:

“The Seattle Aircraft Certification Office has recently been approached by several applicants seeking FAA approval for the installation of systems intended for use by passengers to provide electrical power to portable electronic devices. The in-seat power supply systems are being proposed for installation in transport category airplanes. In consideration of the applicant's proposals, the position of the Transport Airplane Directorate on this subject was requested. The intent of this memorandum is to distribute that position to all aircraft certification offices. The FAA Transport Airplane Directorate advises all aircraft certification offices that for the approval of those power supply systems which connect on-board aircraft electrical power/systems to passenger provided carry-on devices, the following conditions must be met:

- 1) The in-seat power supply system must be designed to provide for adequate circuit protection against system overloads, smoke and fire hazards resulting from intentional or unintentional system shorts, faults, etc., including children inserting thin metal objects into the socket or liquids being split into the socket.

2) Each system output must employ RF filtering to protect critical and essential level aircraft systems from radiated and/or conducted electromagnetic interference (EMI). Also, the manufacturer must ensure isolation of the aircraft electrical system bus from any electrical noise created by connected portable electronic devices or by the ISPSS itself.

3) A clearly labeled and conspicuous means method (on/off switch) of deactivating the PED ISPSS must be provided for the flight crew. This disabling feature shall be available at all times and must allow for the immediate disconnection of all seat outlets. Use of circuit breakers for this means is not acceptable. Also, a description of the flight crew station control feature and its operation must be contained in the Airplane Flight Manual (AFM). Note: Additional switches may be provided for the cabin crew.

4) Occupants shall be protected against the hazards of electrical shock. Applicants must submit substantiation of non-hazard to passengers for proposed voltages. Irrespective of substantiation, voltages appearing at passenger-accessible electrical power outlets shall not exceed 24 volts.

5) System Power Limitations – Applications must submit substantiation of non-hazard to passengers for proposed maximum power. Irrespective of substantiation, maximum power available at each seat outlet shall be limited to 100 watts (4.17 amps @ 24 volts).

6) Conducted/Radiated electromagnetic capability (EMC) evaluation of the in-seat power supply system shall be accomplished with maximum load at each passenger outlet.”

20. A final condition (Condition 7) dealt with the testing of the system. On 3 October 1996 the FAA published the final memorandum (the “**1996 Memorandum**”). It contained most of the text set out immediately above and Condition 7 but also included three new conditions. The first provided for the ISPS to be deactivated by the cabin crew below 10,000 feet and the second that sound would only be permitted through headphones. The third condition (Condition 5) required the ISPSS to have a DC outlet only:

“5) To provide for a power connection from the aircraft ISPSS to the portable electronic device, a special adapter shall be required for all connected PEDs to operate. The special adapter will have the following characteristic - it must have a mating connector that will plug the unique connector on the aircraft side which cannot be mistaken for, and is not compatible with, a conventional duplex alternative current (AC) outlet.”

21. In October 1996 Olin spun off its ordnance and aerospace divisions as an independent company, Primex Technologies Inc (“**Primex**”). In July 1997 the EmPower DC was certified by the FAA and Mr Jouper gave unchallenged evidence that in order to obtain certification Mr Hambley and he prepared a significant number of documents to

demonstrate that it satisfied the FAA's safety requirements and the conditions in the 1996 Memorandum and he set out in Jouper 4 a table summarising the key submissions which were made to the FAA. He summarised the position as follows:

“In summary, the EMPOWER™ Classic DC System relied upon a number of safety features for the purposes of qualification, including: short circuit protection, RF Filtering, thermal management, on/off control by the crew, current limited output, and built-in testing for critical features. In addition, there was protection of the aircraft electrical system from the attached user devices to ensure non-interference with critical systems.”

(4) *Airframe manufacturer approval*

22. Boeing and Airbus were the two principal aircraft manufacturers or assemblers of large airliners during the period for which the Account was taken and they were known commercially as “**airframe manufacturers**” or “**airframers**” or “**OEMs**” (i.e. original equipment manufacturers). Both Boeing and Airbus had separate approval processes which overlapped at the time with approval by the regulators. Mr Barovsky gave the following evidence in his fifth expert report dated 5 July 2024 (“**Barovsky 5**”):

“61. Aircraft manufacturers such as Airbus and Boeing did indeed have in place their own specifications in addition to the requirements of the regulatory and certification authorities such as the FAA. While these additional specifications were not in themselves a matter of regulatory compliance, these specifications were used to demonstrate compliance to the regulations and in order for a manufacturer's equipment to be installed on the airframer's aircraft (often referred to as being ‘**linefit**’ or ‘**retrofit**’ offerable) it was necessary to satisfy the airframers that the designs were consistent with their specifications. This often generally involved sending to the airframer similar documentary evidence and test data to that provided to the aviation authorities. Indeed, in my experience often certification with the FAA would take place in parallel to the process for approval with an airframe manufacturer such as Boeing; with the DER for the airframer working closely with the part manufacturer and FAA, informing the part manufacturer of the tests of analyses required and drawing up a certification plan which would also meet the airframers standards for offerability.”

23. I also adopt the terms “**linefit**” and “**retrofit**” (in bold above) to refer to the installation of equipment on an entirely new aircraft and the installation of new equipment to upgrade or modernise an existing aircraft. Mr Barovsky also gave evidence about the technical specifications which both Boeing and Airbus later adopted and I return to some of these documents below. But Mr Jouper's evidence was that in 1997 no specific guidance yet

existed for in-seat power and the key data which Astronics submitted to both airframe manufacturers was the same as the data which had been submitted to the FAA.

**B. The SkyPower System**

*(1) The first patent application*

24. Mr Andrew Muirhead is currently the Vice President of OEM and Engineering Services at Lufthansa and Co-Head of the Product Segment Original Equipment & Special Aircraft Services (OES). He gave evidence that Lufthansa is part of the Lufthansa Group although it is run by its own management team and conducts business as an independent entity. It was also his evidence that Lufthansa's core business is providing maintenance, repair and overhaul services to the entire market globally. Deutsche Lufthansa AG ("**DLH**"), the airline, is Lufthansa's ultimate parent company.
25. Mr Muirhead gave evidence that in May 1997 he and a colleague, Mr Henry Starke, conceived the invention of the patent to address the need for a 100V in-seat power system. His evidence was as follows:

“My colleague Henry Starke and I put our heads together, thinking surely there must be some way of getting 110V AC approved for passenger use. We conceived of the invention of the patent in suit. This addressed the need for a 110V in-seat power system while achieving a high level of safety that we expected would allow the aviation authorities and aircraft manufacturers to approve the system. This ultimately led to the filing of a first patent application in May 1997. Based on the invention, I wrote a functional specification together with Henry Starke which described the resulting commercial product. Mr Starke and I then discussed this with relevant colleagues in the Lufthansa airline and they indicated to us that they would be interested in it if we were able to build and certify such a product. With the knowledge that we would have a customer, we moved ahead with finding a suitable industrialization partner and in developing the product. We needed someone to build it who had the capability to scale a production, and this led to us teaming up with KID. We regarded KID as a suitable company to build the product – they were already building the Cabin Intercommunication Data System (CIDS) system for Airbus, had access to the Airbus businesses and they were geographically close to Lufthansa Technik in Germany. This led to the 1998 Teaming Agreement. I was personally involved in all of this, and I continued to remain closely involved in the project through commercialisation and thereafter.”

26. Mr Muirhead used the term "**KID**" in this passage to refer to a German company called KID-Systeme GmbH. I will use the same term in this judgment and I describe its

operations in greater detail below. The Patent itself (as later registered) described the task of the invention as the creation of a voltage supply system for aeroplane cabins with increased safety against incorrect application of the power supply voltage to the socket and it stated that this task was solved inventively by the features of Claim 1. Paragraphs in the description of the invention in the Patent were numbered in square brackets from [0001] to [0047] before claims 1 to 7. Where I refer to paragraphs in square brackets and “**Claims**” in this judgment, I intend to refer to paragraphs and claims in the registered Patent (unless otherwise stated). Thus, [0011] and [0012] described the basic operation of the socket detector as follows:

“[0011] The socket detector is designed in such a way that it detects the presence of a contact pin of the plug in the socket. This ensures that a plug inserted in the socket is reliably detected. [0012] The supply device only applies the supply voltage, if the presence of two plug contact pins is detected simultaneously. If both contact pins are detected simultaneously, it can be assumed with a high degree of probability that the socket has not been tampered with, rather that a plug has actually been plugged in. In this way a high level of security against tampering and unwanted application of the supply voltage to the socket is achieved.”

27. The Patent described a number of preferred embodiments (to which I return below). But [0015] went on to describe a further embodiment and referred to a casing detector, detecting the presence of the plug casing at the socket. Detection of the plug occurred when the plug casing was closer than a defined distance from the socket so that the plug was "present at the socket". [0016] specified a preference for a casing detector which was an optical reflection sensor and [0017] expressed a preference that voltage would only be supplied once both the plug detector and the casing detector signalled the presence of the plug.
28. The Defendants asserted that Lufthansa’s priority document included both the plug detectors and the casing detector in Claim 1. There was also an issue whether Claim 1 in the Patent as registered (in the form in which it was included in the trial bundle at A1) included both the plug detectors and the casing detector in Claim 1. I return to these issues in greater detail. But I record at this stage that I was not taken to the priority document during the trial nor was it submitted to me that there was a substantial difference between the priority document and the Patent as later registered.

(2) *The 1997 Memorandum*

29. On 24 June 1997 the FAA published a revised memorandum headed “Revised Guidance Regarding the Installation of In-Seat Power Supply Systems (ISPSS) for Portable Electronic Devices (PED)” (the “**1997 Memorandum**”). It involved no change of policy, identified the same hazards as before and it still prohibited the use of higher voltage AC power. Conditions 1, 4 and 5 were in the same or nearly the same form as the 1996 Memorandum although they were now Conditions a., d., and f.:

“a. The in-seat power supply system must be designed to provide circuit protection against system overloads, smoke and fire hazards resulting from intentional or unintentional system shorts, faults, etc. (e.g., including spilling liquids in the sockets and children inserting thin metal objects into the sockets).”

“d. Occupants shall be protected against the hazards of electrical shock. Applicants must submit substantiation of non-hazard to passengers for all proposed voltages. Substantiation must include system requirements which eliminate the risk of shock.

e. To provide for a power connection from the aircraft ISPSS to the portable electronic device, a special adapter shall be required for all connected PED's to operate. The special adapter will have the following characteristic -- it must have a mating connector that will plug into a unique connector on the aircraft side which cannot be mistaken for, and is not compatible with, a conventional duplex alternating current (AC) outlet.

f. System Power Limitations -- Applicants must submit substantiation of non-hazard to passengers for proposed maximum power. Regardless of substantiation, maximum power available at each seat outlet shall be limited to 100 watts.”

(3) *The JAA Draft Policy*

30. On 13 May 1998 the JAA also produced a draft policy (the “**JAA Draft Policy**”). It stated that it was based on the 1997 Memorandum and that differences between the two texts were indicated by underlining (in accordance with normal JAA practice). It also contained explanatory text in italics. The JAA Policy set out Conditions a, d and e (above) together with the following addition and commentary:

“a. The in-seat power supply system must be designed to provide circuit protection against system overloads, smoke and fire hazards resulting from intentional or unintentional system shorts, faults, etc. (e.g., including spilling liquids in the sockets and children inserting thin metal objects into the sockets). (ref. JAR 25.869(a), 25.1353(d), 25.1357.)”

“d. Occupants shall be protected against the hazards of electrical shock. Applicants must submit substantiation of non-hazard to passengers for all



proposed voltages. Substantiation must include system requirements which eliminate the risk of shock (ref JAR 25X1360(a).) The use of low DC output voltage (below 50 volts) is strongly recommended for that purpose.

*Reason for proposed change: It is JAA belief that use of standard voltages such as 110V/220V is not appropriate, due to both the potential passenger safety risks and also the “facility” to use “strange” PEDs. The use of low voltage together with specific power connections as described in paragraph e. seems the most appropriate solution for generalised application of the ISPSS concept on JAR-25 aeroplanes.*

e. To provide for a power connection from the aeroplane ISPSS to the portable electronic device, a special adapter shall be required for all connected PED's to operate. The special adapter will have the following characteristic -- it must have a mating connector that will plug into a unique connector on the aeroplane side which cannot be mistaken for, and is not compatible with, a conventional duplex alternating current (AC) outlet.”

(4) *KID*

31. In 1996 Airbus (which was then called Daimler Benz Aerospace Airbus or “**DASA**”) set up a division called KID Systeme to supply electronic equipment to the aviation market generally and Mr Dieter Mosebach became the Divisional Leader for Electronic Equipment. In 1997 it began to develop an ISPSS product and in 1999 Airbus chose to incorporate a new subsidiary for the business called KID-Systeme GmbH (which I have defined above as “**KID**”). Mr Mosebach became the Vice President Engineering. The new ISPS system was called the 110V Sky-Power Millenium (the “**SkyPower System**” or “**SkyPower**”).
32. The original SkyPower System was similar to the EmPower DC in that it supplied 15V DC power and relied on customers using adaptors to access this power. At the same time KID worked with Lufthansa to develop an ISPS to provide 110V AC power. On 13 July 1998 a meeting took place between Lufthansa and KID to report on the progress on obtaining approval for the new system by the LBA. Mr Mosebach was present at that meeting and the minutes record that a presentation to the LBA had taken place and that it had given general approval to the procedure which Lufthansa and KID proposed to adopt. They also record that the discussions between the FAA and JAA were “controversial”. Finally, under the heading “International Marketing” the minutes also record (in translation):

“It was unanimously concluded that a sole national approval of Sky-Power does not ensure an international placement of the system. Efforts must therefore be made to achieve acceptance of the system within the framework of the FAA/JAA. Consideration was given to this, switch on a DER (Designated Engineering Representative). A DER can issue a system design approval on behalf of the FAA. This is done by the FAA FORM 8110-3 (Statement of Compliance with Federal Aviation Regulation). As part of an initial installation of the system (e.g. on a Lufthansa aircraft), the system would be officially accepted by the FAA as part of an FAA Conformity Inspection (FAA Form 81-30-9) acceptance. Design Approval + Conformity Inspection would be a national approval of the system at other aviation authorities to a great extent. International marketing of the system would certainly be supported by such an approach.”

(5) *The 1998 Teaming Agreement*

33. On 3 December 1998 KID (which was still then a profit centre or division of another subsidiary of Airbus, DASA) and Lufthansa, entered into an agreement headed “Teaming Agreement” which was in the English language but governed by German law (the “**1998 Teaming Agreement**”). The Preamble and Articles 1 to 4 provided as follows:

**“Preamble**

Responding to a permanently increasing market demand for PC Power Outlets in aircraft seats, several companies have introduced in-seat power supply systems to the market. On account of safety regulations issued by the airworthiness authorities (FAA, JAA) these in-seat power supply systems apply only a low 15 VDC output voltage into the seat outlets. KID is one of the suppliers of a 15 VDC system (hereinafter referred to as “Classic System”). LHT has developed a technical concept for a 110 VAC in-seat power-supply system (hereinafter referred to as “Advanced System”). This concept is concentrated mainly upon solutions regarding the necessary safety aspects in order to comply with the safety regulations of the airworthiness authorities, thus facilitating a system certification.

**Article 1 Scope**

KID will, under its own sole responsibility, introduce the Advanced System to the market. The parties agree that this responsibility comprises the development, the manufacturing, the marketing of, and after-sales support for, the said system. LHT will participate in the revenues resulting from such activities of KID.

[REDACTED]

**Article 2 Team Work**

In order to arrive at best possible marketing results LHT will render the following support to KID applying its best efforts and to the extent reasonably feasible. LHT will render best efforts to the extent reasonably feasible and at its own cost in actively supporting and cooperating with

KID in acquiring the certification for said systems by the Luftfahrt Bundesamt and in case of need by the JAA and FAA. Such support includes for instance advice concerning installation and integration works.

### **Article 3 System installation**

KID undertakes to recommend LHT to any potential buyer as partner for the installation of the systems into the respective aircraft. In principle within this context LHT may offer the following services:

- complete installation of the systems including certification (STC) and complete documentation (full turn key package),
- installation kits,
- certification support.

In such a case LHT will place an offer for such service in its own name, but after consultation with KID, adapted to the individual requirements of the buyer. The placement of the offer and the negotiations resulting therefrom (to be conducted together with KID) will be performed with the express aim to arrive at a commercially attractive over-all offer. In case a potential buyer abstains from choosing the offer of LHT, KID will be free to cooperate with other partners in this respect. LHT will inform KID in due time, if LHT sees no possibility to perform the installation as asked for by the buyer.

### **Article 4 Promotion**

In principle KID will take charge of promotion campaigns at its own costs. However, LHT is also entitled to promotion activities, in which case KID will provide LHT with existing advertising material such as brochures free of charge. Promotion Campaigns conducted by both Parties will be coordinated in advance, especially in respect of contents and costs.”

34. Article 5 and the Appendix set out the commercial conditions and the conditions for payment. Article 7 provided for confidentiality and Article 8 provided for termination on six months’ notice to the year end. Article 6 provided as follows:

#### **“Article 6 Patents/Intellectual Property Rights**

The Parties agree that LHT remains the owner of the intellectual property rights concerning the Advanced System, for which LHT grants to KID an exclusive-user’s right in return for the payment of royalties as stated above for as long as this Agreement is in force.

After termination of this Teaming Agreement, KID shall be granted a non-exclusive user's right in return for the payment of royalties as stated above, enabling KID to fulfil any obligations it has entered into with Customers up to the time of such termination.”

35. On 3 December 1998 KID (through DASA) and Lufthansa also entered into a parallel contract (the “**1998 Purchase Agreement**”) under which Lufthansa agreed to purchase

the SkyPower System which at that time was comprised of components including: the MCU, an in-seat power converter, a power outlet unit and a seat harness. Article 2 defined the services which KID, as the supplier, contracted to provide and these included product support documentation, an adequate number of test units for the seats, technical documentation and technical data. Clause 4.10 was headed “In-house Warranty” and it provided as follows:

[REDACTED]

(6) *The JAA Study Group*

36. On 7 October 1998 the JAA set up an ad hoc group (the “**JAA Study Group**”) to consider ISPSS which was chaired by Mr Rick Bewsey of the CAA. By memo dated 8 October 1998 Mr P Mattei, the chair of the standing study group, wrote to Mr Bewsey setting out the group’s terms of reference and its composition and enclosing the JAA Draft Policy. The terms of reference stated that the purpose of the group was to develop a JAA policy for the approval of ISPSS given the increased demand. The group was tasked with using the JAA Draft Policy together with the FAA’s memoranda as a starting basis. It was also asked to identify and specify threats and associated safety requirements and, in particular, to:

“Consider specifically the acceptability of the use of “conventional voltages/outlets” for the ISPSS and possible other safety concerns regarding the generalised use of “any” passenger provided device.”

37. Under cover of a fax dated 10 February 1999 Ms Anne Fairbank of the Systems Department of the CAA circulated what she described in the subject line as “ISPSS Minutes”. The first page of the fax consisted of a letter dated 26 January 1999 which Mr Bewsey sent to the participants. In the letter he stated that the first meeting of the JAA Study Group had taken place on 6 and 7 January 1999 and that a second meeting had been arranged for 27 and 28 April 1999 in Amsterdam. He also stated that this meeting would “review any outstanding actions from the first meeting”.
38. Behind the letter were what purported to be draft minutes of the first meeting. They record that Mr Mosebach (then of DASA) and Mr Starke of Lufthansa were present together with representatives of the CAA, the airlines and other manufacturers. Paragraphs 2.1 of the minutes recorded that the text of the JAA Draft Policy had been

amended at the meeting. Attachment 2a consisted of the original JAA Draft Policy. Attachment 2b consisted of an amended version which was stated to contain changes agreed at the meeting. Condition a. contained the following amendments (in italics below):

“a. The in-seat power supply system must be designed to provide circuit protection against system overloads, smoke and fire hazards resulting from intentional or unintentional system shorts, faults, etc. (e.g., including spilling liquids in the sockets and children inserting thin metal objects into the sockets). (ref. JAR 25.869(a), 25.1353(d), 25.1357.)

*Output power shall not be present at the ISPSS socket until the PED connector is correctly mated with the ISPSS socket. The design of the ISPSS Connector installation shall be such as to prevent the ingress of fluid into the power socket as far as is practically possible. The ISPSS socket shall be mounted so that the axis of the mated pair is horizontal. The hazard to the occupants of tripping over the PED lead shall be addressed in the design of the ISPSS connector and installation. The minimum pull of force for the release of the PED plug from the ISPSS socket shall be TBA.”*

39. The last sentence of Condition d. had been changed so that the use of low DC output voltage was recommended (as opposed to strongly recommended) and no power limit was specified. Condition e. was unchanged apart from one drafting amendment. Attachment 2c to the minutes consisted of the justification for the changes and the reasons for the changes to Condition a. (above) were expressed to be: “Additional guidance material is provided on design features which would be acceptable to provide part of the circuit protection required by this paragraph.” It also stated that additional guidance was given to reduce the hazard to passengers of tripping over the PED electrical flex. The justification for the amendment to Condition d. was stated to be as follows:

“This paragraph details the requirement for protection of the occupants from the hazards of electrical shock. It was decided not to specify an actual voltage, but to encourage as low a voltage as possible, 15V would be typical.”

40. Paragraph 2.2 of the draft minutes recorded (or purported to record) presentations by Page Aerospace Ltd and DASA of their ISPSS systems. Sub-paragraph (vii) recorded that the DASA system had the option to use a 110v 60Hz supply “with a standard European or US domestic connector” but that this would not comply with the JAA Draft Policy. The final attachment to the minutes was a service information letter sent by

Airbus for the purposes of the meeting. It stated that ISPSS for PEDs were available and certified for use on A319/A320 and A321 aircraft. It also stated as follows:

**“D/Special Adapter**

The in-seat power supply can only be used with a special connector, Hypertronics type (ARINC 628), matching with the seat outlet. The outlet only provides electrical power if the connector is fully inserted, otherwise the outlet remains inactive. The passenger needs to be instructed that a special connector is required or the airline has to furnish the adapter. All common PC manufacturers can recommend an adapter for specific PC type for use on aircraft. The airline should be aware that adapters and other accessories from unknown and unqualified sources may contribute to the safety risks of ISPSS operation.

**E/Output Power**

**a) DC Power**

The output from the in-seat power supply socket is direct current with 15V. This voltage may not be appropriate to supply a specific PED connected. If the voltage required by the PED is less than 15V DC, the outlet power may cause damage to the PED when directly connected. Further the polarity has to be matched to the specific PED.”

(7) *The SkyPower Presentation*

41. The second meeting of the JAA Study Group which had originally been scheduled to take place in April 1999 was postponed until June 1999. Between the first and second meetings Mr Rory Briski, Astronics’ Business Development Manager, attempted to discourage Mr Bewsey (and the study group) from recommending the adoption of AC power. His concern appears to have been prompted by the possibility that KID was about to obtain certification of an ISPS providing 110V AC power. In an internal email dated 28 April 1999 he wrote to a number of colleagues stating that he had met Mr Bewsey and he had seen a drawing provided by KID. He continued:

“Yesterday at the IPEC99 conference, we heard that KID was going to get a 110Vac system certified within the week. I asked Rick about this and he seemed a bit stunned and said that the CAA/JAA currently has no plans in work to certify an AC system. And he didn't know of any efforts underway in other countries. However, he also said that if a "regional" authority wanted to certify such a system they could do so. They do not "have to" have the JAA blessing.”

42. By email dated 4 May 1999 Mr Bruce Green, a Marketing Manager, replied to Mr Briski’s email suggesting a meeting to refine their strategy to anticipate KID’s actions

and to deal with their success in obtaining certification of AC power. He confirmed that the meeting of the Study Group in April had been postponed and then put a particular scenario to Mr Briski:

“Consider this scenario: KID certifies their AC system for Lufthansa through the German CAA. They then contact the world's airlines and announce the certification. Airlines, like SAS and Air Canada who have been waiting anxiously for this news, write and issue specifications for AC based systems. Vendors are selected based on this new criteria and regulatory authorities with whom the customer resides (CAA and TC respectively) are asked to issue project numbers for the AC based systems. The systems are certified and these airlines request that the channels for issuance of bilateral agreements with the FAA be opened for eventual FAA certification of the system. Not a pretty picture ...”

43. By email dated 6 May 1999 Mr Briski wrote to Mr Bewsey asking him to check whether Lufthansa had obtained certification for the KID 110V AC system and on 10 May 1999 Mr Bewsey replied stating that he had been unable to do so. On 5 May 1999 Mr Briski also wrote to Mr Han Gim of Boeing enlisting his help in persuading the CAA and the JAA not to include AC systems in their guidance. By email dated 6 May 1999 Mr Gim replied stating that he was certain that Boeing would not offer such a system and that it was not in its standard options.
44. On 16 and 17 June 1999 the second meeting of the Study Group finally took place in Crawley. Mr Mosebach was not present although he was sent a copy of the minutes. The minutes of the meetings which took place on the first day record that there was detailed discussion about the wording of the JAA Draft Policy which included the question of voltage:

“2.3...The issue of voltage was discussed. There was a confusion over which system (high or low voltage system) the policy was intended to address. To aid the discussion, Rory Briski gave a presentation titled 'What is the right thing to do?', see Reference 9. Rory, also presented letters from Compaq and Intel declaring their intention to provide laptop computer with a 15V d.c. power input port. This initiative from the laptop manufacturers would make it possible to eliminate the hazard of in flight batteries charging, see Reference 10 for details.

To emphasis the difficulty in controlling PEDs, Rick Bewsey raised the concern of the Blue Tooth technology. It was explained that 'Blue Tooth' is a new emerging technology, which enables electrical and electronics devices to communicate with each other via a RF link. This technology is currently available with some laptops, mobile phones and children's toys.

It would be very difficult to recognise these Blue Tooth devices unless a detailed assessment is carried out.”

“2.4.1 Comment concerning paragraph c: The discussion on de-activation of ISPSS and decompression was re-visited. The general consensus was that these issues are very significant to a high voltage a.c. system. It was agreed that there was a strong case to have a separate dedicated section or appendix attached to the guidance document to cover the a.c. or high voltage safety issues.”

45. The minutes of the meetings on the second day record that two presentations were made to the Study Group. The first was a presentation on “Aircraft/Laptop Power System Safety.” The second was made by KID and the minutes suggest that it might have repeated an earlier presentation (and may well have been the DASA presentation on 6 or 7 January 1999):

“Jens Dammann from KID-SYSTEME repeated the presentation on their In-Seat Power Supply & Power Management System as a reminder of the issues discussed during the first meeting. A copy is attached as Reference 14. KID Systeme continue to believe that an high voltage system can be a safe option for operators. They also believed that an 110V a.c. system would avoid the risk of third party power adapters. The KID system allows three phase power lines to be routed to each seat. This sparked a concern over the lack of phase to phase shorting protection. The debate on the merit of high voltage system vs low voltage system was re-opened. Note: After the meeting, Rory Briski provided a table of comparison for the record of the minutes, see Reference 15.”

46. The presentation attached as “Reference 14” consisted of a 17 page slide deck called “SkyPower In-Seat Power Supply & Power Management System”. Slide 4 dealt with the safety of the MCU and slide 7 dealt with the system safety features which included “Ground Fault Interrupter Functionality”, “Watchdog Functionality” and “Monitoring of AC-Outlet Unit with respect to possible misuse (e.g. children)”. Slide 6 was headed “System Features In-Seat Power Supply – AC (ISPS-AC)” and it set out the following bullet points under the sub-heading “AC-Outlet (110VAC)”:

- “● AC Outlet Unit: For standard American and European connector types.
- Mechanical locking system for American and European connector types.
- Electrical connector monitoring via three electrical sensors
  - sensor 1 & 3 monitor that both plug pins have been engaged at the same time
  - sensor 2 monitors engagement of mating plug



- All three sensors will be synchronized and monitored by a micro controller

**Power release only if all safety checks are identified as positive by ISPS”**

47. In the summary on slide 8 KID asserted that the SkyPower design generated a high level of safety features in respect of passenger misuse, that original PED connecting devices could be directly plugged in to the 110V AC outlet and that the “incalculable” interference or risk associated with third party power adapters would be avoided. Finally, the minutes of the meeting record the following action point and post-meeting note:

“Rick Bewsey to provide some words for the intended systems (high and low voltages). **ACTION: CAA (R Bewsey)**

**Post meeting note:** The following is added to 'Introduction' of the ISPSS Policy document. 'For guidance on additional criteria to be met for the approval of high voltage (greater than 50V RMS or 100V DC (JAR 25.X1360 and' ACJ)) in-seat power supply systems refer to appendix "TBD" of this policy.'

(8) *Appendix A*

48. On 15 July 1999 the next meeting of the Study Group took place at which both Mr Mosebach and Mr Briski were present. The meeting notes record that it was agreed that the introduction to the JAA Draft Policy would be changed to incorporate both low and high voltage systems:

“An in depth discussion on whether the Draft JAA Policy document should specify a voltage range for both the a.c. and d.c. systems were carried out. The general consensus was that it will be beneficial to encourage a certain standard for ISPSS. In this way, it will be less confusing for airlines and passengers alike. It can also minimise the risk of system mismatch (e.g. plugging a 110V a.c. PED into a 220V a.c. ISPSS, or plugging a 15V d.c. PED into a 28V d.c. ISPSS). The meeting recognised that there will be cases (e.g. V.I.P. aircraft) where operators may request to embody an ISPSS with a different voltage range. These cases will then be assessed on a case by case basis, which is normal practice for any aircraft system that falls outside the normal requirements.

It was agreed that the Introduction in the Draft JAA Policy document will be changed to state that low voltage system infers a nominal 15V d.c. ISPSS and high voltage system infers a nominal 110V a.c. ISPSS. See Introduction in the Draft JAA Policy document (Attachment 3). These voltage ranges were based on the discussion in an ARINC meeting (10/06/99), Strawman for In-Seat Power Supply Unit (ARINC 628 part 2) (See Attachment 2).

49. The Defendants relied on the fact that the minutes also recorded a wide range of safety features under the agenda item “Fault Protection”:

“The different type of faults and fault protection techniques were considered. Initially, there was some confusion over the meaning of Ground Fault Interrupt Protection, Differential Protection and Galvanic Isolation. The definition and meaning for these protection techniques were discussed and agreed to be as follows.

Ground Fault Interrupt Protection:

The protection circuit monitors the current flow in the power input line against the ground potential. If the measured fault current exceeds a certain level, the protection circuit will cut off the power.

Differential Protection:

The protection circuit compares the current flow in the power input and power return lines. If the current differs for more than a certain level, the protection circuit will cut off the power.

Galvanic Isolation:

Use of isolation transformers to isolate the output part of the power outlets from the main power inputs. The power outlet is effectively floating and should not cause hazardous electric shocks to passengers. This is a technique used in shaver sockets in bathrooms.

The merits of the above techniques were discussed. The general consensus of the meeting was that suitable use of the above methods should address the concerns over short circuit faults (phase to ground fault & phase to phase fault) and shocks to passenger. It was also agreed that the maximum fault current should be limited to 30 mA and the activation time should be less than or equal to 30 mSec. see 'Appendix A' (Attachment 3) for the agreed wording on fault protection issues.

The meeting was inform that KID Systeme uses Differential Protection at each seat out let which will protect the passenger from phase to phase short circuit faults and phase to earth short circuit faults.”

50. Appendix A to the JAA Draft Policy was intended to deal exclusively with high voltage power supplies and after the meeting Ms Cathy Au circulated the meeting notes together with the revised policy documents confirming that this was its purpose. In the covering email she stated as follows:

“Please find attached notes of the meeting held on 15 July 99, concerning additional criteria to be meet for the installation of 110V 60 Hz a.c. ISPSS. Attached with the notes is the latest draft policy for ISPSS including the Appendix A as agreed on the 15 July. In view of the time available, it has been decided to change the target date for submitting the draft policy to the JAR D&F Committee from end of July to end of August. Please send

any comments on the latest draft Policy to Rick Bewsey or myself by 20 August. In absence of any comments and after then it will be assumed that recipients are in agreement with the contents of the policy.”

51. The revisions to the JAA Draft Policy reflected the decision in principle to permit the installation of ISPSS supplying 110V AC power. Conditions a. and e. were largely unaffected but the additional sentence which had been added to Condition d. recommending DC power had now been removed. An appendix (“**Appendix A**”) had been agreed and added to the draft policy in the following terms:

“Additional Criteria To Be Met for The Installation Of 110V, 60 Hz AC Systems

The following criteria in this appendix should be considered in addition to the material presented in the main guidance document for approval of 110 volt 60 Hz AC ISPSS:

1. The power outlets should be labelled with the output voltage and frequency (110V a.c., 60 Hz) and suitable safety instructions should be provided for the passenger detailing the PED permitted to be used. These instructions should also include the use of the system, its limitations, hazards and the control of airline supplied equipment.

2. Fault Protection.

a) Suitable means of protection should be provided through the use of differential protection and/or galvanic isolation (isolation transformer) to minimise the risk of passenger shock. This is to guard against inadvertent contact with live parts of the system.

If differential protection is utilised, it should have the following characteristics:

Maximum fault current should be limited to 30 mA. Activation time in the event of a differential fault should be less than or equal to 30 mSec. In the event of differential protection circuit failure, output power should be automatically shut down at the outlet.

b) To guard against damage to ISPSS cable assemblies installed in the seat itself, seat mounted ISPSS cable looms should have additional protection means.

3. Indication should be provided to enable cabin crew to detect which outlets are in use.

4. The ISPSS should be automatically deactivated in the event of a rapid decompression of the aircraft.

Note 4 Finally, the use of external audio speakers shall not be permitted with any portable electronic device. All audio must be delivered through headphone[es].”

52. On 7 September 1999 a JAA certification meeting took place at which Mr Bewsey and Mr Mosebach were present. The minutes of the meeting record that its purpose was to progress the certification of a high voltage 110V ISPS for the Airbus SB and LR aircraft and that this had been linked to the adoption of the JAA Draft Policy. In relation to compliance with Conditions a. to h. the minutes record the following:

“The outlet can be used with a normal two pin domestic connector (European or American format) but it is not a conventional duplex ac outlet due to the built-in safety precautions. Power is only released to the outlet if a connector is inserted correctly. The connecting is monitored by three micro-switches sensing the synchronous insertion of the two connector pins followed immediately by the depression of a pin in the outlet by the connector body. This pin is mounted between the openings for the connector pins. The connector monitoring together with the indication lights provide an equivalent safety to special adapters. The JAA considered the equivalent safety argument as acceptable, but want to keep the policy harmonised with the FAA. The JAA took the action to discuss this item with the FAA.”

53. The minutes also record that the meeting concluded that the system could be certified provided that all documents and actions were completed and assuming that the JAA Draft Policy did not change. Morgan J understood that SkyPower was the system for which Airbus had applied for certification at this meeting and that certification was finally granted in October 1999 and there was no challenge to either of these conclusions before me. He stated as follows in the Liability Judgment, [232]:

“The work on a re-draft of the JAA policy to permit the use of a high voltage AC system subject to additional safeguards continued. In July 1999, there was a further meeting of interested parties and the release of a revised draft policy in relation to a high voltage AC system with additional safeguards. At around the same time, Airbus applied for JAA certification of a high voltage AC system which I understand was the KID Systeme apparatus which was later the subject of the Patent. In September 1999, the JAA considered that this system was acceptable as regards safety and in or around October 1999 it was certified.”

(10) *The 1999 Memorandum*

54. On 5 October 1999 the FAA agreed to adopt the JAA Draft Policy in its revised form and this agreement was recorded in a revised memorandum (the “**1999 Memorandum**”). I set out the introduction to the memorandum together with conditions a., d., e. and f. of the “ISPSS Approval Conditions” and Appendix A in full:

“The policy contained in this memorandum has been harmonized between the FAA and a Joint Aviation Authority (JAA) and industry harmonization working group. It should be applied to all transport airplane programs for an acceptable method of compliance with 14 CFR part 25 for in-seat power supply systems (ISPSS) installations.

## INTRODUCTION

The following describes conditions that should be met for the approval of ISPSS which connect aircraft electrical power to passenger provided carry-on devices. This policy does not cover the approval of the use of such portable electrical devices (PED's) or any interconnecting means (adapters, cords etc.) used to power such equipment onboard an aircraft. This guidance covers the approval of low voltage (nominal 15V DC) and high voltage (nominal 110V AC, 60 Hz) systems. Nominal output voltages differing from the typical voltage values specified above may also be considered for approval using the guidelines specified in this policy. For guidance on additional criteria to be met for the approval of the high voltage ISPSS, refer to Paragraphs l), m), and n) of this policy.

This policy is based on the FAA memorandum on the same subject, dated June 24, 1997, issued by the Transport Airplane Directorate. This policy was modified from that in a JAA and FAA study group (DFSG#103) and agreed to on October 5, 1999. Differences from the Draft JAA policy include: references to FAA, CFR, AC (Advisory Circular) etc., rather than JAA, JAR (Joint Aviation Requirements), AMJ (Advisory Material Joint), etc.; the use of American English terminology and some minor clarification and editorial modifications.

## ISPSS APPROVAL CONDITIONS

a. The ISPSS should be designed to provide circuit protection against system overloads, smoke and fire hazards resulting from intentional or unintentional system shorts, faults, etc., (e.g., including spilling liquids in the sockets and children inserting thin metal objects into the sockets. Ref. 14 CFR, Sections 25.869, 25.1353, 25.1357).

Output power should not be present at the ISPSS socket until the portable electrical device (PED) connector is correctly mated with the ISPSS socket.

The design of the ISPSS socket installation should be such as to prevent the ingress of fluid into the power sockets.

The hazard to the aircraft occupants of tripping over the PED lead wire should be addressed in the design of the ISPSS connector and installation.

If an automatic overheat protection feature is employed by the ISPSS, then this feature should not be able to be reset in flight.

The ISPSS should be powered from a non-essential power supply (bus) of the aircraft.

In addition, appropriate quantitative and/or qualitative failure analyses of each installed ISPSS should be conducted such that any likely failure condition would not reduce aircraft safety nor endanger the occupants. The

analysis should consider the effects of the environment in which any IS PSS equipment is installed, the cooling arrangements and the safety features employed to prevent a fire or overheat condition from being inadvertently created.”

“c. Occupants should be protected against the hazards of electrical shock. Applicants should submit substantiation of non-hazard to passengers for all proposed voltages. Substantiation should include system requirements which eliminate the risk of shock.”

e. To provide for a power connection from the aircraft ISPSS to a PED, a special adapter should be required for all connected PED's to operate. The special adapter will have the following characteristic: it should have a mating connector that will plug into an ISPSS outlet on the aircraft side that cannot be mistaken for, and is not compatible with, a conventional alternating current (AC) outlet. The intent of this paragraph is, in part, to control the PED's that are connected to the power supply by the selection of a particular connector type if the control of the PED's cannot be effected otherwise (e.g., by equipment features or cabin crew procedures). Automotive sockets (cigarette lighter style) would not be acceptable.

f. ISPSS Power Limitations - Applicants for installation approval should submit substantiation of proposed maximum power as being non-hazardous to passengers. Regardless of the level of substantiation, the maximum power available at each seat outlet should be limited to 100 watts.”

#### ADDITIONAL CRITERIA FOR THE INSTALLATION OF 110V, 60 HZ AC SYSTEMS

The following criteria in this appendix should be considered in addition to the material presented in the main body of this policy for approval of 110 volt 60 Hz AC ISPSS:

1. The power outlets should be labeled with the output voltage and frequency (110V AC, 60 Hz) and suitable safety instructions should be provided for the passenger detailing the PED's permitted to be used. These instructions should also include the use of the system, its limitations, hazards, and the control of airline supplied equipment.

m. Suitable means of protection, such as differential protection and/or galvanic isolation (isolation transformer), should be provided to minimize the risk of passenger shock. This is to guard against inadvertent contact with live parts of the system.

If differential protection is utilized, it should have the following characteristics:

Maximum fault current should be limited to 30 mA. Activation time in the event of a differential fault should be less than or equal to 30 mSec. In the event of differential protection circuit failure, output power should be automatically shut down at the outlet.

The fault protection system should include features for monitoring the health of the fault detection circuits. If a fault is detected, the power to the outlet should be automatically removed. Any automatic reset feature

should not be permitted.

n. The ISPSS should be automatically deactivated in the event of a rapid decompression of the aircraft.”

“Note 5: Operators should provide suitable safety instructions for the passengers detailing the PED's permitted to be used. These instructions should also include the use of the system, its limitations, hazards and the operation of airline supplied equipment.

The general policy stated in this document is not intended to establish a binding norm; it does not constitute a new regulation and the FAA would not apply or rely upon it as a regulation. Although the FAA retains the discretion not to follow the policy in this document, an Aircraft Certification Office proposing a deviation from this policy should only do so with the concurrence of the Transport Standards Staff, ANM-113. Applicants should expect that the certificating officials will consider this information when making finding of compliance relevant to new certificate actions. Also, as with all advisory material, this statement of policy identifies one means, but not the only means, of compliance.”

55. Mr Kenneth Brady, who had 39 years' experience in the aerospace industry, gave expert evidence on behalf of the Defendants' in relation to the commercial market for ISPSS. His experience included leading a team of 100 engineering staff in the development of audio and video entertainment systems, cabin management and interactive systems for commercial aircraft. He gave evidence (which I accept) that although the 1999 Memorandum was marked as a draft the policy was finally agreed and approved by the FAA at the meeting.
56. The 1999 Memorandum was not mandatory. It expressly stated that the general policy contained in the document was not intended to establish “a binding norm” and that it did not constitute a new regulation. However, it also stated that although the FAA retained the discretion not to follow the policy, an aircraft certification office proposing to depart from it should only do so with the concurrence of FAA staff and that applicants should expect certificating officials to consider its contents when making findings of compliance. It concluded: “Also, as with all advisory material, this statement of policy identifies one means, but not the only means, of compliance.”

(11) *Launch*

57. A few months after the certification process had been completed KID launched the SkyPower System commercially. I was taken to a presentation which KID made to an organisation called the WAEA in Seattle during June 2000 entitled “AC Power – A

Challenge??” It stated that the 110V AC system had been in-service since April 2000, that it had approximately 4,000 seats in service with Lufthansa and that a number of other airlines with Airbus aircraft in service had adopted it both for linefit and retrofit installation. Slide 8 showed a photograph of the outlet and set out the following statements by its side: “Receptacle for US 2/3 pin plug and European standard”, “Mechanical children protection to prevent manipulation”, “3 sensors and a micro-controller release power only if a plug is engaged” and “LED system status information”.

(12) *Registration*

58. On 26 November 2003 the Patent was registered at the European Patent Office (“**EPO**”) with a priority date of 31 May 1997. The specification records that Mr Muirhead and Mr Starke were the inventors and that Lufthansa was the patent holder. Morgan J set out the critical passages from the description and Claims and also the figures to which they refer in the Liability Judgment at [19] to [44]. I will have to consider his analysis of the Patent in some detail later in this judgment and I do not repeat that detail here.

C. The EmPower Classic

59. In September 1998 Astronics launched a second DC system called the “**DC Plus**” following a change by Airbus in its technical specification. This prompted a re-design of the MCU and the introduction of the Enhanced MCU (“**EMCU**”) (part no. 1100-x). It was a more sophisticated power management system which involved a modification to the interface between the control unit and the ISPS. Shortly afterwards Astronics developed the Advanced MCU (“**AMCU**”) (part no. 1176) which involved a lower cost design and enabled multiple AMCUs to communicate with each other and control cabin power in conjunction with In-Flight Entertainment (“**IFE**”) systems.

60. In 2000 General Dynamics Corporation (“**GD**”), the US aerospace and defence contractor, acquired Primex. By 2002 GD had begun to develop an AC version of the EmPower System. Mr Jouper accepted that KID had been the first to market with an AC product certified for airline seats and that Astronics subsequently entered a rapid development program to finalize and launch its own design. The new system was described internally as the EmPower Classic AC System (the “**EmPower Classic**”) and it involved three components: the ISPS (part no. 1170), the MCU (originally part no. 1170) and the outlet unit (part no. 1171) to which I will refer as the “**1171 Twist Lock**”



or the “**Twist Lock**”.

(1) *The 1171 Twist Lock*

61. I set out and discuss the detailed particulars of the 1171 Twist Lock below but, as its name suggest, the principal difference between the Twist Lock and the earlier DC outlets which had been used for the EmPower System was that it had a mechanical shutter which twisted to lock the plug into place. The passenger would partially insert a plug, twist the shutter by 45 degrees, then push the plug into two holes which contained the plug detect mechanism. The 1171 Twist Lock used an electronic plug detect mechanism rather than a mechanical one and it also included a timing feature which required a signal from both electrical sensors before the power supply was activated. Mr Jouper’s evidence was that the Twist Lock was compatible with the US NEMA plug 1-15 Type A, the US NEMA plug 5-15 Type B, the Schuko plug Type E/F, the Europlug Type C and Australian plug types, Type 1.

(2) *Certification*

62. On 11 June 2001 GD applied for certification of the EmPower Classic and in 2002 the FAA certified the product. GD applied for both certification and airframe approval in parallel which meant that it submitted the same documents both to the FAA and to Boeing. Mr Jouper gave evidence about the number of documents which GD submitted to obtain certification and approval. He also gave evidence that GD made a detailed submission about the safety features of the EmPower Classic and the 1171 Twist Lock in response to the 1999 Memorandum.
63. One of the documents to which Mr Jouper referred was D1170-226 which was entitled “Safety Features EmPower™ AC In-Seat Power Supply Part Number 1170-1.” The authors of the document described those safety features in section 3.0:

“3.1 DESCRIPTION

The 1170 AC ISPS is a power conversion unit designed to provide an airline passenger access to 60 cycle 110VAC power at the passenger seat. When providing the flying public with access to power, safety features and interlocks must be provided to ensure safe, reliable operation of power and fault tolerance of the power source to ensure passenger and aircraft safety. The ACISPS contains several levels of interlock and safety features to ensure that when the passenger requests power it is available and should a

fault condition arise, the power supply will remove power or disable itself under all foreseeable failure modes.

This paper addresses safety at the system level and the seat level. System safety is addressed with the use of the combination of the EMPOWER™ Master Control Unit (MCU) 1067-2, 1170-1 ACISPS and 1171-1 Outlet Unit. These three Line Replaceable Units (LRU) and associated cables make up an extended system of the EMPOWER™ Classic DC system. For information on the EMPOWER™ Classic system refer to System Description Document DI068-228. This document describes system 1 and 2 for systems with and without the use of an MCU.

#### SYSTEM LEVEL SAFETY

The EMPOWER™ Classic AC system is designed to meet stringent safety standards as set forth by the FAA and the airframe manufacturers. The AC systems has unique features to compensate for the fact that the system will accept a standard plug. The function of the MCU in the system is to control power enable to the system, interface with the aircraft decompression signal and disable the system during cabin decompression, monitor and control the total power usage of the system, provide overload protection between the MCU and the ACISPS and monitor and report fault conditions via the front panel indicators. The ACISPS provides input current limiting, output current limiting, over voltage protection, under voltage protection, short circuit protection, ground fault protection, thermal sensing and control, EMI filtering from the ACISPS and the Passenger Electronic Device (PED) attached and line voltage isolation from chassis and output voltage. In addition to the listed safety features, output power is only available when the MCU indicates additional power is available and a user plugs in an appropriate plug and no output faults exist. When an appropriate plug is installed, both contacts of the plug must be inserted with a short time period in order to allow for power to be applied. The timeout is less than 0.1 seconds to ensure that an object inserted in one contact of the outlet will not enable the output to be active.

The outlet assembly provides a shutter type front panel which covers the internal contacts whenever the outlet is not in use, and indicator LED that indicates when power is available and interlock pins providing feedback to the ACISPS whenever a user is plugged in and requesting power.”

64. Mr Jouper also referred to Document 1171-221 (Rev A), which was a safety assessment of the 1171 Twist Lock dated 14 March 2002 and which described him as the engineer. It set out in tabular form the safety measures which GD had taken to meet certain risks identified in the relevant FAA regulations. I set out one of the risks below and the safety features to combat it immediately below:

“Cabin system equipment shall be designed to adequately protect flight crew, cabin attendants, maintenance crew and passengers from injury due to moving parts, electrical shock, burns, high energy levels, toxicity and

radiation.

1. Passenger contact with OU power contacts is prevented by a latching shutter and power switching that removes power from the OU when a valid plug is not inserted.
2. Electrical shock probability of occurrence has been predicted in this analysis to be much less than  $10^{-5}$ , which satisfies the FAA Advisory Circular.
3. The risk of high temperature on the case is shown in this analysis to be extremely improbable.
4. Toxicity - The OU is not an ignition source as verified in D1170-215 tests.
5. The OU satisfies EMI emissions.”

(3) *The Empower AC Plus*

65. The EmPower Classic was not approved by Airbus for linefit of its aircraft and Mr Jouper accepted that this was one of the primary reasons for the creation of the next generation of the AC system. In 2003 Airbus updated its requirements for ISPS and in order to comply with these new requirements GD created a new ISPS (part no. 1174). Mr Jouper’s evidence was that this was a “re-package” of the 1170 ISPS and that it initially used the 1171 Twist Lock. By this time Airbus had introduced a number of new technical specifications (each a “TS”). One TS numbered TS 2520 M1F 0010 00 (“**TS0010**”) specifically warned the manufacturer that it would be necessary to obtain a licence to use the GD AES Patents. Under the heading “Important Note” it stated as follows:

“In this specification references are made to the PED Power Management. This PED Power Management is patented by General Dynamics. Due to the fact that Airbus does not and will not buy a license for these and other patent(s), an agreement needs to be negotiated between patent holder and patent user (MCU/system vendor). If no agreement can be reached the system vendor might design an alternative PED power management but if so Airbus must be informed of the fact.”

66. Airbus also produced a second TS numbered 2520 M1F 001100 (“**TS0011**”) and dated 11 September 2003 which contained requirements relating to the additional architecture which was required for IFE systems. Appendix 2, section 10 contained a detailed specification for the outlet unit:

“The OU for 110VAC shall be compatible with North American plugs (NEMA 1-15P/NEMA 5-15P), Euro type plug (EN 50075:1990) and French/German plug types. The OU for 15V DC shall be compatible with

Hypertronics connector....For 110VAC only: Output power shall be available only if both pins are inserted at the same time and if the matching plug is fully engaged in the outlet unit. The OU shall be protected against ingress of liquids and insertion of objects.”

67. The Defendants submitted that this was not a critical safety feature or the primary (or even secondary) means of protecting against electric shock because TS0011 stated that it was strongly recommended that the applicant design critical safety features or functions in hardware only: see section 2.4.1. Moreover, a table in section 3.6.1.1 stated that the detection of correct matching and correct plug in the outlet unit was classified as “Minor-D” rather than level C.

(4) *The 2003 Settlement Agreement*

68. It was Mr Mosebach’s evidence that in 1999 Primex first gave notice to KID that it had obtained patents for its power management system and by a licence agreement dated 15 January 2000 Primex granted a non-exclusive licence to KID for a lump sum royalty payment. In 2002 GD asserted that KID had infringed the GD AES Patents by offering for sale power management systems relating to IFE devices for commercial aircraft. Mr Mosebach exhibited a letter dated 23 April 2002 in which GD gave notice of infringement to KID and a letter dated 15 May 2002 in which both Airbus and KID asserted that GD was itself infringing the Patent. In making this assertion KID relied on the 1998 Teaming Agreement:

“The first claim of patent US 6,016,016 dtd. May 31, 1997 clearly describes the arrangement and functioning of the system as General Dynamics is currently using, thus meeting all criteria of an infringement of the prevailing patent owned by Lufthansa Technik AG. This Teaming Agreement, which is still in full force and application, grants KID-Systeme GmbH an independent right to raise any claim of infringement towards General Dynamics. Furthermore, Lufthansa Technik AG expressly indicated its agreement with the legal steps envisioned by KID-Systeme GmbH, if no negotiated solution can be found in reasonable time. Apart from this, Lufthansa Technik GmbH reserves to itself the right to enact its own legal proceedings in this respect.”

69. It was also Mr Mosebach’s evidence that Airbus, which still controlled KID at the time, chose to settle the dispute and by a settlement agreement dated 27 October 2003 (the “**2003 Settlement Agreement**”) the parties agreed to enter into a new framework agreement to govern the contractual relationship between them and gave mutual releases.

In clause 3(e) Airbus and KID also covenanted not to sue GD on the following terms:

“Notwithstanding anything to the contrary in this Agreement, the Patent License Agreement, the Existing SFE Framework Agreement or the Framework Agreement (if it is entered), each of Airbus and KID, for itself and for its Affiliates, covenants not to sue or initiate legal action of any kind on any legal theory against GD AES, or its Affiliates, or its or their directors, officers, employees, agents or customers, relating both to (i) any patents owned by Airbus or KID as of the Effective Date, or which Airbus or KID has the right to assert, as of the Effective Date including but not limited to United States Patent No. 6,016,016, and related in any way to power management systems and any continuations, divisions, refiles, reissues or reexaminations of any such patents or the application from which it issued, and any extensions thereof, or any foreign counterparts thereto, and (ii) products marketed as of the Effective Date and made, used, offered for sale, sold, or imported by or on behalf of GD AES or its Affiliates.”

70. KID also made certain representations and gave certain warranties about the 1998 Teaming Agreement and, in particular, that Article 6 granted KID an exclusive user’s right in return for the payment of royalties. Clause 7(d)(i) provided that the agreement was to be governed by the law of the State of Virginia USA and that all disputes were to be settled by arbitration and clause 7(d)(ii) provided for the exclusive jurisdiction of the Eastern District of Virginia. Clauses 7(h) and 7(i) also provided as follows:

“h. Third-Party Beneficiaries. Except for Article 2, Section 3(e), and Section 4(b), hereof, which are intended to benefit and to be enforceable by any party referred to therein as entitled to a release or forbearance thereunder, nothing in this Agreement, expressed or implied, is intended to confer on any person other than the parties hereto or their respective permitted successors and assigns, any rights, remedies or liabilities under or by reason of this Agreement.

i. Successors and Assigns. Neither this Agreement, nor any of the rights, duties or obligations hereunder, may be assigned (by operation of law or otherwise) by the parties hereto without the prior written consent of all other parties hereto, which consent shall not be unreasonably withheld or delayed; provided, however, that each party shall be allowed to assign this Agreement without consent in connection with a sale or transfer of all or substantially all of such party's assets (or, in the case of GD ABS, all or substantially all of the assets relating to its Airborne Electronic Systems group). This Agreement shall be binding upon, and inure to the benefit of, the parties hereto and their respective permitted successors and assigns (and any party referred to in Article 2 or Section 3(e) hereof as entitled to a release or forbearance thereunder). Any attempt by a party to assign this Agreement, or any of the rights, duties or obligations hereunder, other than as permitted by this Section 7(i) shall be null and void.”

#### D. The EmPower Fusion

71. In 2004 GD launched the EmPower Fusion system (the “**EmPower Fusion**”), which continued to use either an MCU or an AMCU or an EMCU but involved a separate, new ISPS. Mr Jouper’s evidence was that one of the key aims of the EmPower Fusion was to develop a system which could be used with cables, outlet units and other line replaceable units (“**LRUs**”) from the previous platforms of systems. This explains the name “Fusion”.
72. The three components of the EmPower Fusion system were now the ISPS (part no. 1191), the outlet unit (part nos. 1235, 1292 and 1295) and a cable connecting the ISPS and the outlet unit together. The parties referred to these three components together as the “**Primary Components**”. They also used the term “**12xx**” to denote the various different versions of the outlet which all bore part numbers which began with the number 12. The parties referred to a number of additional components as “**Secondary Components**” the most important of which were the MCUs, AMCUs and EMCUs. The full list of components was set out in Excel spreadsheet which formed Appendix B to the Re-Amended Points of Claim and Lufthansa pleaded the key components in the body of the document. I adopt all of these terms.

##### *(1) The 12xx series*

73. Mr Jouper’s evidence was that during the design process for the EmPower Fusion system Airbus updated its requirements for all aircraft types and published TS0011 (above). He explained how GD or Astronics (as I will now refer to it) met those requirements in Jouper 4:

“145. This new requirement stipulated that for 110VAC systems, if the outlet accepted plugs with ground pins but the contact was not grounded by the outlet, then the ISPS must have GFI and galvanic isolation. The new 1191 ISPS had been designed so that it would not have galvanic isolation (due to the changes made in order for it to produce a true-sine wave); therefore, any outlet used with the 1191 ISPS would need to ground all plugs with ground contacts that it accepted. The 1171 Outlet did not meet that requirement for the German Schuko plug (which would not have been a problem with the older 1170 ISPS, as that had both a GFI and galvanic isolation).

146. As a result, the AES engineering team realized that we needed to design a new AC outlet unit to use with Fusion 1191 power supply that

allowed the outlet to ground all plugs with ground contacts (later systems designs dealt with this issue by including 2 GFIs) as well as excluding those that could not be grounded properly by the outlet.

147. Greg Trombley and John Lamb, two other members of the engineering team, were tasked with the design of this Outlet Unit. When you start over with a design, you get a blank slate, therefore, in the process of reviewing the existing designs, the team identified that there were other improvements that could be made alongside the required changes – in particular, following feedback from Airbus and Boeing, it was determined that the twist lock feature was not necessary. The electrical plug detect of the 1171 Twist Lock outlet was also not compatible with the new 1191 Fusion ISPS (without modification, see paragraph 210(a) below). Therefore, it was determined that the easiest solution was to move to the use of mechanical switches. The resulting new AC Outlet Unit was given the part number 1235. I refer to the system that included the 1191 ISPS and 1235 Outlet Units as the “Fusion System”.”

74. Mr Jouper also explained that a “**Ground Fault Interrupt**” or “**GFI**” is an electrical device designed to instantly cut off an electrical power supply when it detects that current is flowing an unintended path (e.g. through a liquid or person). It does so by monitoring the current balance between the ungrounded or “hot” conductor and the grounded conductor and interrupting the electrical circuit if the current passing through the conductor is not equal and opposite in both directions (indicating an improper flow).

(2) *The 2005 Memorandum*

75. In 2004 the FAA certified the EmPower Fusion system. Mr Jouper gave evidence that Astronics responded to an early draft of an FAA memorandum and that it was ultimately adopted by the FAA on 18 March 2005 (the “**2005 Memorandum**”). It was entitled “Policy Statement on Certification of Power Supply Systems for Portable Electronic Devices on Part 25 Airplanes” and it contained very similar guidance to the 1999 Memorandum. In particular, it contained a series of certification guidelines (rather than conditions) including the following (original emphasis):

“e. Hazards to Occupants. Experience has shown that electrical shock, smoke, and fire can be hazardous to occupants. Therefore, §25.601 requires that an applicant substantiate the design does not introduce a source of injury due to electrical shock, smoke, and fire. A fault of the circuit associated with the PSS in the cabin interior or system short circuits could lead to system overloads or fire/smoke hazards. These types of faults may be caused by spilled liquids or insertion of conductive objects into the outlets. The design of the PSS socket installation should prevent fluid from reaching the electrical circuitry of the PSS electrical components or the

power sockets. The design should also minimize the possibility that conductive objects could be inserted into the power sockets. Otherwise an applicant should show that a design means is in place to mitigate the hazard of these situations. An example of such mitigation would be a design where output power is present at the PSS socket only when the PED connector is correctly mated with the socket.”

76. Section 2 contained specific criteria for high voltage AC systems which largely mirrored Appendix A. The 2005 Memorandum also contained substantially the same paragraph as the 1999 Memorandum dealing with its status. It was not a regulation but applicants were told that officials would expect compliance but also that the memorandum only identified one means of compliance.

(3) *Certification*

77. Mr Jouper’s evidence was that to obtain certification Astronics submitted 18 key documents to the FAA, a number of which Mr Acland explored with Mr Repenning. Astronics dealt with Condition a. of the 1999 Memorandum in D1191-202 which was entitled “Response to FAA/JAA Transport Airline Directorate for PED Power Systems EmPower AC In-Seat Power Supply (P/N 1191-x) and Outlet Unit (P/N 1235-x-x)”. Section 4.1 was headed “Protection Against Overloads” and after referring to the specific condition in the 1999 Memorandum, Astronics set out its response in a series of bullet points:

“• The ACISPS (1191-x) has been designed and verified to be tolerant of overloads, short circuits intentional and unintentional.

• Power is not applied to the output until an appropriate plug is inserted into the outlet unit.

• After the plug is inserted into the outlet, the ACISPS delays activation of the power.

• The Outlet Unit contact chambers are isolated from each other such that objects inserted into one chamber cannot internally reach the other chambers.

• The Outlet Unit connection is through the use of a standard duplex style connector that can be pulled free under emergency egress situations.

• The Outlet Unit and ISPS carry the third “ground” pin for PED chassis grounding.

• A dual level thermal limit is used to protect the ACISPS during operation. Level one is self-resetting and if this fails, level two will trip and can only be reset by cycling the input power OFF and then ON.



- The ACISPS includes GFI circuit compliant with UL 943. If GFI is tripped, the 60Hz outputs to PEDs are disabled and power must be removed to reset the GFI circuit.
- Installation designs power the ISPSS systems from non-essential busses.
- For safety features of the ACISPS and the ISPSS system refer to document D1191-207.”

78. The second bullet point was a reference to the mating guidance in the 1999 Memorandum and in their Closing Submissions the Defendants accepted that this guidance was met by use of the inserted feature of the Patent. However, they made the point that the document identified numerous other safety features including the GFI circuit in the eighth bullet point (above). Astronics also dealt with Condition c. of the 1999 Memorandum in D1191-202 in section 4.4 headed “Electrical Shock”. Again, after referring to the specific condition in the 1999 Memorandum, Astronics set out its response in a series of bullet points:

- “• The Outlet Unit is finger proof and designed to power plugs.
- Power on self tests are performed to determine proper state of the outlet unit. If the outlet unit is not in the proper state, power is not applied to the outlet unit.
- The outlet unit contacts are in isolated chambers such that a plug or other device may not touch more than one contact internally to the outlet unit.
- After a valid connection, loss of either contact removes power to the outlet unit.
- Over voltage is monitored and the outlet unit is deactivated if the threshold is reached.
- The ACISPS includes a Ground Fault Interrupt (GFI) circuit to protect the passenger in case of contact with output voltage.
- The third ground pin is carried in the system to isolate the PED chassis.
- The ACISPS monitors all internal power supply voltages to maintain the unit within nominal operating conditions.
- Power is not applied to the output unless an appropriate power plug is installed in the outlet unit noted by simultaneous activation of both contacts.
- For additional safety features, refer to Document D1191-207.”

79. Astronics also dealt with Appendix A and the additional criteria in the 1999 Memorandum in D1191-202 in section 5. Astronics set out its response in a series of bullet points under the following headings (and for brevity I have excluded the references

to the 1999 Memorandum below each one):

#### “5.1 POWER OUTLET LABEL

- The ISPSS Outlet Unit is labeled with “110VAC 60Hz” to signify the output voltage and frequency.
- Additional system safety instructions, system utilization and approved devices are the responsibility of the customer or installer.

#### 5.2 SUITABLE MEANS OF PASSENGER PROTECTION

- The Outlet Unit is finger proof and designed to power plugs.
- Power on self tests are performed to determine proper state of the outlet unit. If the outlet unit is not in the proper state, power is not applied to the outlet unit.
- The outlet unit contacts are in isolated chambers such that a plug or other device may not touch more than one contact internally to the outlet unit.
- After a valid connection, loss of either contact removes power to the outlet unit.
- Over voltage is monitored and the outlet unit is deactivated if the threshold is reached.
- The ACISPS includes a Ground Fault Interrupt (GFI) circuit to protect the passenger in case of contact with output voltage. The maximum fault current is limited to less than 6 mA and an activation time of less than 30 mSec.
- The third ground pin is carried in the system to isolate the PED chassis.
- The ACISPS monitors all internal power supply voltages to maintain the unit within nominal operating conditions.
- Power is not applied to the output unless an appropriate power plug is installed in the outlet unit noted by simultaneous activation of both contacts.
- For additional safety features, refer to Document D1191-207.

#### 5.3 AUTOMATIC DECOMPRESSION SHUTDOWN

- Logic-level signal inputs are provided in the ISPSS to allow installation of ON/OFF control by either the flight crew, the cabin crew or external keylines such as DECOMPRESSION.
- Actual implementation of ON/OFF switches are a function of the system installation design. Inputs can be routed directly to the ACISPS (when no MCU is installed) or to the Master Control Unit (MCU). In addition, the control switches can go to relay logic to control power to the input of the MCU or ACISPSs without the use of an MCU. This adds an additional safety margin by completely removing the ISPSS from the power bus.
- This switch is normally controlled by the flight crew and/or cabin crew or as a key line input (i.e., altitude or DECOMPRESSION switch).”

80. A number of these passages refer to D1191-207 which was entitled “Safety System Assessment EmPower AC In-Seat Power Supply Part Number 1191-x and EmPower AC Outlet Unit Part Number 1235-x-x”. This document referred to both hardware and software safety features:

“The following safety features are implemented in hardware, designed to safety Design Assurance Level (DAL) C:

- Input Current Limiting
- Output Current Limiting
- Output Over/Under Voltage Protection
- Short Circuit Protection
- Ground Fault Interrupt
- Over Temperature Thermal Limit
- AC ISPS to PED EMI Filtering
- Watchdog Timer
- Warning Labels on the AC ISPS case
- Voltage level indicator on the AC ISPS case
- ON/OFF control from the MCU and/or Flight Crew and Flight Attendant switches
- AC OU contacts recessed in isolated, enclosed chambers
- AC OU redundant ground wires”

“The following safety features are implemented in software, designed to RCTA DO-178B software level D:

- GFI BITE
- Power on Self Test (POST) Checksum
- AC OU Plug-in Detection”

81. Section 3.3.3 described the “AC OU Plug-in Detection” feature, which involved two software features: first, signals from the outlet socket to the micro-controller and, secondly, a timer (as Mr Repenning accepted):

“A contact pair in each of the AC OU chambers is monitored by the microcontroller in the AC ISPS to detect when an object is inserted. A software timer determines whether the contacts in both chambers are detected within a specified time interval, indicating that a legitimate power plug has been inserted.”

82. Finally, section 4 set out the design requirements which Astronics had adopted. In

particular, it stated that it had adopted a hardware design to level C and a software design to level D (and, therefore, less critical):

“Table 4-1 provides a description of requirements that have been imposed on the EMPOWER® AC ISPS and AC OU system and an assessment of compliance to these requirements. Hardware design was performed to safety DAL C, with all critical safety functions and features under hardware control. Software that adds additional functionality or reliability beyond the basic safety features has been developed to RTCA DO-178 Level D.”

(4) *Boeing approval*

83. Mr Barovsky gave evidence that on 8 September 2003 Boeing issued “D-36440 Standard Cabin Systems Requirements Document Rev. D” (“**D-36440**”) providing specific guidance for ISPS. It was also his evidence that it did not generally distinguish between DC and AC power although paragraph 5.4.2.4(c) did require that: “For AC systems, the ISPS shall be designed to provide nominal voltage of 115 volts AC at 60 Hz”. D-36440 did, however, provide general guidance in relation to the safety of each component. For example, the document set out the following guidance in relation to each individual component:

**“5.1.1 Safe LRU Design Commentary**

Each LRU must be designed with safety in mind. Safety is generally addressed through a combination of design features and protective devices, analysis of the probability of failure and component reliability, and qualification testing. Protective devices must be designed to operate independently from the normal operation of the LRU. Each protective device must “fail safe,” i.e., the hazard is precluded when the device has failed. The reliability of each protective device must be documented in the Safety Analysis (SCSRD section 6.1.5) such that each failure is adequately addressed based on the severity of its effect and associated probability of occurrence.

Passengers and crew must be protected from electrical shock. If the LRU is designed with a non-conductive case, shock is not an issue. If the LRU operates with voltage(s) less than 30 volts AC or DC and is to be installed in a dry area, shock is also not an issue. If the LRU is to be installed in a wet area, e.g., a galley, then adequate grounding (SCSRD section 7.3.2.4) becomes important. If the LRU operates with more than 30 volts AC or DC and is far from an adequate airplane ground, e.g., installed in the passenger seats, purser work station, or video control center, then one or more protective devices must be provided to remove power.”

**“6.1.5 LRU Safety Analysis Commentary**

A Safety Analysis is required for each LRU to document the details of each potential failure in the LRU and its safety impact. That is, each potential failure must be assessed for its effect on the airplane and occupants as described in the System Safety Analysis (SCSRD section 4.2.8). The analysis must identify and discuss the methodology used to avoid failures that assessed as catastrophic, hazardous, or major. The information may be provided in an individual analysis for each LRU, or all together in one detailed System Safety Analysis for the entire system. The LRU Safety Analysis is intended to address the following hazards as a minimum:

1. A passenger or crew member is shocked.
2. There is arcing in the equipment.
3. Sparks are emitted by the equipment.
4. Smoke is emitted by the equipment.
5. An LRU and/or interconnecting wiring starts on fire.
6. An LRU develops a surface temperature exceeding 204°C.
7. A battery vents.
8. Personal injury occurs due to contact with equipment.
9. Personal injury due to exposure to RF transmissions from a wireless system.

#### Requirements

- a. A Safety Analysis shall be provided for each LRU and cable or wire bundle in accordance with the negotiated Technical Data Delivery Plan (SCSRD section 4.2.1). [CR]”

#### **“6.1.5.2 Over-current and Over-voltage**

##### Commentary

Current levels up to the gauge of the power input connector pin/socket will be provided in Boeing installations unless limitations are noted in the LRU Outline Drawing (SCSRD section 6.1.2). Airplane power is subjected to many transients as defined in SCSRD section 7.3.2. Over-current and over-voltage conditions may result in arcs, sparks, smoke, and/or fire. The following questions illustrate the focus of this portion of the safety analysis. They are not presented as a complete set. The supplier is encouraged to “expand the envelope” of the safety analysis for its LRU as necessary based on superior knowledge of the system design, LRU design, and interconnecting wiring.

1. Are there internal components that are incapable of withstanding the maximum input current or normal/abnormal voltage transients?
2. What design features or protective devices, hardware or software, limit the current to internal components that cannot handle the LRU’s maximum input current?
3. What design features or protective devices, hardware or software, prevent the LRU’s maximum input current from flowing onto smaller-gauge signal output lines?

4. Can pass-through power lines accept the LRU's maximum input current?
  5. What happens if a pass-through power line shorts to ground or multiple lines short to each other "downstream" from the LRU?
  6. If there are motors or transformers in the LRU, is there a failure mode where an over-current condition may occur without the pertinent circuit breaker opening?
  7. If software is used to contribute to the safety margin provided by design features or protective devices, what RTCA/DO-178B level is it?"
84. I was not taken to any safety assessments which Astronics submitted to Boeing in relation to the EmPower Fusion. However, Mr Repenning exhibited a response headed "Boeing LRU System Safety Assessment for the Seat Power Module Part Number 1248-10 (Panasonic Avionics Corporation Part Number RD-FA3621-01) and AC Outlet Unit 1235-X-X". The document was signed off between 4 October 2007 and 4 December 2007. It is likely that this response was submitted when Astronics first became involved in the development of an integrated system (which I explore). But that document also stated in paragraph 1 under the heading "Scope":
- "This LRU SSA demonstrates compliance to Boeing Corporation requirements per "Standard Cabin System Requirements Document Volume 1" document number D6-36440 Vol 1 sections 4.2.8, 5.1.1 and 6.1.5 for LRU safety assessment and analysis as listed in Table 4.1."
85. Section 3.2 was headed "Hardware Safety Features" and paragraph 3.2.9 headed "AC OU Recessed Contacts in Chambers". It stated that the AC outlet unit was designed such that 110V AC power was not present at the outlet unless a suitable plug was "fully inserted in a specified time interval". It also stated that the contacts were in isolated moulded chambers to prevent shorting due to bent contacts or conductive fluids and that the contacts were recessed to prevent a passenger touching them.
- (5) *Airbus approval*
86. Astronics was also required to satisfy TS0010 and TS0011 (above) in order to obtain Airbus approval for the EmPower Fusion system. However, the removal of the shutter and twist mechanism from the 1171 Twist Lock prompted Airbus to raise concerns about the safety of the 1235xx outlet units. Mr Jouper also gave evidence in Jouper 4 that Airbus granted approval for the EmPower Fusion system after discussions with the Airbus Design Office. By email dated 24 March 2004 Mr Gerd Dueser of Airbus wrote to Mr

Mike Hettich of Astronics raising a number of questions and by email dated 30 March 2004 Mr Hettich replied embedding his answers in bold in the body of the original email.

I set out the questions and answers in full in the same format:

“Mike, last Friday we checked the ISPS 1191 in conjunction with the outlet 1235. Main change to the previous [sic] AC outlet-design is the missing mechanical children protection device. The remaining electronic protection mechanism does not fulfill [sic] the certification aspects and Airbus requirements.

**Please see comments below on how the specific items are addressed and overall safety is addressed.**

1. There is no device which hinders to insert thin objects.

**The intended function of the AC OU is to accept thin metal objects (i.e., power plugs). One needs to look at the ISPS (1191) in conjunction with the Outlet Unit (1235) as a system. The AC OU as a stand-alone unit does not provide power under any conditions to a passenger. Only when connected to the ISPS and specific operational/safety conditions have been met will power be provided to the Outlet.**

**TGM/25/10 does not require a device to block objects from being inserted. The TGM requirements state "a. The in-seat power supply system should be designed to provide circuit protection against system overloads, smoke and fire hazards resulting from intentional or unintentional system shorts, faults, etc. (e. g., including spilling liquids in the sockets and children inserting thin metal objects into the sockets)." The 1191 and 1235 meet these requirements.**

**Further in TGM the FAA/JAA state "In addition a qualitative failure analysis of each installed in-seat power supply system should be conducted such that any likely failure condition would not reduce aeroplane safety nor endanger the occupants ... " The 1191 and 1235 meet these requirements also.**

**Please see the detailed analysis in the Preliminary Safety Assessment. Once this Preliminary Safety Assessment is approved by Airbus, GD will complete the detailed FMEA, Safety Assessment, and Fault Tree providing the quantitative data fulfilling this requirement.**

2. It was no problem to activate the power output at the outlet by inserting "thin objects".

**The timing of the insertion of the plug is monitored. The line and neutral contacts on the power plug must engage the power contact "simultaneously" (within 200 msec currently) and remain mated for greater than one second. The intent of this is to reduce the chance of obtaining power if an inappropriate object is inserted. Airbus and GD personnel know the inter-workings of the Outlet and ISPS. Therefore, we understand how to activate the output power. We are investigating a reduction in the "simultaneous" time to 100-150mSec.**

3. We found also no protection element against ingress of dirt and dust or

spilling liquids in the socket.

**As long as the AC OU maintains a safe condition when exposed to the ingress of dirt, dust, or spilling liquids, then this is not necessary. Also note that the FAA/JAA, Airbus, and General Dynamics installation documentation require the Outlet to be mounted in a horizontal orientation to avoid the ingress of fluids and other materials. GD has performed a series of liquid tolerance tests and the ISPS and OU operated as expected and remained safe during the tests. These test were run with and without plugs inserted.**

4. There is no device which detects if a mating PED plug/connector is attached to the outlet.

**A correct making plug is determined as indicated in 2. above.**

You might answer that the two micro-contact-mechanism is the answer to 1., 2. and 4. but we think that this is not sufficient [sic]. Please propose an additional feature, similar as you had on your previous design with the mechanical children protection mechanism. This mechanism was also good for answering item 3.

**GD and the FAA DERs disagree with the need for a mechanical interlock. Instead, we have a significant number of protection devices and safety features in the ISPS and OU that significantly reduce the exposure to electrical shock and continue to meet the FAA/JAA requirements as well as GD internal requirements for safe products. The ISPS employs numerous safety features to reduce the risk of electrical shock (finger proof, GFI, sense timing for application of power, disconnect timing for removal of power, OU sense self test at power up, delay prior to application of power, etc.). No additional features are required to meet the certification requirements. In fact, if we employed a mechanical interlock, one must address the failure mode of this device and assume that it has failed. Under this failure condition, it is possible that the potential for shock would be increased since the design would depend on the mechanical features. GD has taken an aggressive approach on the safety features of the system and do not depend on a mechanical device which is prone to failure over time.**

**Please review revision 2 of the Preliminary System Safety Assessment which addresses each function in detail and provides more detailed explanations.**

Another issue is the quality of the already installed electronic protection mechanism. Here we require following improvements:- pls confirm that if someone inserts thin metal objects into the outlet during power off that after power up these outlet is still off.

**We have implemented a design change to meet this. The auto-reconnect after power is eliminated.**

- the pwr-enable-time-window for simultaneously contact insertion shall be <100ms (as short as practical [sic] possible)

**Currently at 200 msec. Will investigate whether this can be reduced**



**and still provide a reliable connection when a power plug is inserted (i.e., still perform it's intended function).**

- the pwr-enable-time until the outlet enables power after a successful insertion of plug shall be >1s.

**We have implemented a design change to meet this. The time is set at approximately 1.25s.**

- scenario: the outlet pwr is enabled because two thin objects has been inserted simultaneously [sic]. Then one thin object is removed. Then the detection mechanism must deactivate power as fast as possible. Today the timing seems to be too slow (~500ms)

**The design is currently at 100mSec.**

As a good practice [sic] we strongly recommend to increase the refresh timing and stabilize frequency for the status LED when it is in amber-mode. Goal is a non-flickering amber-light.

**We concur with the flickering observation and are implementing a design change to remove the amber mode.**

Requirements

1. TGM-25-10 (certification base):

ISPSS APPROVAL CONDITIONS

a. The in-seat power supply system should be designed to provide circuit protection against system overloads, smoke and fire hazards resulting from intentional or unintentional system shorts, faults, etc. (e.g., including spilling liquids in the sockets and children inserting thin metal objects into the sockets). (ref. JAR 25. 8 69 (a), 25. 1353 ( d), 25.1357.)

**Comply.**

Output power should not be present at the ISPSS socket until the PED connector is correctly mated with the ISPSS socket.

**Comply.**

The design of the ISPSS Connector installation should be such as to prevent the ingress of fluid into the power socket as far as is practically possible.

**Comply (as far as is practically possible). Outlet Unit mounted in horizontal orientation.**

2. Airbus spec. requires

For 110 VAC only: Output power shall be available only if both pins are inserted at the same time and if the matching plug is fully engaged in the outlet unit.

**Comply. Definition of fully inserted is within .1" of faceplate.**

The OU shall be protected against ingress of liquids and insertion of objects. Faulty safety sensors or connections shall lead to disabling of power at the output.

**Comply. Definition of protects means maintain a safe condition.”**

(6) *The 2005 Asset Purchase Agreement*

87. On 31 January 2005 Astronics Acquisition Corporation was incorporated in the State of Washington USA and the Secretary of State issued a certificate of existence and authorisation. By an agreement dated 3 February 2005 (the “**2005 Asset Purchase Agreement**”), which was governed by the laws of the state of New York, General Dynamics OTS (Aerospace) Inc, a company incorporated in the State of Washington, sold certain assets to Astronics Acquisition Corporation, which was also a company incorporated in the State of Washington. The recitals to the 2005 Asset Purchase Agreement stated as follows:

“WHEREAS the Seller’s business located at its facility in Redmond, Washington, is engaged directly in the design, manufacture, sale, distribution and service of products for (i) power generation, distribution and control for airborne applications (known as the Seller’s “Airborne Power and Control” or “APC” Business) and (ii) aircraft cabin power and in-flight applications (known as the Seller’s “Cabin Electronics” or “CE” business (the “Business”)

“WHEREAS, this Agreement contemplates a transaction in which the Buyer will acquire substantially all of the assets of the Business and assume substantially all of the liabilities of the Business on the terms and subject to the conditions set forth in this Agreement”

88. Section 2.1 provided that the buyer bought the “Purchased Assets” from the seller (and assumed the “Assumed Liabilities”). Section 2.2 identified all of the assets which fell within this description and section 2.2(a) (v) defined the intellectual property rights included in the sale:

“to the extent used or held for use by the Seller exclusively for the Business, and in each case to the extent legally assignable, all (A) patents, patent applications, trademark registrations and applications, copyright registrations and applications and domain names solely to the extent set forth on Schedule 2.2(a)(v), (B) unregistered trademarks, unregistered trade names, computer software, unregistered copyrights, trade secrets, confidential business information (including formulas, compositions, inventions, manufacturing and production processes and techniques, technical drawings and designs, technical data, customer and supplier data, pricing and cost information) and (C) all rights in, relating to, or for use or exploitation of, “Airborne Electronic Systems” and “AES”, and in each case, all associated goodwill, including all rights thereunder, remedies against infringement and rights to protection of interests therein under the

Laws of all jurisdictions (collectively, the “Intellectual Property”);”

89. In section 4.13(a) the parties agreed that Schedule 4.13 identified each patent, patent application, trademark registration and application, copyright registration and application and domain name owned by the seller and used or held for use by the seller exclusively for the Business, and each material licence, sublicense, agreement or other permission which the seller has granted to any third party with respect to any material Intellectual Property owned by the Seller. Schedule 4.13 expressly included the 2003 Settlement Agreement as a permission to third parties to use Intellectual Property owned by the seller.
90. On 11 February 2005 an amendment to the Articles of Association of Astronics Acquisition Corporation took place and its name was changed to Astronics Advanced Electronic Systems Corporation. On 14 February 2005 the amendment to the Articles was filed by Mr David Burney, the Chief Financial Officer. Astronics Advanced Electronic Systems Corporation, which is often known as “**AES**”, is the First Defendant in these proceedings and the company which I have defined or called “**Astronics**”.

E. IFE Integration

91. Mr Mosebach gave evidence that following the introduction of the SkyPower System which KID had developed under the 1998 Teaming Agreement, demand for the 15V DC system fell away and KID had great success with SkyPower. One of the reasons which he gave for this success was that GD did not introduce a competing AC system until two years later. Both before and during this period IFE and ISPSS systems had been developed and sold independently. However, over the next decade ISPSS and IFE systems were integrated and then manufactured and sold together. Mr Brady gave evidence that the integration took place in two phases which he called “**Phase 1 integration**” and “**Phase 2 integration**”. I adopt those terms.
92. It was common ground that during the Relevant Period both Astronics and KID continued to supply power systems directly to airlines which were not related to the supply of IFE systems (e.g. for aircraft on short haul flights where IFE was not standard at least in economy). Mr Brady used the term “**power only**” market and “**power only**” sales to describe sales of this kind. I also adopt those terms. I also use the term “**IFE sales**” to describe sales by Astronics or other manufacturers to the IFE providers.

(1) *Phase 1 integration*

93. Mr Brady explained that in the early 2000s both airlines and airframe manufacturers started to look for ways to simplify their procurement processes. They also wished to reduce the costs of design and manufacture of cabin electronic systems and also their weight. In 2001 and 2002 Airbus was the first to specify an MCU which provided power for both PED and IFE systems and this principle was incorporated into ARINC 628 Part 4C<sup>1</sup> which was originally released in September 2005. This change in regulation enabled airframe manufacturers to build aircraft with a common set of provisions and Boeing then accepted systems which utilised this architecture. This also enabled other savings to be made. A separate GFI was not required for each system and power wiring to seats was reduced by half. The installation and use of an MCU for IFE systems became a standard feature whether or not the airline specified PED power.

(2) *Phase 2 integration*

94. The development of the Boeing 787 aircraft between 2005 and 2011 generated a second phase of integration. Boeing decided to dictate the architecture and form of IFE equipment and designated PED as part of the IFE system. It also made the IFE supplier responsible for obtaining certification and approval of the new equipment. Mr Brady described this as the “IFE responsible approach” and gave evidence that it was subsequently adopted by Airbus in the development of the A350 aircraft. The two principal manufacturers of IFE equipment were Panasonic and Thales Avionics (a division of the Thales Group) (“**Thales**”), for whom Mr Brady worked for 20 years.
95. Mr Brady described the technical consequences of Phase 2 integration in his first expert report dated 16 July 2024 (“**Brady 1**”):

“52. This development required a significant redesign of the IFE and PED Power system architectures such that there would be a single seat power box that provided the power for both in-seat power and the IFE. That meant that the Seat Electronics Box (“**SEB**”), which was the component that originally supplied power to the IFE, did not need to have its own components to convert the AC aircraft power to DC (the SEB was in fact entirely eliminated By the Thales AVANT system further reducing power consumption and weight). In parallel the seat power box (“**SPB**”,

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<sup>1</sup> The ARINC Standards are prepared by the Airlines Electronic Engineering Committee (AEEC) and ARINC 628 is a standard for Cabin Equipment Interfaces.

sometimes also known as the seat power module “**SPM**”) was completely redesigned so that, amongst other things, in addition to providing AC for the in-seat power, it could provide DC power to power the IFE. The principle aim of the complete integration of the two systems was to make overall savings in weight, power consumption, and cost.”

96. Mr Brady also gave evidence that when IFE suppliers became responsible for providing PED equipment, the two established PED suppliers were Astronics and KID and that although Thales solicited other avionics supply companies to bid on each development none of them made it past the bid stage. He summarised the position by the end of Phase 2 integration in the following passage:

“61. In summary, cabin architecture evolution went from separate IFE and PED Power systems to separate systems with a common approach toward power distribution to seats using an MCU (phase 1 integration) in roughly 2002-2003 to a single in-seat power box (SPB) for both IFE and PED Power in 2011-2012. This meant that: (i) the MCU was a required part of the 2002-2003 phase 1 integrated systems, irrespective of whether PC power was provided; and (ii) SPBs were a required part of a 2011-2012 IFE system, irrespective of whether PED Power was provided. This evolution was driven by aircraft manufacturers desire to reduce their effort in providing cabin systems (IFE and/or PED Power) and reducing their efforts in managing suppliers during development (such that IFE suppliers became responsible for it all). The effect of phase 2 integration was that Thales' decision about which power supply (effectively KID or AES) to use in each generation of IFE, determined the fate of that power supply bidder in the Thales IFE products for the life of that generation of IFE.”

97. Although there was a change in terminology, the SPB or SPM was a more sophisticated version of the ISPS. Moreover, the power management system for the supply to the SPB or SPM remained the EMCU or AMCU. Mr Jouper gave evidence that between 2002 and 2005 GD developed the PAC SPM (part nos. 1248-10, 1248-20 and 1238-21) for Panasonic. He also gave evidence that Astronics initially developed an SPB (part no. 1301) for Thales, which was not fully integrated and did not meet the requirements for the new Boeing 787 aircraft, but that it later won the bid to produce a new fully integrated SPB (part no. 1390). Finally, he gave evidence that both the SPMs and the SPBs which Astronics developed and manufactured for Panasonic and Thales used the same outlet units and the same EMCUs and AMCUs as the EmPower Fusion system.

(3) *The supply chain*

98. The equipment installed on a commercial aircraft is conventionally described as either

Supplier Furnished Equipment (“**SFE**”) or Buyer Furnished Equipment (“**BFE**”). SFE is supplied by the OEM or supplied by a third party but fitted and sold to the airline by the OEM. The price of SFE is usually included in the total price of the aircraft. By contrast, BFE is optional equipment bought by the airline directly from a third-party supplier. BFE was “linefit offerable” if the OEM was prepared to instal the equipment on the aircraft using its own production line. But even if the equipment was “linefit offerable” the airlines usually negotiated directly with the equipment suppliers and the equipment supplier sold the equipment directly to the airline.

99. During the Relevant Period Astronics manufactured both the Primary Components and the Secondary Components of the EmPower System. It either sold those components to IFE providers, principally Panasonic or Thales, who in turn sold integrated IFE systems to the airlines. Alternatively, where the airline required ISPSS but not IFE systems, Astronics sold those components directly to the airlines. In both cases the components were BFE and purchased by the airline directly from Astronics or Panasonic depending on whether the airline was purchasing an integrated IFE system for the aircraft or just an ISPS. The airlines did not, however, install any of the Components on the aircraft. They were installed either by the airframe manufacturers or by installers such as Lufthansa itself or by seat manufacturers such as Safran. Where Astronics sold ISPSS directly to the airlines it is described as a “**first tier supplier**” and where it sold them to Panasonic or Thales (the principal suppliers of IFE systems) it is described as a “**second tier supplier**”. Again, I adopt these terms.
100. Mr Timothy Seager, who is a Technical Marketing Manager for Panasonic, made a witness statement dated 17 May 2024 in which he described the operation of the supply chain. He confirmed that Panasonic predominantly sold its IFE systems to airline customers:

“In April 2016, I joined PAC (an IFE and connectivity provider) as its Technical Marketing Manager for the Middle East, Central & Southern Asia and Africa. As an IFE provider, PAC predominantly sells its IFE systems to airline customers for installation upon their aircraft (though this installation will in fact be carried out by third parties, e.g. a seat manufacturer or the OEM). My primary responsibility as Technical Marketing Manager for the Middle East, Central & Southern Asia and Africa was to engage and build relationships with potential and actual PAC customers in the region, which included: Emirates, Etihad, Qatar, Saudia, Kuwait, Vistara, Spice Jet, Uzbekistan, Air Arabia, Royal Air Maroc,

Biman Bangladesh Airlines, Ethiopian Airlines and Egypt Air, amongst others.”

101. Mr Robin Hough, who is the Commodity Manager responsible for managing electrical commodities at Safran, also made a witness statement dated 16 May 2024 in which he gave evidence that IFE and ISPS systems were the only electrical commodities which Safran treated as BFE principally because of their high cost. He also gave evidence that although Safran issued a purchase order for each item for record purposes, it received the Components for the EmPower systems at no cost. He gave the following evidence about title to the Components and the contractual relationship between Safran, Panasonic and its customers:

“20. Though Safran receives BFE such as EmPower components at no cost, Safran will still need to raise a PO against which to receive the BFE into stock and maintain traceability. While it will be Safran’s customer who will have contracted with the IFE/EmPower System supplier to supply parts, under that contract Safran will be the shipping address for the PO between the supplier and the customer. Safran will therefore raise a zero-value PO simply to receive the parts.

21. When BFE parts such as EmPower components are received from their supplier, the Safran stores team will deal with putting parts in our stock in a similar way to other items. However, importantly, on the receipt, BFE part numbers will be given an identifying suffix that is unique to the airline supplying the parts to us as BFE. For example, for American Airlines, the parts would be booked as (ABC123)-AA. Air New Zealand has a suffix of “AZ”, and so on. Each airline is given a different suffix because these are standard IFE systems and Safran will likely receive the same IFE system from different customers, so we must have a way to assure that the correct IFE system is installed into the correct seats. Airlines may be using the exact same part numbers, so the suffix denotes ownership of the particular part.

22. Regarding title in the BFE parts, Safran does not own the BFE at any stage. They are owned by the customer. I am not aware that title ever transfers to Safran. The suffix shows that the parts are owned by someone else and not to be touched for any other purpose other than installation into that customer’s seats.”

24. Contracts relating to BFE are made between our business and our customer. Who our customer is, contractually, is not something I get involved with. My understanding is that it can be an airline or Airbus/Boeing. Either way, as far as BFE is concerned, Safran will be supplied it free of charge. There is no contract for the supply of BFE parts between Safran and the BFE supplier.

25. As briefly mentioned above, the only circumstance where we would have a contractual relationship with Astronics or any supplier of a BFE

EmPower System is if we lose or break parts supplied to us and have to replace them at our cost. In those circumstances, there is a transactional PO raised and the “battle of the forms” determines whose terms and conditions apply. From memory, we did not have a consistent process in place over the relevant period for issuing further paperwork asserting Safran’s terms & conditions of purchase after receipt of a supplier’s order acknowledgement, so typically the supplier’s terms and conditions would apply.

26. Across suppliers, our relationship with Panasonic (“PAC”) and other IFE system suppliers is the same as it historically has been with Astronics. We only place a PO with them in respect of replacement parts, the terms of which will then be governed by either Safran’s standard Terms of Purchase or the supplier’s standard Terms of Sale.”

102. Finally, Mr David Rosser, who is Head of Electrical Certification at Safran, also made a witness statement dated 17 May 2024 in which he gave evidence that during the Relevant Period: (i) it took Safran about three days to manufacture a business class seat broken down into about 20 stages, (ii) the IFE system was installed at stage 5 or 6, (iii) the Components were provided already complete and (iv) the electronic installation took up about 10% of the production time or about 2.5 hours.
103. Lufthansa did not challenge any of this evidence. Mr Hough and Mr Rosser were not called to give evidence and Lufthansa did not challenge the extract from Mr Seager’s evidence above. I find, therefore, that during the Relevant Period Panasonic sold IFE systems including the individual Components directly to its airline customers on terms that they were delivered to Safran which accepted them as agents for the airline, connected the Components together to form the EmPower Fusion system, assembled the IFE systems and incorporated them into the seats during its manufacturing process. I also assume in favour of the Defendants that title to the Components passed to the airline customer on delivery to Safran and that Panasonic became entitled to payment in full no later than delivery of the Components and before Safran had connected them together.

(4) *The KID SPM*

104. One example of the way in which the supply chain operated related to the SPM developed by KID (the “**KID SPM**”). In August 2006 DLH, Lufthansa and Panasonic entered into an agreement under which Lufthansa selected Panasonic to provide the ex2 IFE system for 10 Airbus A380 aircraft together with an option to supply the system for an additional 5 aircraft. On or about 30 November 2007 DLH, Lufthansa and Panasonic also entered



into a Memorandum of Understanding for the supply of PED power to DLH's fleet of 20 Boeing 747-8i aircraft with an option exercisable by DLH to supply PED power to an additional 20 aircraft. It is clear that Airbus had not yet approved the KID SPM as linefit offerable and it is likely that Boeing had not done so either.

105. It was common ground that there was a heat dissipation issue with the KID SPM although there was a dispute about the significance of that issue. Lufthansa disclosed a slide deck entitled "Lufthansa A380-300 Program Review eX2 InFlight Entertainment System" dated 26 February 2008. Slide 11 showed that KID was originally intended to supply the SPM for this system. But it also showed a red traffic light against "Development Status" and the commentary for the slide also indicated that the following problems had been encountered:

**"[REDACTED]."**

106. On 15 May 2008 and 28 October 2008 meetings took place between DLH and Lufthansa and Lufthansa disclosed the slide decks from each meeting. They show that the thermal dissipation issue with the KID SPM had not been resolved by either of those dates and that the KID SPM had still not been approved by either Airbus or Boeing. The position remained unresolved by the following year. By email dated 22 April 2009 Ms Tammy Cavana of DLH wrote to Mr Frank Niss and Mr Stefan Kahabkha of KID to inform them that Mr Peter Lewalter of DLH was to visit Lufthansa the following week. She stated as follows:

**"[REDACTED]."**

107. On 27 April 2009 that meeting took place and under cover of an email dated 29 April 2009 Mr Niss sent the slide deck for that meeting to Mr Muirhead. The slides stated that the KID SPM case temperature was 72°C with 400W output at ambient room temperature and that the software-enabled PED power cutback resulted in a lower case temperature but reduced PED power capability. They also referred to a technical note in which KID had identified three solutions to the problem. But the slides also indicated that the KID SPM had to meet additional technical requirements to become linefit offerable. In the covering email Mr Niss summarised the position as follows: "Here is a presentation that Panasonic gave to Peter Lewalter this week. The clouds on the subject of KID SPM are getting darker again. There is again open talk of a switch to Astronics SPM."

108. By email dated 7 May 2009 Mr Iain Moffatt of Panasonic wrote to Mr Niss setting out Panasonic's appreciation of the meeting. He stated that two of the three solutions were not acceptable to Panasonic and that the third required further analysis. He also indicated that a change to the Astronics SPM was being considered. On 5 June 2009 Mr Mathias Finck of Airbus wrote to a number of recipients including Mr Dieter Mundt of KID and Mr Moffatt copying in a large number of recipients including Mr Muirhead. He stated as follows:

“please be aware of the fact, that the faith of the KID-SPM depends on showing compliance to the requested means and actions covering the 72°C-issue. Action holders are PAC (KID) and Contour for DLH. We would like Panasonic (KID) to answer our questions and to provide us with requested pieces of information - at least in draft status. I cannot remember anymore how often we asked for feedback. Please do not ignore Lutz and me. Hopefully we will get technical feedback within the next days.”

109. It is clear from the email exchanges which Lufthansa disclosed that an acceptable solution to the problem had still not been found by the autumn. By email dated 2 September 2009 Mr Muirhead wrote to Mr Kahabka asking for a status update. He also stated: “The switch to Astronics MUST be avoided.” However, only a week later that switch took place. By letter dated 8 September 2009 Boeing wrote to Mr Jurgen Lauterbach, who was the Manager of Corporate Aircraft Configuration for the Lufthansa airline, stating as follows:

“[REDACTED].”

110. It is also clear from the email exchanges which Lufthansa disclosed that DLH was not prepared to use the KID SPM in either economy or business class for the Airbus A380 aircraft but only in the first class cabin. By email dated 1 October 2012 Mr Niss wrote to Mr Muirhead stating as follows under the heading “A380”:

“[REDACTED].”

111. On or about 25 October 2010 DLH, Lufthansa and Panasonic entered into an agreement under which the parties agreed a specification which required the use of the Astronics SPM in first class, business class and economy. In their Opening Skeleton Argument the Defendants submitted that only Astronics SPMs were supplied for the Boeing 747-8i project and they relied on an extract from a spreadsheet which Panasonic had produced

in which the part numbers listed for SPMs were all for the Astronics' EmPower system. They also set out a very detailed narrative in relation to the failure of the KID SPM project: see Annex 2. Lufthansa did not dispute any of this evidence. I should also record that, although the Defendants made a number of criticisms of Lufthansa's disclosure in relation to the KID SPM, it was unnecessary for me to rule on those criticisms for this reason.

(5) *Market Share*

112. There was no direct evidence of the effect of these events on either Astronics or KID's performance. But Mr Brady and Mr Dennis Markert, who was Astronics' Director of Business Development, both gave evidence that the ISPSS market was largely a duopoly between Astronics and KID. Indeed, it was put to Mr Markert that from 2010 there were only two real contenders in the market and this was the answer which he gave. There was also no dispute that from 2000 to 2006 the sale of the SkyPower System increased and the experts were agreed that in those early years, the market share of both Astronics and KID were roughly even.
113. It was also common ground that Astronics outsold KID during the Relevant Period. Mr Mosebach made a witness statement ("**Mosebach WS**") in which he gave factual evidence about the development of the SkyPower System and two expert reports ("**Mosebach E1**" and "**Mosebach E2**") in which he gave evidence about the market more generally (to the best of his expertise). In Mosebach E1, Mr Mosebach accepted that Astronics took all of the IFE market and its share of AC power sales grew very significantly. Mr Brady exhibited a market report to Brady 1 which had been prepared by the Valour Consultancy ("**Valour**") and was entitled "The Future of Aircraft Seating and In-Seat Power". The authors of that report reported that Astronics' share of the market in 2018 was 87.89% and KID's share of the market was 9.77%. They also stated as follows in their commentary:

"The in-seat power market is largely a duopoly contested by Astronics and KID-Systeme. The latter had first mover advantage having pioneered 110V AC power and certificating the first SKYpower system in 2000 and has since shipped some 650,000 outlets to more than 200 airline customers throughout the globe. Astronics claims to have shipped more than two million outlets thanks primarily to exclusivity with IFE system manufacturers which incorporate its power systems into the seatback architecture. Despite having signed large-scale contracts in recent years,

newcomers such as IMAGIK (GOL, Air Europa and Neos), Inflight Canada (British Airways, Japan Airlines and Air Transat) and Burrana (a major carrier in Latin America) have yet to make much of an impact in terms of their share of in-service outlets.

Astronics again leads the way when it comes to share of annual revenues. Valour Consultancy estimates that the in-seat power market was worth USD \$233 million in 2018 and Astronics' share of this was 88 per cent. Again, the company's dominance in the supply of IFE-integrated power is fundamental to this substantial lead over its rivals. KID-Systeme generated just under USD \$23 million from the sale of in-seat power products in 2018 giving it a 10 per cent share of total revenues. Together, the six remaining companies in the market share table – IMAGIK, Eirtech Aviation Services, Inflight Canada, True Blue Power, Northern Avionics and Burrana – accounted for 2.35 per cent of 2018 revenues.”

114. In his second report dated 30 August 2024 (“**Brady 2**”) (as corrected) Mr Brady gave evidence based on the parties' disclosure that between 2009 and 2018 Astronics sold **[REDACTED]** ISPSs in power only sales and **[REDACTED]** SPBs or SPMs in IFE sales. It was also his evidence that during the same period Astronics sold **[REDACTED]** AC outlets compared with 117,803 sold by KID. Finally, it was also his evidence that only **[REDACTED]** of those sales were attributable to the power only market rather than the IFE market. If one uses either ISPSs or outlets as a guide to the share of power only sales which Astronics made during that period, then power only sales represented 22% of its revenue.

F. The 2014 Teaming Agreement

*(1) The German proceedings*

115. Since 2010 Lufthansa and Panasonic and Astronics have been litigating over the German designation of the Patent in the German Courts. On 29 December 2010 Lufthansa commenced infringement proceedings in Mannheim in which it asserted that Astronics had infringed the German Patent. On 6 February 2015 the Mannheim District Court (the “**Landgericht**”) ruled that Astronics had infringed the German Patent and that Lufthansa was entitled to damages from 23 December 2003. I will refer to this decision as “**Mannheim I**”.
116. On 10 November 2015 the Karlsruhe Court of Appeal (the “**Oberlandesgericht**”) dismissed an appeal against Mannheim 1 and I will refer to this decision as “**Appeal I**”. On 18 December 2018 the Federal Supreme Court, the *Bundesgerichtshof*, rejected an

application by Astronics for permission to appeal against the Oberlandesgericht's decision in relation to the effect of the 1998 Teaming Agreement and on 26 March 2019 the Federal Supreme Court dismissed Astronics existing appeal against the wider decision in Appeal I. It was common ground before me that Appeal I was binding on the parties.

117. In the course of the infringement proceedings in Germany, Lufthansa survived an attack on the validity of the Patent. I was not taken to any evidence about the German decision although it appeared to be common ground that the decision of the Court was dated 18 December 2013 and that the German Court held that Claim 1 was not valid by itself but that a combination of Claim 1 and Claim 2 was valid only. Mr Jouper gave the following evidence about the consequences of that decision which Lufthansa did not challenge (footnotes omitted):

“197. In early 2014, Mike Hetteich came to my office and asked me to design and implement a modification for the models of Outlet Unit (1235, 1292 and 1295) that had been found to infringe in the German proceedings (the US version of the patent was later found to be invalid). In Germany, claim 1 as granted had been found invalid. The patent was reduced to a combination of claims 1 and 2 as the independent claim. AES' systems were found to infringe this amended claim allowed in Germany. Given that Germany was the only place LHT had sued, designing around the claim 1 of the German patent was what was needed. The solution to the infringement was to remove the ability of the system to detect the timing of the insertion of a user's plug pins (the “Modified Outlet Units”) as the timing feature had become a part of the amended claim 1 in Germany. I was not asked and did not attempt to make any other changes, for example, to design around claim 1 of the unamended patent-in-suit as the German patent had been limited by the combination of claims 1 and 2.

198. This modification took the form of a very minor hardware change. The change was so immaterial that a new part number was not necessary. AES submitted a modification notification to the relevant aviation authorities (e.g., FAA) and aircraft/IFES manufacturers (e.g., Airbus, Boeing, Panasonic, Thales) to notify them of the change (see Exhibits JJ-74-76). The responses from Airbus and Boeing accepting and approving this change are also provided at Exhibits JJ-77-78. AES also sent notifications of the change to certain seat vendors (including Recaro), and sent service bulletins to airline customers, notifying them of a change in the outlet units (I have attached the Recaro notification and a few sample service bulletins, see Exhibit JJ-79).”

118. The earliest notification of change which Mr Jouper exhibited was dated 7 January 2015 and submitted to Airbus, whose representative counter-signed the notification on 4

February 2015 approving the change. The other notifications which he exhibited were dated 7 January 2015, 4 March 2015 and 23 March 2015. Mr Jouper also gave evidence that the cost to Astronics in terms of design time, qualification, testing and readiness for production was [REDACTED].

119. On 26 July 2017 Lufthansa brought a claim for damages for infringement against Astronics in relation to its shipments to Germany and on 6 December 2019 the Landgericht awarded Lufthansa 50% of Astronics' profits for shipments to Germany as damages. I will refer to this decision as "**Mannheim II**". On 12 July 2023 the Oberlandesgericht dismissed an appeal against that decision and I will refer to it as "**Appeal II**" and confirmed Lufthansa's entitlement to 50% of Astronics' profits. Finally, on 29 December 2017 Lufthansa commenced proceedings claiming damages for infringement against Astronics in relation to indirect shipments arising out of the infringement of the German designation of the Patent. On 6 December 2019 and 12 July 2023 the Landgericht and the Oberlandesgericht also handed down decisions in relation to that claim.

(2) *The 2014 Teaming Agreement*

120. Mr Muirhead gave evidence that he regarded KID's initial performance under the 1998 Teaming Agreement as good but that from about 2007 sales and royalties fell significantly year on year until 2009 and then continued to fall further still until 2014 when Lufthansa decided to terminate the 1998 Teaming Agreement. By letter dated 25 June 2014 Lufthansa terminated the agreement with effect from 1 January 2015. Mr Muirhead then gave evidence about what happened next (which the Defendants did not challenge):

"...Lufthansa Technik and KID then negotiated terms for a new teaming agreement to adapt the commercial terms under the 1998 Teaming Agreement in light of the market conditions (with competition from Astronics) and KID's poor performance – KID needed better commercial conditions in the market. The parties agreed on a new remuneration model comprising a [REDACTED] for the remaining three and half years until the lapse of the Patent, and [REDACTED] of [REDACTED] per outlet unit sold from 1 January 2015 ("**2014 Teaming Agreement**").

32. The term of the 2014 Teaming Agreement ended with the lapse of the Patent on 22 May 2018. I was still suspicious about KID's reported sales and accordingly, I informed KID by letter dated December 13, 2018 that Lufthansa Technik elected to use the [REDACTED] of the 2014 Teaming

Agreement.

33. During the audit, Lufthansa then discovered that KID [REDACTED] to Lufthansa Technik under the 1998 Teaming Agreement from 2009 to 2014.

34. On the basis of its recalculations, KID then paid [REDACTED] on 26 November 2020 to Lufthansa.

35. [REDACTED]

36. [REDACTED]

121. On 18 December 2014 Lufthansa and KID (now incorporated as KID-Systeme GmbH) entered into a new agreement (the “**2014 Teaming Agreement**”) and it took effect on 1 January 2015 from the termination of the 1998 Teaming Agreement. The preamble stated as follows:

“LHT developed a technical concept for a 110 V AC, in-seat power supply system (hereinafter referred to as "Advanced System"). This concept is concentrated mainly upon solutions regarding the necessary safety aspects in order to comply with the safety regulations of the Aerospace authorities, thus facilitating a system certification.

The Parties entered into a Teaming Agreement regarding the joint development and the obtaining of a certification of the Advanced System on December 3, 1998 (hereinafter referred to as the "First Teaming Agreement"). The close cooperation between the Parties was the key to a successful introduction into the market of the Advanced System and the certification by the aviation authorities. LHT terminated the First Teaming Agreement effective as of January 1, 2015.

The Parties wish to adapt the existing collaboration to a market situation, which has changed since the First Teaming Agreement was signed, in particular with respect to the products manufactured and offered by Astronics Advanced Electronic Systems (hereinafter referred to as "AES"), which are competing with the Advanced System. Claims which LHT may have with respect to the use of the Advanced System by AES and/or the Settlement Agreement between KID and AES are not subject of this Agreement and shall remain unaffected.

The Parties having the goal to jointly and seamlessly continue the further development and marketing of the Advanced System wish to renew their agreement as follows.”

122. Articles 1 to 4 of the 2014 Teaming Agreement were in a very similar form to Articles 1 to 4 of the 1998 Teaming Agreement. In particular, Articles 2 and 3 continued to contain provisions requiring Lufthansa to support KID and to promote the SkyPower system and KID to recommend Lufthansa:

**[REDACTED]**

### **Article 3 System Installation**

KID will recommend LHT to any potential buyer as partner for the installation of the Systems into the respective aircraft. In principle, within this context, LHT may offer the following services:

- Complete installation of the systems including certification (STC) and complete documentation (full turnkey package),
- Installation kits,
- Certification support.

In such a case, on request of the end buyer and after consultation with KID, LHT may place an offer of such service in its own name, adapted to the individual requirements of the buyer. The placement of the offer and the negotiations resulting therefrom (to be conducted together with KID) will be performed with the express aim to arrive at a commercial and attractive overall offer.

In the event a potential buyer does not request or accept an offer from LHT, KID will be free to cooperate with other partners in this respect. LHT will inform KID in due time, if LHT determines it is impossible to perform the installation requested by the buyer.”

123. Article 5 provided that KID should make an immediate non-refundable payment of **[REDACTED]** to Lufthansa and pay **[REDACTED]** per unit sold containing the patented technology described in the Patents in Appendix A (which included the Patent). It also provided that **[REDACTED]** was payable for sales to DLH but that the immediate payment and the ongoing royalty were not compensation for Lufthansa’s claims in the AES Proceedings or under the Settlement Agreement. The AES Proceedings were defined in Article 8 as follows:

#### **“Article 8 Settlement with AES**

LHT is currently asserting the Patents against AES in Germany (docket no. 7 0 289/10 of the Mannheim District Court, hereinafter referred to as the "German Proceedings") and in the United States of America (docket no. 2:14-CV-01821 of the United States District Court for the Western District of Washington, hereinafter referred to as the "US Proceedings", the German and US Proceedings jointly referred to as "AES Proceedings"). LHT invited KID to join the German Proceedings in support of LHT. On November 17, 2003, KID had entered into a Settlement Agreement with AES (hereinafter referred to as "Settlement Agreement"), which includes a non-assertion obligation of KID with respect to the Patents.”

124. Article 8 also provided that the rights granted under the agreement should not preclude Lufthansa from concluding any settlement with Astronics or granting any licences to



Astronics. Article 9 then provided as follows:

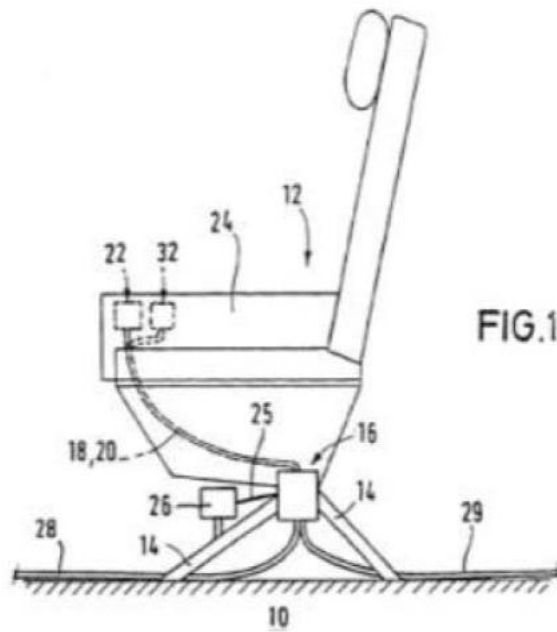
**“Damage Claims**

For the avoidance of doubt, LHT and KID consent that LHT shall be entitled to enforce and collect all damages claims and assert all other rights regarding the infringement of the Patents in the past or in the future in its own name. KID shall support LHT with the enforcement of any possible claims against AES or other third parties as far as possible with regard to the restrictions imposed on KID under the Settlement Agreement.”

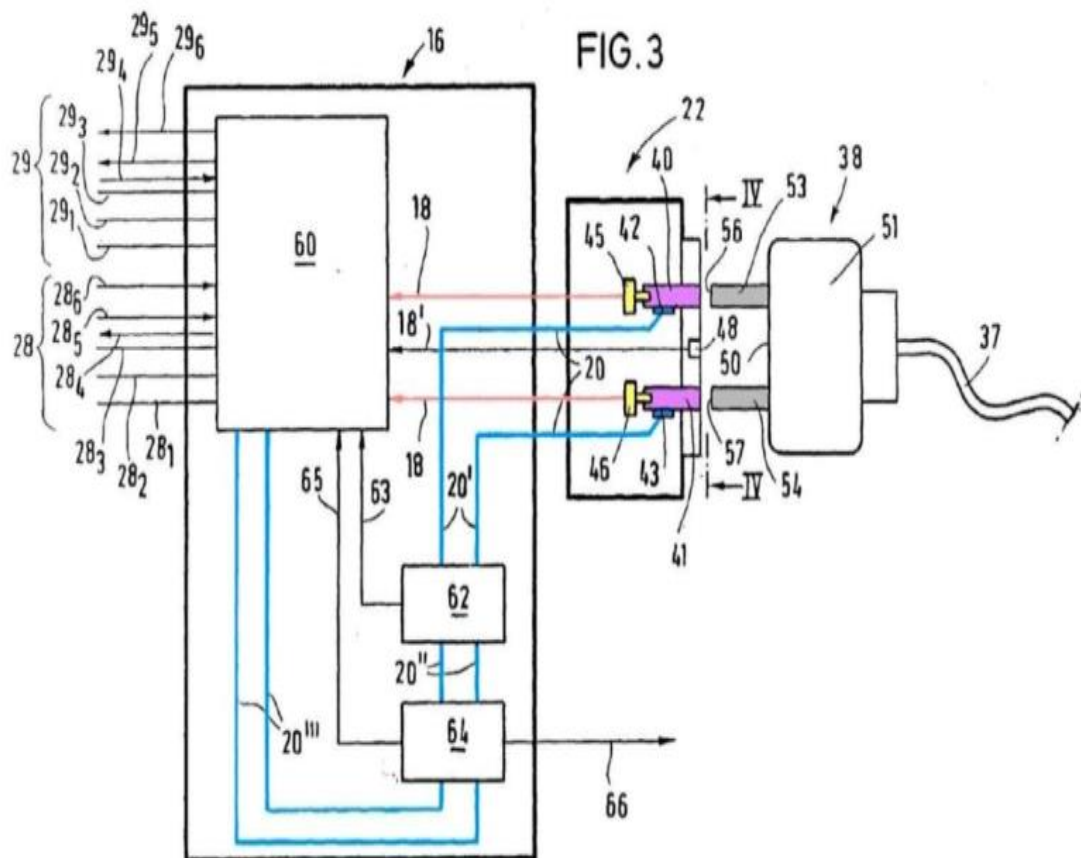
125. Article 12 provided that the agreement was to remain in force until the expiry of the last patent (subject to a right of termination on 30 days’ notice) and that its place of jurisdiction was Hamburg. On 18 August 2016 the US Proceedings referred to in Article 8 resulted in the US patent being revoked and on 22 May 2018 the Patent expired. Finally, on 24 February 2023 the French designation of the Patent was found to be invalid.

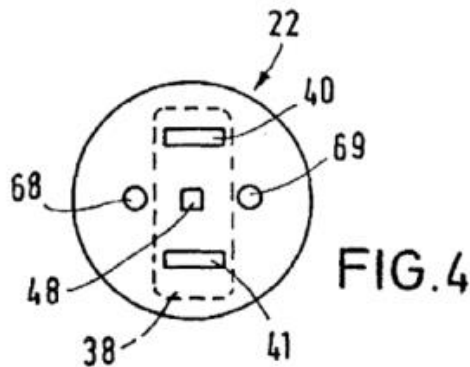
**III. Liability**

126. Morgan J heard the trial on liability for patent infringement over 5 days between 22 June 2020 and 1 July 2020 (the “**Liability Trial**”) and on 22 July 2020 he handed down judgment. He set out the text of the Patent in some detail together with a number of the figures: see the Liability Judgment, [19] to [62]. Birss LJ also set out part of the text and Figures 3 and 4: see the Appeal Judgment, [5] to [17]. For the reader to make any sense of my own analysis and findings, it is necessary for me to do the same although I keep the repetition to a minimum. As will be apparent from section II (above) the invention of the patent is concerned with the provision of power in an aircraft for PEDs. The power is delivered by an ISPS as shown in Figure 1, (16) and a socket such as shown in Figure 1, (22) (below):



127. Figure 3 shows an ISPS at (16), a socket at (22) and the plug of the device being inserted into the socket at (38). Figure 4 depicts the face of a socket which is designed to receive the two pins of a US NEMA plug (40) and (41) or the two pins of a European socket:





128. Morgan J described the way in which he understood the invention to work in the Liability Judgment by reference to Figures 3 and 4 in the following passage at [36] to [42]:

“36. The recessed contact terminals in the socket (shown in purple, 40, 41) were each designed to receive a pin, and at the end of each recess there was a microswitch (in yellow, 45 and 46). As the plug was pushed in, each pin travelled to the bottom of its recess and on reaching the end it triggered its corresponding microswitch, detecting that the pin was inserted.

37. On the front face of the socket (22) there was an optical infrared reflection sensor (48), which sensed the body of the plug. It comprised an infrared emitting LED and a receiver diode. If the distance between the socket and the plug fell below a certain minimum separation, the radiation emitted from the LED was reflected from the plug and received by the receiver diode.

38. Each of the microswitches was connected via a signal line (18) to the voltage supply device (specifically, to a control and monitoring unit – 60). Each microswitch, when activated, sent a signal from the socket to the voltage supply device. When all signal inputs were triggered (i.e. when both contact pins are inserted far enough to push the microswitches), the supply device detected that a plug has been inserted. The optical sensor was similarly connected to the supply device via a signal line (18'), and when the plug was close enough to reflect the light from the LED, that too could send a signal to the supply device.

39. The control and monitoring unit was connected to the 110V, 60Hz mains supply (29, 28), and had a voltage switch that could apply the high voltage (via supply cables 20).

40. The control and monitoring unit of the supply device also took inputs from a short circuit detector (62) to detect current leakage and provide power limiting of the power supply to approximately 100W to prevent overload of the supply device, and from a line monitoring detector (64) that worked together with the control and monitoring unit to filter interference out of the supply lines.

41. In this way, when the supply device received an input from all the associated sensors and detectors, indicating that each sensing condition was satisfied, it could switch the supply on, allowing high voltage power to flow, via the supply lines (20) to the pins of the plug.

42. Figure 4 (above) showed the face of a socket designed to receive the 2 pins of a US plug (40, 41) or of a European plug (68, 69). The optical sensor (48) was shown at the centre of the socket. There was no hole for the earth pin of a UK plug.”

129. As I have stated above, the Patent consisted of a detailed description and seven claims. Claims 1 to 3 were the subject matter of the declaration which Morgan J made in the Liability Order and Claim 2 was held to be valid by the German Courts. Claim 5 was also the subject matter of detailed argument before the judge in the context of the construction of Claim 1. I therefore set out Claims 1 to 7 in full:

“1. A voltage supply apparatus for providing a supply voltage for electric devices (36) in an aeroplane cabin, comprising a socket (22) to which the device (36) is connectable by means of a plug (38) and to which the supply voltage can be applied, the socket (22) comprising a socket detector (45, 46, 48) detecting the presence of a plug (38) inserted in the socket (22), and a supply device (16) being provided remotely from the socket (22) and being connected to the socket (22) via a signal line (18) and via a supply line (20) for the supply voltage, the supply device (16) applying the supply voltage to the socket (22) when the plug detectors (45, 46, 48) indicate the presence of the plug (38) via the signal line (18) to the supply device (16).

**characterized in that**

the plug detector (45, 46) is formed such as to detect the presence of two contact pins (53, 54) of the plug (38) in the socket (22), and the supply device (16) only applies the supply voltage to the socket (22) if the presence of two contact pins (53, 54) of the plug (38) is detected simultaneously.

2. The voltage supply apparatus according to claim 1, wherein the supply device (16) only applies the supply voltage if a maximum contact time is not exceeded between the detection of the first and the second contact pin (53, 54) of the plug (38).

3. The voltage supply apparatus according to claim 1 or 2, wherein the plug detector comprises mechanical switches (45, 46) activated by the inserted contact pins (53, 54) of the plug (38).

4. The voltage supply apparatus according to one of claims 1 - 3, wherein the plug (22) comprises a casing detector (48) detecting the presence of the plug casing (51) of the plug (38) at the socket (22).

5. The voltage supply apparatus according to claim 4, wherein the casing detector (48) is an optical reflection sensor detecting a minimum distance of the plug casing (51) to the socket (22).

6. The voltage supply apparatus according to claim 4 or 5, wherein the supply device (16) applies the supply voltage to the socket (22) only if the plug detector (45, 46) indicates the presence of the contact pins (53, 54) and the casing detector (48) indicates the presence of the plug casing (51).

7. The voltage supply apparatus according to one of claims 1-6, wherein a plurality of supply devices (16) and a central voltage source (30) are provided for the voltage supply of the supply devices (16), the voltage source (30) being able to be deactivated by a control signal.”

130. Birss LJ explained why Claim 1 came to be drafted as it was in the Appeal Judgment at [9]. The first part of Claim 1 was based on a patent called Quintel and the second part contained the inventive step which Lufthansa claimed over this prior art:

“The claim is drafted using the EPO's conventional approach of having two portions divided by the words "characterised in that". By convention the pre-characterising part is based on prior art, in this case a patent called Quintel (FRA 2,653,944). This case highlights a curiosity of the pre/post characterising approach to claim drafting. When drafted this way the characterising features of the claim explain what the patentee thought were features not disclosed in the prior art on which the pre-characterising part was based, i.e. Quintel. In other words these characterising features are presented as representing the inventive step over that prior art. However the challengers to validity in this case, as they are entitled to, rely on different prior art. In response the patentee seeks to identify distinctions over that other prior art. As it turns out in this case those distinctions are features of the pre-characterising part. So the inventive step (if it is one) over the other prior art may very well not be the features in the characterising portion of the claim at all. I mention this only to make the point that it is a legitimate approach for patentees to take. Many good inventions amount to new combinations of old features. The fact that each of the individual features making up a claimed invention can be found in various places in the prior art may well help the party challenging validity to make their case but it does not, on its own, prove that a claim lacks an inventive step.”

## G. Construction

### *(1) The safety problems*

131. The parties identified three safety issues which the Patent was intended to address: the “**knitting needle problem**”, the “**drenching problem**” and the “**double knitting-needle problem**” (all of which were anticipated or considered to some extent in the regulatory materials which I have considered above). Morgan J explained those problems in the Liability Judgment, [209] and [210]:

“209. Professor Wheeler gave evidence that there would have been concerns raised at the suggestion of a new design of a socket installed in the seat which would provide a high voltage AC supply. The concerns would have been due to: i) the risk that a metal object, not a plug, might be inserted into the socket which might deliver an electric shock to a passenger; this risk was said to exist in particular in relation to a child poking something into the socket; this was referred to as “the knitting needle problem”; the problem was not confined to the use of a knitting needle but the phrase was intended to describe a general problem of an object being inserted into the socket so as to deliver an electric shock to the passenger; ii) the risk of liquid entering the socket causing a short circuit or possibly an electric shock to a passenger; the liquid might come from a spilt drink or from a cleaning product; this was referred to as “the drenching problem”.

210. In addition to these problems identified by Professor Wheeler, there was considerable discussion at the hearing as to what was described as “the double knitting needle problem”. This involved the risk of electrocution caused by inserting metal objects into two apertures of the socket (where there was no risk of electrocution caused by inserting a single metal object into the socket).”

132. The judge stated that Claim 1 dealt with the knitting-needle problem and the drenching problem and Claim 2 dealt with the double-knitting needle problem. The principal issue which the judge had to decide was how, as a matter of construction of the Patent, Claim 1 addressed these problems. There was no issue in relation to the construction of Claim 2 which required the plug pins to be inserted into the outlet unit at the same time and for contact to be simultaneous (or almost simultaneous). I will refer to this as the “**timing test**” or the “**timing feature**”.

(2) *The insertion test*

133. The first issue which Morgan J had to decide was what test the words “the presence of two contact pins (53, 54) of the plug (38) in the socket (22)” required the plug detectors to perform. He held that Claim 1 required the insertion of a plug in a socket “to such an extent that the tips of the pins of the socket make contact with the plug detectors at 45 and 46” and I will refer to this holding as the “**insertion test**” or the “**insertion feature**”. He stated that this was the natural meaning of Claim 1 at [69] and after considering a number of arguments, reached a final conclusion to this effect at [75]:

69. Before I deal with the submissions as to the relevance of the full patent specification in Quintel, I will consider the submissions based on the language used in the Patent itself. I will start with the wording of Claim 1.

This describes a socket and a plug. It refers to "the presence of a plug inserted in the socket". The presence of the plug is detected by the socket detector. Claim 1 says that the socket detector includes that which is numbered 45 and 46. The numbers are obviously references to the drawings and, in particular, Figure 3. Accordingly, simply to understand what is referred to in claim 1, it is necessary to refer to the drawings which show the location of the detectors numbered 45 and 46. Figure 3 shows the detectors numbered 45 and 46 at the bottom of the holes which receive the pins of the plug. Claim 1 goes on to provide that the plug detectors (45 and 46) are formed so as to detect the presence of "two contact pins" (53 and 54) of the plug in the socket. The contact pins, 53 and 54, are simply the pins of the plug. The natural reading of claim 1 is that it is describing detection which occurs when the contact pins make contact with the detectors at 45 and 46. That means that the pins of the plug must be inserted so that they make contact with the detectors. There was no technical evidence to the effect that the detectors detect the pins of the plug as they approach the detectors as distinct from when they touch the detectors. In this way, the words "inserted in the socket" and "the plug in the socket" are referring to a state of affairs where the pins of the plug are in contact with the detectors of the pins of the plug and that requires a degree of insertion which brings the pins into contact with the plug detectors. In addition, the natural meaning of the words "inserted in the socket", using the past participle, suggests that the plug has been fully inserted rather than partially inserted although that sense might not have been the only possible reading if there were other wording to contradict the natural meaning."

"75. Based on the above considerations, I conclude that claim 1 requires the insertion of a plug in a socket to such an extent that the tips of the pins of the socket make contact with the plug detectors at 45 and 46. I do not think that state of affairs is satisfied by any partial insertion of a plug short of that. This was the conclusion reached by the German court in relation to the same issue. I reach my conclusion independently of the German decision but I note that my reasoning overlaps with some of the reasoning in that decision."

134. The judge used the words "fully inserted" at the end of [69]. This is not surprising since the issue which he was asked to decide was whether the insertion test required full or partial insertion: see [63](i). He also used the words "fully inserted" in [70] in considering an argument which Mr Acland KC for the Defendants advanced by reference to Claim 5, namely, that the casing sensor on the outside of the outlet would have detected the casing of the plug before the pins had made contact with the plug detectors. He also used it in [71] when considering the other references in the Patent description to a plug being "plugged in" or "inserted":

"70. This reading of claim 1 is consistent with the language of the other claims. The claims contain a number of references to "the contact pins".

Claim 5 refers to another form of detection of a plug. Claim 5 involves the use of an optical reflection sensor which detects the casing of a plug at the socket when it is within a minimum distance from the socket. The Patent does not define what this minimum distance is. It could be said that if the plug casing is being detected when it is still at a distance from the socket then at that point the plug might not be fully inserted. It could then be argued that this tends to show that other claims do not require the plug to be fully inserted. I do not accept that argument. The Patent refers to two different methods of detection of a plug in the socket. Claim 1 appears clearly to require the pins of the plug to make contact with detectors at the bottom of the holes which receive the pins. Claim 5 refers to the plug being detected when it is within a minimum distance from the socket. I do not regard the additional detection process described in claim 5 as detracting from the clear requirements of claim 1.

71. The description in the Patent contains numerous references to the plug being "plugged in" or "inserted". Again, the natural meaning of these words is that the plug is fully plugged in or inserted but, again, that natural meaning might yield to an alternative reading if there were other wording to contradict it. More relevantly, the description explains the way in which the detectors 45 and 46 (referred to in claim 1) work. These detectors are "at the bottom of each plug hole": paragraph [0024]. Further, paragraphs [0026] and [0027] refer to the free ends (56 and 57) of the contact pins activating the microswitches at 45 and 46. Figure 3 shows 56 and 57 at the tips of the contact pins."

135. I will have to return to the question of what precisely the judge decided and, in particular, whether he held that the insertion test required the plug casing to touch the faceplate of the outlet (i.e. whether it required a "**casing to casing**" test of insertion). But it is important to note at this stage that the words "fully inserted" did not form part of the test which he held Claim 1 to require and was a shorthand description for that test: see [75] (above). What the judge held was that Claim 1 required the pins of the plug to be inserted to such an extent that the tips of the pins made contact with the plug detectors at (45) and (46).
136. Moreover, the decision to which the judge referred in [75] was the decision of the Federal German Patent Court dated 18 December 2013. In that case the Court analysed *Quintel* as requiring an insertion test which required the contact pins of the plug to be "inserted almost completely into the holes in the receptacle and therefore cannot be touched when there is a live power supply voltage". The Court reached the same conclusion about the Patent itself:

"With this understanding, detection of an "inserted" plug according to



M3.1<sup>2</sup> presupposes that a plug with its contact pins is inserted almost completely into the holes in the receptacle. This interpretation finds additional support in the description of the apparatus according to patent claim 1, where it is repeatedly and consistently required that the plug must be and have been inserted prior to switching the power supply voltage on. Consequently, such detection of the plug according to the patent in suit which detects the plug and/or the contact pins already at the start of the process of insertion into the receptacle will be excluded from such plug detection according to the patent in suit because, in accordance with features M 4.3, 4.3a and 4.3b, such early detection also results in the power supply voltage being switched on at the start of the insertion operation. However, this would compromise the shock protection provided as described above, and therefore the intended safety improvement could not be achieved.”

137. The Court of Appeal dismissed the Defendants’ appeal against the judge’s decision on this issue. It is unnecessary for me to set out or analyse the reasons of the Court other than to note that Birss LJ agreed with Morgan J about the natural way to read the Patent. He stated this at [40]:

“Moreover I agree with the judge’s reasoning in parts (c) and (d). The natural way to read the references in the claim to a plug “inserted in the socket” is to a plug which has been plugged in, i.e. fully inserted. It is not talking about a plug being detected as it is being inserted, it is detecting a plug which has been inserted into the socket.”

(3) *The remoteness test*

138. The second issue which Morgan J had to decide was what was meant by “remotely” in the phrase “a supply device being provided remotely from the socket”: see [63](ii). I will refer to this as the “**remoteness test**” or “**remoteness feature**”. The judge considered that it meant more than separate and required the ISPS to be kept away from the socket and, in particular, arranged in such a way that there was no source of danger to the passenger: see [88]. He did not consider it necessary to decide whether the risk that the ISPS might be drenched was common general knowledge: see [90]. Finally, he did not consider that the references to remoteness in the Patent gave rise to any conceptual uncertainty. He stated this (at [94]):

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<sup>2</sup> The German Court divided up Claim 1 into a number of different features of which M3.1 was: “The plug detector (45, 46) detects the presence of a plug (38) inserted into the receptacle.”

“In the present case, I do not consider that there is any conceptual uncertainty in the references to remoteness in the Patent. The concept involved is in fact quite clear. The concept is that the supply device must be kept away from the socket and, as a result, the supply device will be kept away from the passenger who is intended to have access to the socket. The purpose of keeping the supply device away from the passenger is so that there will not be a risk of something happening to the supply device which would cause a problem, such as a short circuit or an electric shock being administered to the passenger. What the Patent does not spell out, I think deliberately, is what design option should be chosen to advance the achievement of the object. However, it is permissible for the Patent to leave that choice to the individual skilled person implementing the Patent. As explained in *Anan Kasei*, referring to earlier cases, a patent is not insufficient for uncertainty just because the boundary of the monopoly claimed is a “fuzzy boundary”. In this case, I do not regard the boundary as being particularly “fuzzy” and it is much less fuzzy than some earlier cases where the boundary was demarcated in the patent by language which involved matters of degree.”

139. The Court of Appeal also dismissed the appeal against the judge’s decision on this issue. Birss LJ agreed with his reasoning about the remoteness test. He dealt with this issue at [69] to [73]:

“The appellants are correct on appeal that the purpose of the invention is not concerned with the precise location of the supply device but that does not justify a conclusion that the supply device only has to be separated from the socket and could be located anywhere, even very close to the socket. The purpose of this aspect of the invention is to keep the supply device away from the socket and arrange things in such a way that there is no source of danger to the passenger.”

“Moreover, contrary to another aspect of the appellants’ case, the judge did not reach his conclusion on construction by reference to the drenching problem. Paragraph 90 of the judgment notes that the patent itself does not refer to the drenching problem and also holds that there is no need to decide at that stage if the risk of drenching was part of the common general knowledge.”

(4) *Neuenschwander*

140. *Neuenschwander* was a US patent filed in 1985 and published in May 1986 which described a mains electric socket in which the supply of high voltage electricity was triggered by the insertion of a plug. The means by which it achieved this was a “light bridge” using light sensors or optical conductors: see the Liability Judgment, [134] to

[139]. The Defendants argued that the Patent lacked novelty and obviousness over this item of prior art. It was common ground before Morgan J that *Neuenschwander* did not disclose a requirement for complete insertion of the plug into the socket before power was supplied to the socket: see [143]. Given the judge's finding in relation to the insertion test (above), the judge held that Claim 1 was novel over *Neuenschwander*: see [183] to [187]. He also held that Claim 1 was not obvious over *Neuenschwander* because it did not deal with the double knitting-needle problem and did not teach a remoteness test: see [214] and [261] to [263].

141. The importance of *Neuenschwander* to the issues which I have to decide is that it framed the dispute over the insertion test. If the Defendants were right and the insertion test did not require full insertion then, so the Defendants argued, it was not novel over *Neuenschwander*. The dispute was also relevant to an argument which the Defendants advanced in relation to Figure 4 (above). They argued that the insertion test only required partial insertion because Figure 4 contemplated micro-switches at the sides rather than the bottom of the plug holes:

“72. Mr Acland drew attention to Figure 4. Figure 4 is described in paragraph [0032] of the description in the Patent. That paragraph refers to the location of the microswitches for the plug detector in a way which is consistent with the other parts of the description whereby the microswitches are at the bottom of the holes for receiving the pins of the plug. However, paragraph [0032] goes on to refer to the possibility that the pairs of plug holes (US and European) might be arranged so that they are not at right angles to each other (as shown in Figure 4) but overlay each other. With that possibility, paragraph [0032] states that the microswitches are to be arranged to the sides of the plug holes. There is no drawing dealing with this possibility which shows where precisely the microswitches should be placed.

73. Mr Acland suggested that if, for the purposes of this possibility, the microswitches were placed on the sides of the plug holes but not at the bottom of the plug holes, then a plug would be detected when it was not fully inserted. The suggestion then seemed to be that when I come to construe claim 1, which refers to an arrangement which appears to require full plug insertion, I should reconsider what it means in order to accommodate the possibility referred to in paragraph [0032], but not illustrated, which might involve switches which are not at the bottoms of the plug holes. It then appears to be said that I should then hold that claim 1 permits the microswitches to be at the bottom of the plug holes or somewhere else on the sides of the plug holes.

74. Mr Acland's submission based on paragraph [0032] involves reading claim 1 in a way which is wider than the language in which it is apparently

expressed and which dispenses with the requirement apparently expressed in claim 1 which is that the plug is detected when the pins make contact with microswitches at the bottom of the plug holes. I accept that the possibility which is identified in paragraph [0032] is part of the material which I should consider when I come to construe claim 1 but it is not the only material. I consider that taking the wording of claim 1, with its express cross references to the drawings and taking the other parts of the description and drawings altogether, claim 1 does identify a requirement that the plug is fully inserted in the socket and that is how it should be construed. On that basis, claim 1 and, indeed, the other claims do not appear expressly to deal with the possibility referred to in paragraph [0032]. I was not addressed on the implications of that position as regards that possibility and I will not deal with it further.”

142. It can be seen from this passage that the judge rejected the argument because the wording of Claim 1 did not support this wider construction and the Court of Appeal held that he was right to do so: see the Appeal Judgment, [45] to [49]. It is not necessary to explore the reasoning. The key point, for present purposes, was that the construction issue was relevant to the question whether Claim 1 was novel over *Neuenschwander* and the question whether Claim 1 involved an inventive step. The judge and the Court of Appeal also rejected the Defendants’ case that Claim 2 was obvious over *Neuenschwander*. Birss LJ stated as follows in the Appeal Judgment at [80] and [81]:

“80. The appeal relating to the obviousness of claim 2 over *Neuenschwander* also now fails because since claim 1 involves an inventive step, necessarily so does claim 2. Again however I will also add that I was not persuaded by the argument being advanced on this part of the appeal. What claim 2 adds to claim 1 is a timing feature. The timing feature allows for the detection of the arrival times of the two pins of a plug, so as to be able to determine if they have arrived substantially simultaneously with one with the other, and thereby distinguish between a plug and (say) two paper clips applied separately. The submission on appeal was based on an alleged hint in *Neuenschwander*. The hint argument arose from a sentence in paragraph 160 of the judgment which was part of the judge’s reasoning rejecting the submission that *Neuenschwander* contained clear and unmistakable directions to introduce the timing feature....81. The appellants seek to argue that because the judge referred to no “other” hint, this was a finding that the sentence in question was itself a hint of the timing feature. I am not convinced. The judge was not finding that the passage in *Neuenschwander* was itself a hint of the timing feature. His point was that since there was no other hint of that feature anywhere else in the document, it was entirely possible that there was no hint of the feature in the relevant passage either. The passage was simply a description of what would happen in the ordinary case when an ordinary plug was plugged in – which would be the simultaneous arrival of the two pins.”

(5) *Sellati*

143. *Sellati* was a US patent filed in December 1987 and published in October 1989 for a safety power outlet which generated a “connect signal which activates a power connection” upon the insertion of all of the prongs of a plug. The judge described how the invention worked at [164] and [165]:

“164. The "Background and Prior Art" section of the description explained the known dangers of fires or injuries associated with metallic objects being inserted into the socket and fires and explosions caused when the plug and outlet were joined, with the power connected. *Sellati* identified two disadvantages of the prior art devices. The first was that they did not prevent the accidental insertion of wires or metals from causing injury or fires because power was present before the plug was inserted into the outlet (column 1, lines 25-30). The invention however ensured that power was supplied only when a plug was "fully inserted" into the socket (column 1, lines 7-10) or the plug and outlet were “completely joined together” (column 1, lines 29-30). The second disadvantage was that the prior art devices required specially constructed mating plugs and outlets (column 1, lines 30 to 36).

165. The "Summary of the Invention" explained that *Sellati* provided an outlet that was "safely disconnected from the high potential power lines, until a standard electrical power plug has been fully inserted" (column 1, lines 39-44). The outlet was connected to high potential power lines, and was typically contained in a housing, mounted to a wall or connected to a flexible power cord (column 1, lines 45-61). The housing had a receive terminal to receive each prong of a plug, where each recessed contact terminal of the socket had a normally-open mechanical switch, which was closed only when the corresponding prong of the plug was completely inserted into the recess (column 1, lines 61-65). When all the switches were closed the socket generated a "connect signal" which had the effect of closing a switch, such as a triac or a relay, thereby making a connection between the mains supply line and the contact terminals (column 1, line 61 – column 2, line 12). There was a light that indicated whether the power was on or off (column 2, lines 13-23). *Sellati* explained that if one of the prongs was 'missing', the person was protected from shock (column 2, lines 24-29).”

144. It was common ground that *Sellati* disclosed a requirement for complete insertion of the plug into the socket in order to turn on the power supply: see the Liability Judgment, [175]. The issue between the parties was whether it also taught a remoteness test and the judge held that it did not do so. He expressed his reasons at [181] and [182]:

“181. There is considerable room for argument as to what *Sellati* did disclose in relation to the separation of the power supply from the socket.

Figure 2 showed the triac as being outside the socket but it did not show any enclosure for the triac. Further, if Figure 2 is to be understood as showing the location of components, it is rather puzzling that it shows the wire between the two microswitches and the connection between the neutral and the LED as also being outside the socket. That makes one question whether Figure 2 is to be read as showing the location of components at all.

182. If Sellati did intend the power supply to be separate from the socket, it did not contain any clear and unmistakeable direction in that respect. In any event, on my construction of the requirement of remoteness in claim 1 of the Patent, the supply device must be provided “remotely” from the socket and this requires that that the two components are more than “separate” so that the supply device must be “kept away” from the socket and, in particular, “arranged in such a way that there is no source of danger to the passenger”. The description in Sellati did not draw attention to any issue as to remoteness or any perceived benefit as to remoteness and cannot be said to contain a clear and unmistakeable direction in the respect required by claim 1 of the Patent. I consider that this requirement of claim 1 of the Patent is not disclosed by Sellati.”

145. The judge held that Claims 1 and 2 were novel over *Sellati* because it did not disclose the possibility of remoteness of the power supply or the timing feature: see [189] to [191]. He also held *Sellati* dealt with the single knitting-needle problem but did not deal with the double knitting-needle problem and did not really deal with the drenching problem: see [215] and [250]. He therefore held that both Claims 1 and 2 were not obvious over *Sellati*: see [251] to [255]. However, he gave the following additional reasons for this decision:

“256. As to the other submissions which were made under this head, based on my earlier findings, I am able to conclude that at the priority date: i) the mindset of the skilled person would not lead him to consider the installation of a high voltage AC power supply at an aeroplane seat; ii) the skilled person would not regard *Sellati* as a reason to design a high voltage AC ISPSS; iii) the skilled person would know that if his design was not a significant improvement on existing systems, it would not be certified by the CAA.

257. I have considered the question of technical obviousness separately from the question whether claim 1 involved an inventive step by reason of it overcoming the mindset or prejudice involved in the common general knowledge. As I have considered that the design in claim 1 was not technically obvious, it is not necessary to consider what the position would have been if it had been technically obvious. In this case, the mindset or prejudice involved in the common general knowledge is an additional reason why the design in claim 1 would not have been obvious to the uninventive skilled person.

258. As I have explained, the Claimant's submissions stressed, and I accept, that, at the priority date, the regulators would have been resistant to the certification of an ISPSS which used high voltage AC. That fact is relevant because I consider that the attitude of the regulators is indicative of the mindset of the relevant skilled persons at the priority date. This is not a case where the use of high voltage AC was technically obvious but it is being said it involved an inventive step because there was a perceived difficulty in obtaining regulatory approval. This is not a case like *Re Richardson-Vicks Inc's Patent* [1997] RPC 888."

146. Before the judge, the Defendants advanced their case on obviousness primarily over *Sellati*. But, as Birss LJ observed in the Appeal Judgment, they changed tack on the appeal: see [27]. They did not challenge the judge's conclusions that Claims 1 and 2 were valid over *Sellati* but challenged them on the basis that they were obvious over *Neuenschwander* (and I have briefly summarised the conclusions of the judge and the Court of Appeal on those issues above). They must, therefore, be taken to have accepted the judge's findings in relation to novelty and inventive step.

(6) *The skilled person*

147. Morgan J held that the skilled person was a person interested in power supply systems in an aircraft with a degree or equivalent in electrical engineering and 3 to 5 years of experience in the aircraft industry: see the useful summary which Birss LJ set out in the Appeal Judgment, [25]. The judge dealt in some detail with the mindset of the skilled person and after summarising the evidence of Mr Barovsky (who also gave evidence at the Liability Trial), he set out his conclusions at [236] and [237]:

"236. My finding, based on the contemporaneous documents, and the oral evidence is as follows. In May 1997, the mindset of skilled persons of the kind identified by Mr Barovsky was that: i) a high voltage AC system was significantly more dangerous than a low voltage DC system; ii) the aviation authorities, led by the FAA, would resist a proposal to install a high voltage AC system; iii) the reasons for that resistance were well understood by the skilled person; and iv) the design of an ISPSS ought to be a low voltage DC system. 237. I find that this was the mindset of skilled persons of the relevant kind, taken as a whole, and not just the mindset of some of them."

## H. Infringement

(1) *The judge's findings*

148. Morgan J considered that the EmPower Fusion system had three essential components, namely, the ISPS, the socket or outlet and the power and signal connection cables (which I have defined as the Primary Components): see [274]. He held that Astronics was liable for indirect infringement under section 60(2) of the PA 1977 by supplying the Components to seat manufacturers such as Safran and that Safran committed direct infringement by connecting them together and incorporating them into airline seats:

“277. Astronics supplies components which are not, at the time of supply, connected together to form the System. However, the components constitute the means, relating to an essential element of the invention in claim 1, for putting that invention into effect, within section 60(2) of the Patents Act 1977, dealing with indirect or contributory infringement. Astronics admits that at the time of its supplies, it had the knowledge required for indirect or contributory infringement within section 60(2). That being the case, it is not necessary in this case to consider whether Astronics was also liable for direct infringement pursuant to section 60(1)(a) whether as a sole tortfeasor in respect of its own actions or pursuant to a common design to commit a direct infringement.

278. Safran is a seat manufacturer and uses the components of the System by connecting them together and forming them into a System in a seat supplied by it. Safran accepts that it thereby commits a direct infringement of claim 1.”

149. The judge identified a number of different ways in which Lufthansa put its case against Panasonic. He rejected the argument that on the true construction of Claim 1 the product referred to in the Patent comprised the individual Components: see [281](i). But he considered it unnecessary to decide the other issues because he held that Panasonic was liable for infringement as a participant in a common design to infringe under section 60(1)(a) of the PA 1977 at [279], [285] and [286]:

“279. The position of Panasonic requires further elaboration. Panasonic is a supplier of IFE systems. It advertises for sale its own IFE systems. These IFE systems incorporate a bespoke implementation of the System. Panasonic then supplies the components of the System with the knowledge and intent that they will be assembled into the System in the UK. The components as supplied by Panasonic are an almost finished version of the System. The interconnect cable has different connection hardware at either end so that it cannot be incorrectly attached to the ISPS or the socket. There is only one way to assemble the components. The connections are colour coded to assist the installer who is provided with assembly instructions and the components are connected in the same way regardless of the type of seat into which they are installed.”

“285. In the present case, there does not appear to be any dispute as to the



facts, summarised above, as to what Panasonic did and what it said to its customers. On those facts, there was a common design involving Panasonic and its customers to connect the components to form the System. When the customers did form the System from the components, pursuant to the common design, they infringed claim 1 of the Patent pursuant to section 60(1)(a). Liability under section 60(1)(a) did not depend on the customers', or Panasonic's, knowledge of the technical workings of the System.

286. Accordingly, I conclude that Panasonic is liable by reason of its common design to do acts which amount to an infringement within section 60(1)(a). This conclusion means that it is not necessary in this case to consider the further arguments which the Claimant has put forward. In his closing submissions, Mr Cuddigan invited me to decide the case against Panasonic on this basis and not to deal with the other arguments. I agree that I ought not to deal with the other arguments. A decision on those points is not necessary in this case. Some of the points raised are not straightforward and are better left for decision in a case where they need to be addressed.”

(2) *The Liability Order*

150. On 22 July 2020 the Liability Order was sealed. One of the recitals recorded that Morgan J had tried all issues of liability apart from certain adjourned issues and it contained five declarations which were amended under the slip rule by the Order of Mr Recorder Douglas Campbell KC dated 27 April 2023 to add a sixth. The six declarations (each a “**Declaration**”) were as follows in their amended form:

- “1. The EmPower In-Seat Power Supply System is a product falling within claims 1 to 3 of European Patent (UK) No. 0,881,145 B1 (“the Patent”).
2. The Modified EmPower In-Seat Power Supply System is a product falling within claim 1 of the Patent.
3. The Modified EmPower In-Seat Power Supply System is not a product falling within claim 2 of the Patent.
4. Astronics Advanced Electronic Systems has infringed claims 1 to 3 of the Patent by supplying in the UK components of the EmPower System.
5. Panasonic Avionics Corporation has infringed claims 1 to 3 of the Patent by reason of its common design with its customer to connect the components to form the EmPower System in the UK.
6. Safran Seats GB Limited has infringed claims 1 to 3 of the Patent by assembling EmPower Systems in the UK.”

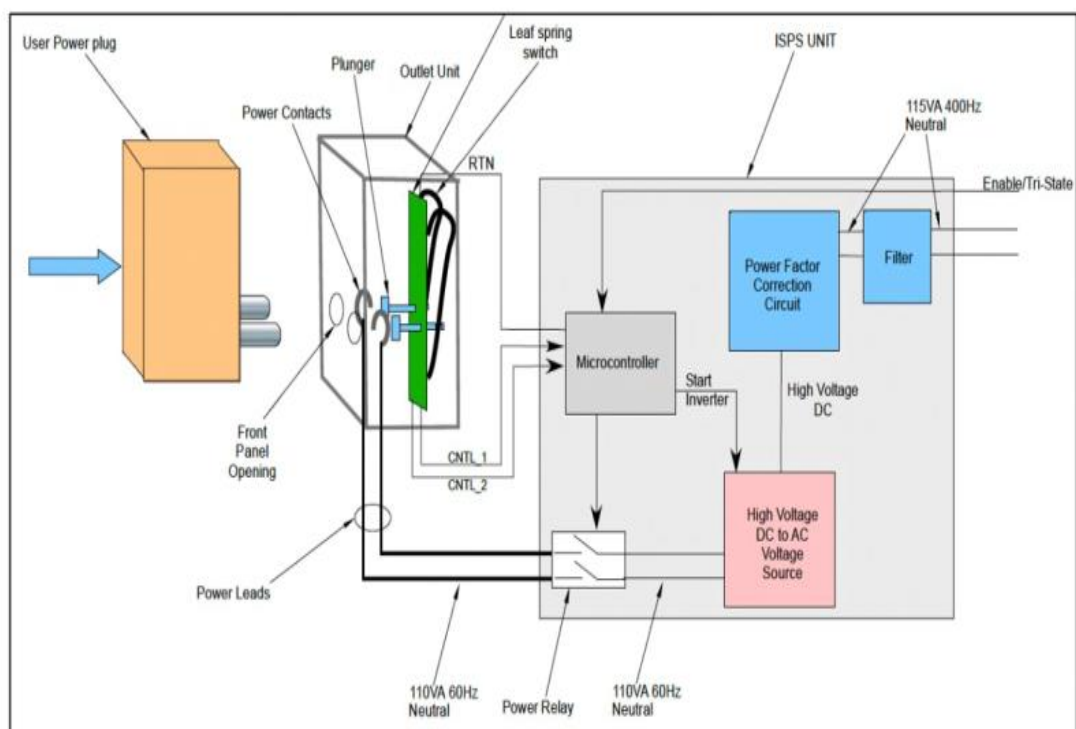
151. The judge certified in the Trial Order that the validity of Claims 1, 2, 3 and 7 had been unsuccessfully contested by the Defendants and he dismissed their counterclaims. He

then ordered an inquiry in the following terms:

“8. There shall be an inquiry in both HP-2017-000085 and HP-2019-000019 as to the damages suffered by the Claimant or, at the Claimant’s option, an account of the profits accruing to the Defendants and each of them, by reason of the Defendants’ acts of infringement of the Patent (“the Inquiry/Account”).

9. The Defendants shall pay to the Claimant the sums found due pursuant to such inquiries or upon the taking of such accounts, together with interest pursuant to section 35A of the Senior Courts Act 1981 alternatively under the Court’s inherent equitable jurisdiction.”

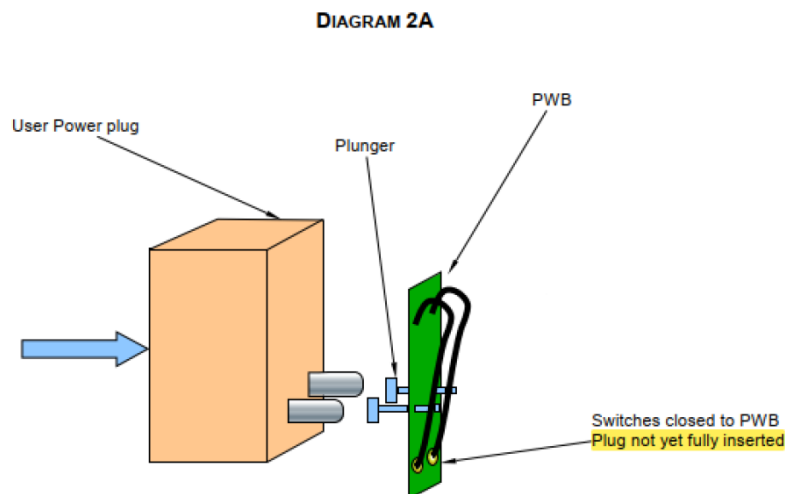
152. On 2 September 2022 Lufthansa elected for an account of profits. However, Declaration 1 did not set out the precise reasons why the EmPower Fusion system fell within Claim 1. In particular, it did not state why the outlets in the 12xx series satisfied the insertion test. In their Opening Skeleton Argument, the Defendants drew my attention to their Re-Amended Product and Process Description dated 18 November 2019 (the “PPD”) and submitted that Diagram 2 showed the plug detectors at the bottom of each plug hole:



153. The Defendants accepted that they could not challenge the judge’s finding of infringement but argued in their Opening Skeleton Argument that he had not actually decided what degree of insertion was required to satisfy the insertion test:

“202. The PPD did not disclose the degree of plug insertion required to activate the supply voltage, nor was this the subject of any evidence or submissions before Morgan J. Nor did the degree of insertion for the EmPower Systems form any part of the Judge’s reasoning as to infringement. However, as indicated above, the Defendants did not advance a positive case of non-infringement in the event that the inserted feature was construed narrowly. The EmPower System must therefore be taken to satisfy the Judge’s construction. The Defendants do not suggest otherwise. To be clear, although the EmPower System does not in fact achieve full insertion, this forms no part of the Defendants’ case in this account.”

154. Lufthansa placed particular reliance upon Diagram 2A which shows the switch mechanism in greater detail. For ease of comparison I reproduce that diagram here (Lufthansa’s highlighting):



### (3) *The Unresolved Issues*

155. Once Lufthansa had elected for the Account and served Points of Claim, the Defendants also took the point that Panasonic had made no (or very few profits) from the acts of infringement as found by the judge. Their case was that his findings of infringement were limited to the acts carried out by Safran and other seat assemblers in connecting the Components to each other and not to their sale or commercial exploitation. They also contended that Lufthansa was prevented from asking the Court to determine those issues which Morgan J had left unresolved or adjourned at the Liability Trial.

156. In a reserved judgment dated 12 May 2023 Mr Recorder Douglas Campbell KC held that Lufthansa was entitled to argue the issues which Morgan J had left unresolved but not

those which had been adjourned: see [2023] EWHC 1136 (Pat). As I have indicated in my preliminary remarks, the Court of Appeal dismissed an appeal against that decision: see [2023] EWCA Civ 1306. In his Order dated 5 June 2023 the Recorder identified the unresolved issues (the “**Unresolved Issues**”) as follows:

“(a) Panasonic has infringed the Patent by supplying in the United Kingdom means relating to an essential element of the invention of claims 1, 2 and 3 of the Patent, being Outlet Units, ISPS/SPMs/SPBs or any combination thereof upon the basis of the position asserted in paragraph 14 of the Amended PPD in HP-2019-000019;

(b) Panasonic and Astronics have infringed the Patent because their disposal in the UK of components of EmPower Systems amounted to a ‘kit of parts’, pursuant to paragraph 8 of the Re-Amended Reply and Defence to Counterclaim in HP-2019-000019 and to paragraph 7D of the Re-Amended Particulars of Infringement in HP-2017-000085;

(c) Panasonic and Astronics have infringed the Patent because the collection of unassembled components that each disposed of was equivalent to a product falling within those claims pursuant to paragraph 9 of the Re-Amended Reply and Defence to Counterclaim in HP-2019-000019 and to paragraph 7E of the Re-Amended Particulars of Infringement in HP-2017-000085.”

157. By Order dated 1 December 2023 Bacon J ordered that the Unresolved Issues should be determined at the trial of the Account on the basis of the PPD and the evidence (written and oral) before Morgan J at the Liability Trial. She gave permission to the parties to make submissions in relation to those issues but not to serve any further factual or expert evidence in relation to those issues. In their Opening Trial Skeleton the Lufthansa team summarised the three different bases upon which they argued that Panasonic was liable in the following manner:

- (1) *Unresolved Issue (a)*: Lufthansa claimed that Panasonic was liable for indirect infringement under section 60(2) of the PA 1977 because it supplied the Components in the United Kingdom in the knowledge that they were suitable for putting the invention of the Patent into effect or this was obvious to a reasonable person in the circumstances.
- (2) *Unresolved Issue (b)*: Lufthansa also claimed that the doctrine of equivalents applied and that the disconnected set of Primary Components were equivalent to the connected apparatus of claim 1.

- (3) *Unresolved Issue (c)*: Finally, Lufthansa relied on direct infringement on the basis that Panasonic supplied all of the Primary Components in the United Kingdom and that they were a complete “kit of parts” for assembly into the patented product, namely, the EmPower Fusion system.

#### **IV. Non-Infringing Alternatives**

158. In this section I consider in detail the question whether Astronics could have developed, manufactured and supplied an alternative product which would not have infringed the Patent. I will refer to this as a “**Non-Infringing Alternative**” or “**NIA**”. The Defendants’ primary case was that it would have been able to do so and at minimal cost. This is primarily a factual and expert question although it is better to characterise it as a mixed question of fact and law because the Court must determine a hypothetical outcome or “**Counterfactual**” or “**CF**”. I consider further the legal consequences of the findings which I make on this issue in the next section.

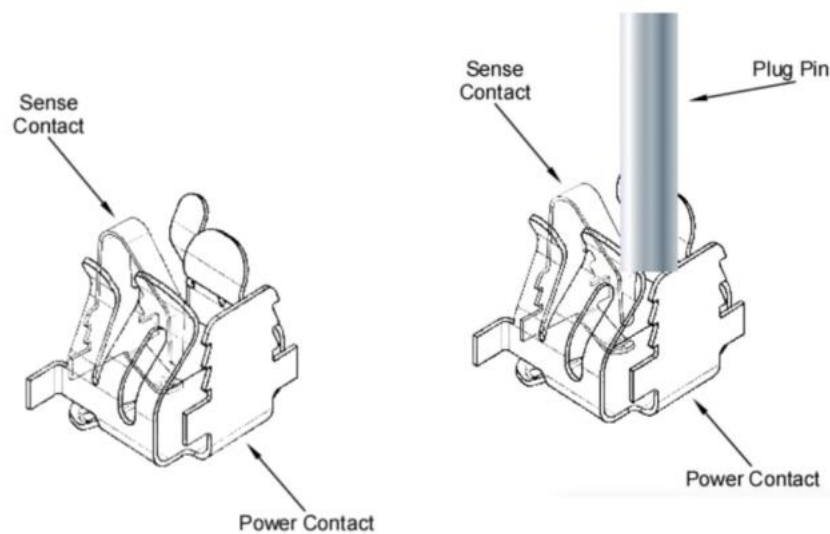
##### **I. Alternative Outlets**

###### *(1) The 1171 Twist Lock*

159. The Defendants served Particulars of the 1171 Twist Lock (the “**Twist Lock PPD**”) in which they set out a detailed description of the individual components which consisted of an MCU or AMCU, an ISPS, optional in-use indicators and power and signal cables contained within a single inter-connecting cable. The PPD stated that in early 2002 the 1171 Twist Lock was certified by the FAA. It then continued as follows:

“1.5 The 1171 Twist Lock Outlet Unit has a mechanical twist lock socket shutter. Once partially pushed into the outlet unit, the plug is twisted and, once twisted through approximately 45 degrees, can be further pushed into the outlet unit. In the 1171 Twist Lock Outlet Unit, there are two pin detectors that are connected to signal lines that carry a signal to a microcontroller (in the ISPS) to control the supply of 110V AC power to the outlet unit. One pin detector is located in each of the line and neutral receptacles (“receptacles” meaning the holes in the outlet unit that receive the plug pins) of the outlet unit. The pin detectors are located to the side of the plug receptacles (meaning inside but to the side of the receptacles) and are positioned such that for all compatible plug types (see further below), the outlet unit will send a power-on signal (and the ISPS will supply 110V AC power to the 1171 Twist Lock Outlet Unit) even though a portion of the line and neutral plug pins remains outside the outlet unit.”

160. The method of plug detection differed from that of the EmPower Fusion (above). Instead of mechanical leaf switches at the bottom of each plug hole, the Twist Lock detected the presence of a plug by an electrical connection between two sensors: the “**Power Contact**” and the “**Sense Contact**”. The Sense Contact was set centre to the leaves of the Power Contact which touched the side of the plug pin as it was pushed in. Figures 3 and 4 of the Twist Lock PPD show the position of the sensors both before and after the insertion of the plug pin:



161. Figure 4 shows the plug pin being pushed into the Power and Sense Contacts (which are just behind the Twist Lock faceplate). Section 3 described the operation of the system in the following terms:

“3.2 The 1171 Twist Lock Outlet Unit is a plug socket. It comprises a "female" socket, that is, a housing, which contains two or more holes intended to receive the pins of a "male" plug to which electric devices can be connected. Each of the line and neutral holes in the female socket contains a Sense Contact and a Power Contact as illustrated above.

3.3 Mains power is only available at the Outlet Unit as described below. The presence of a plug in the Outlet Unit is detected using two sensors (the line sensor and the neutral sensor), each comprising a Power Contact and a Sense Contact. As the plug is pushed in, each pin first comes into contact with a Power Contact. On being pushed in slightly further, each pin comes into contact with a Sense Contact, thereby providing an electrical connection between the two Contacts through the plug pin itself. This electrical connection initiates the transmission of a signal to the ISPS Unit microcontroller via CNTL\_1 or CNRL\_2.

3.4 Upon the microcontroller receiving a signal from either one of the sensors, the ISPS Unit then sets a timer of 50 or 300 milliseconds

depending on the model of ISPS Unit. When the timer expires, the ISPS Unit checks whether signals are present from both line and neutral sensors. If this criterion is met, a further 0.5 second timer is set. If both sensors remain engaged throughout the duration of the second timer, the central AC voltage source is engaged, a corresponding output relay is closed and power then flows, via the power cable (labelled “Power Leads” in Figure 1) which is contained within an Interconnect Cable, to the 1171 Twist Lock Outlet Unit and the user’s device.

3.5 In the 1171 Twist Lock Outlet Unit design, the Sense Contacts and Power Contacts are located on the side of the holes into which the plug pins are pushed. For all compatible plug types, power is supplied to the 1171 Twist Lock Outlet Unit by the ISPS when a portion of the plug pin remains outside the 1171 Twist Lock Outlet Unit.”

162. Section 4 of the Twist Lock PPD is headed “Measurements” and deals with the pin length exposure on activation of the power supply:

“4.1 The depth from the face of the socket to the sense contacts in the 1171 Twist Lock Outlet Unit is 14.7mm. Table 1 below shows the maximum and minimum length of the plug pin, for each compatible plug type, that will remain outside the socket when the pins reach the sense contact such that 110V AC power is supplied to the 1171 Twist Lock Outlet Unit by the ISPS.

4.2 Table 1 below is based on testing by pushing each of the plug types into the 1171 Twist Lock Outlet Unit to the point at which the two sensors are engaged. For each type of plug, the exercise is repeated 5 times with the average taken. The engagement of the sensors is indicated by an electrical connection (continuity) being made between the Power and Sense Contacts for each pin using a multimeter (see Figure 6 below).

4.3 The “Length Variation” is a value taken from the standard applicable to the plug type in question and corresponds to the limits of pin length for live and neutral pins allowed for a plug that is compliant with the standard. The “Actual Pin length” is the length of the line and neutral pins of the plug, measured with a calliper. The “Tested engagement exposed” value is the length (measured with a calliper see Figure 7) of the line and neutral pins (face of plug to face of outlet unit) that is exposed at the point at which the multimeter indicates an electrical connection is made between Sense and Power Contacts for both line and neutral pins. The “Minimum length exposed” and “Maximum length exposed” are calculated based on the “Tested engagement exposed” and “Actual Pin length” in actual measurement and normalized to the minimum and maximum length pin per the specified Length Variation.”

163. The table immediately below this text and Figure 7 (which showed the calliper and how it measured the exposed pin length) showed that the minimum plug length exposed for five types of plug was 1.2 mm and the maximum exposed for all plug types was 3.7 mm

giving a range of exposure of 2.5 mm. The types of plug used were a US NEMA 1-15, a US NEMA 5-15, a Schuko plug, a Europlug and an Australian plug.

164. On 25 April 2024 the Defendants served a Notice of Experiments and I gave permission for them to rely on the notice and also directions for repeat experiments. On 8 August 2024 those repeat experiments were carried out and on 11 September 2024 the parties filed an agreed report of those experiments. The purpose of the experiments was to establish the “exposure trigger point” or “ETP” for a range of plugs and outlets and, in particular, to calculate the distance of the ETP from the outlet faceplate and, therefore, the length of the plug pins which remained exposed when they made contact with the switches or sensors in the plug holes. Lufthansa described the purpose of these experiments in its Opening Trial Skeleton as follows:

“189. The position regarding ranges is best considered by reference to the boundary conditions. The diagram below shows the boundary condition for the smallest ETP. This occurs when (i) the associated plug has the smallest pins permitted by the applicable standard and (ii) the manufacturing process for the outlet produced one with the deepest holes/most distant switch arms.

190. The second boundary condition relates to the other end of the range for ETP: (i) a plug with the longest pins within the standard and (ii) a socket construction with the shallowest holes/closest switch arms:

191 For their experiments, Ds’ have measured the length of one of the pins of the plug being used. If their measurements are accurate, and representative of the shorter of the two plug pins, it is easy to calculate what the result would have been if the plug used had instead had the smallest and largest pins permitted by the applicable standard. In other words, one can calculate the minimum and maximum ETP for that particular physical socket.”

165. Professor Patrick Wheeler, who is Professor of Power Electronic Systems at Nottingham University and head of the Power Electronics Machines and Control Research Group, gave expert technical evidence on behalf of Lufthansa both at the Liability Trial and on the taking of the Account. In section 6 of his fifth report dated 2 September 2024 (“**Wheeler 5**”) he gave the following evidence about the Twist Lock:

“32. I understand that the Defendants assert that the location of the switches in the hypothetical modified 1171 Twist Lock outlet unit, and the degree of pin insertion required to activate them, would be the same as in the actual 1171 Twist Lock outlet unit. I have been asked therefore to consider the question of equivalents by reference to the actual 1171 Twist



Lock outlet units.

33. The 1171 Twist Lock outlet unit is shown in Figures 1 and 2 of the Defendants' 'Particulars – AES 1171 Twist Lock'. It has its detectors arranged to the side of the pin sockets so that it detects the side of the pin, not the end of the pin. I have been asked whether the 1171 Twist Lock achieves substantially the same result as the invention of claim 1, in substantially the same way.

34. In this regard, the result is a safe arrangement for detecting a plug inserted in the socket. The skilled person would consider the key objective of having switches at the bottom of the socket holes was to ensure that the length of pin exposed at the trigger point were kept to a safe level. I have explained that the inventive concept of claim 1 achieves this result through the use of pin detectors which are triggered only once the pin is inserted. An arrangement such as that of the 1171 Twist Lock outlet can achieve this objective. This is because what matters is the pin exposure at the point at which the pin detector is triggered.

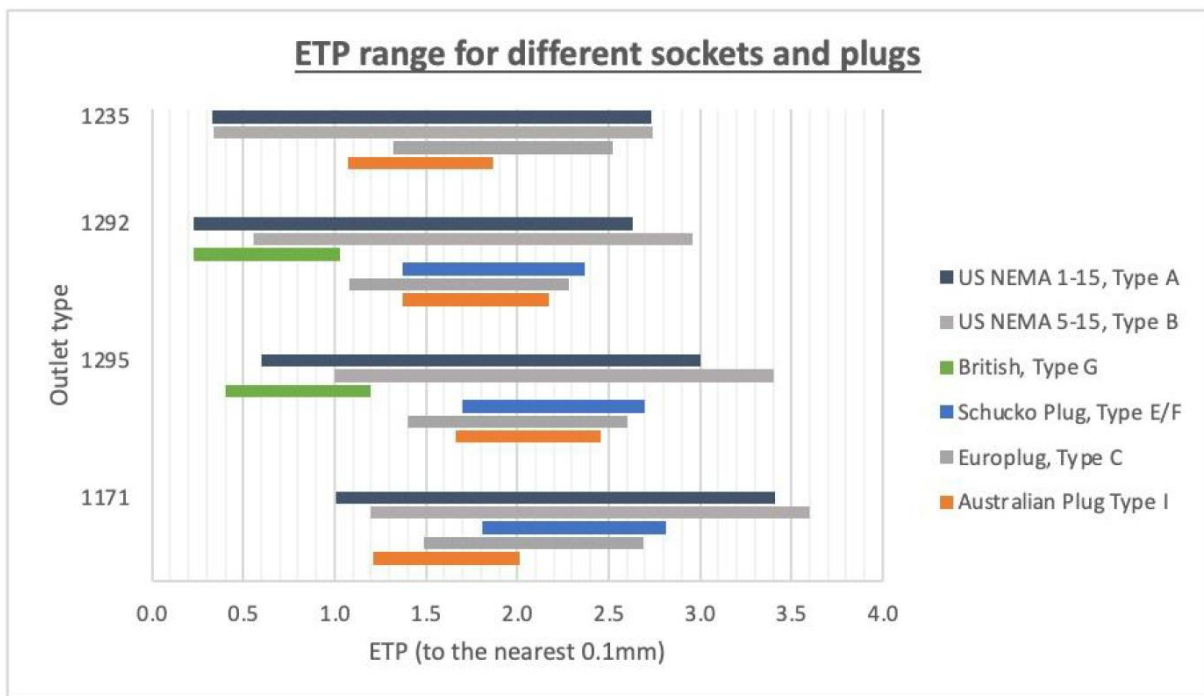
35. The question whether the 1171 Twist Lock does in fact achieve the same result will therefore depend on the amount of pin exposure allowed by those outlets in practice. It is apparent that the pin detectors on the 1171 Twist Lock, though on the side of the socket holes, are deep within the socket holes. Jones Day have shown me a table comparing the 1171 Twist Lock with the 1235 outlet. I attach this at Exhibit PWW-31. I understand this to be a document created by AES. I note that AES indicate that with both the 1171 Twist Lock and the 1235 outlet, there is 0.1 inch (i.e. 2.5mm) of pin exposure at the point when power can be supplied. On its face, it is an indication that the 1171 Twist Lock outlet and the 1235 outlet achieve the same result in this respect. In particular, they promote safety by testing for a plug which is almost completely inserted, with the degree of insertion required by both outlets being identical.

36. I have also been referred to the results of experiments conducted for the purposes of these proceedings by the Defendants, which I attach at Exhibit PWW-32. I understand these have been designed to show the pin exposure at the power trigger point for 1171 Twist Lock outlets and for each of the 12xx outlets which were the subject of the liability trial. These results are shown in the following chart (where 'ETP' refers to Exposure Trigger Point – i.e. the degree of pin exposure at the point at which the power is turned on):...

166. Exhibit PWW-31 to which Professor Wheeler referred in the passage (above) was a document produced by GD (and, therefore, in the early 2000s) headed: "Subject: Comparison of the original EmPower® AC and new EmPower® AC system operational and safety features." It contained a table which compared the EmPower Classic and the EmPower Fusion by reference to a number of features and, in particular, between the 1171 Twist Lock outlet and the 1235 outlet. The last row in the table identified the feature "US 2 prong exposed while receiving power". In the column headed "1174/1171" the

compiler of the table had inserted “.1 inch”. In the column headed “1191/1235” the compiler had also inserted “.1 inch”.

167. At paragraph 192 of the Claimant’s Opening Trial Skeleton was a chart of the experiments conducted for the purpose of the Account to establish and compare the Exposure Trigger Point or “ETP” for each of the 1171 Twist Lock and examples of the 1200 series with a number of different plug types. I reproduce that chart immediately below and I will refer to it as the “ETP Chart”:



168. The ETP measurement is on the x-axis and the top two rows of the chart refer to the results of the repeat experiments on the 1235 and 1292 outlets which are examples of the 12xx series. The Defendants were unable to conduct a repeat experiment on the 1295 and so the results shown come from the Notice of Experiments. The final row refers to the results of the repeat experiments on the 1171 Twist Lock.

169. The ETP Chart was reproduced in both Lufthansa’s Opening Trial Skeleton and its Closing Submissions. The Defendants did not challenge it and, indeed, they reproduced the part of it relating to the 1171 outlet in their own Closing Submissions. Professor Stephen Burrow, who is a Professor of Aircraft Systems at Bristol University, gave expert technical evidence on behalf of the Defendants. He was instructed not to address Wheeler 5, section 6 on the basis that it was a matter for legal argument. However, Mr Cuddigan

put this section of Professor Wheeler's report to Professor Burrow in order to establish whether there were any technical issues between them:

"Q. I am grateful. What happened next in Professor Wheeler's report is he addressed the question of equivalence of Twist Lock in relation to the switch position issue. Now, that was another section which you were told was legal argument. You've read this part of Professor Wheeler's report, haven't you? A. I have, yes, yes, yes. Q. If, perhaps, we could pull out so we can see how it continues over the page. Is there anything in section 6 which you disagree with as a matter of engineering? A. So I think, just to try and be helpful here, I think perhaps the difference in the legal point is about where you set your test for equivalence. So is the result safety, and that's achieved by detecting full insertion, or is it the result detecting pins, and so on? I think that's why, to that extent, it is a matter for legal argument, I don't think I can offer anything to the court. For me, as I'll try to articulate, whether you detect the end face of the pins or the side face, it does have some consequence on how easy it would be to cope with particularly the difference in the different plug standards, and achieve zero ETP. Q. Yes. That point aside, is there anything that you take issue with in this section of Professor Wheeler's evidence as a matter of engineering expertise? A. How far through? So are we 32, 33, 34 -- Q. Could you go as far as -- as far as 39 {C2/12/13}, please. A. Right, okay. (Pause). So the only thing -- I've got to 35 {C2/12/12}. So in exhibit PWW-31, I believe that is a -- sort of a design target or a design aspiration for them and it does, indeed, quote 0.1 of an inch as the ETP with NEMA sockets. I think, although that was the design target, we've discovered through the experiments that actually there is a bit of variation, that they both don't achieve that, and particularly the 1171 doesn't achieve that aspiration. Q. Yes. It doesn't always achieve it, but it does sometimes? A. Indeed, yes. Yes. So I think in -- I'm just down to the bottom of page 10 at the moment. So in 37 {C2/12/12} Professor Wheeler describes the key safety objective for preventing access by a passenger's fingers to the live pin. I think that's -- it's also a combination of the shape of the plug housing. So although we can talk about the pin exposure, and we imagine the face of the socket as a plane, the shape of the plastic housing around the side will influence whether or not we could say a passenger's fingers might contact with those pins, but I take his point. Q. So the plug shape is part of the solution as well? A. And that is why plug shape is dictated in the standards. Q. Yes. A. And that's partly why travel adapters can never meet the standards, but anyway. Could we move on to the next page, please? (Pause). So I think you see in, sort of, 38 {C2/12/13} where myself and Professor Wheeler differ in our outcomes. So for me, the way the Twist Lock actually detects -- the mechanism is so different that, in my mind, I suggest it doesn't achieve in the same way. But if the test is wider and it doesn't matter about the mechanism, then you can understand you come to a different conclusion. (Pause). And in 39, again, I think it is probably a legal matter, rather than -- Q. It's certainly a mixed -- A. Yes. Q. -- engineering and legal matter, absolutely. So I'm content for you not to engage with that, if you would prefer not to. A. I don't think -- I don't think I have anything to add

there.”

170. Professor Burrow disagreed with Professor Wheeler that the 1171 Twist Lock made use of the same inventive concept as Claim 1 but considered this to be a legal issue. Subject to this qualification, he accepted all of Professor Wheeler’s evidence in the passage which I have set out above and added some useful detail of his own. I make the following findings of fact based on this evidence and the Twist Lock PPD:

- (1) I accept Professor Wheeler’s evidence and I find that the pin detectors of the 1171 Twist Lock were deep within the socket holes although on the sides of the socket holes rather than at the end of each one. I also accept Professor Wheeler’s evidence and I find that the purpose of locating the pin detectors was to ensure that the length of pin exposed at the trigger point was kept at a safe level.
- (2) I also find that the purpose of positioning the plug detectors to the side of the plug receptacles or plug holes was to enable the outlet to send a power-on signal for all five compatible plug types, namely, the US NEMA 1-15, the US NEMA 5-15, the Schuko plug, the Europlug and the Australian plug: see the Twist Lock PPD, ¶1.5 and ¶4.3 together with the table immediately below it.
- (3) I accept Professor Burrow’s evidence in cross-examination and I find that Exhibit PWW-31 contained a design target. I also find that the 1171 Twist Lock and the 1235 outlet were designed to have the same ETP target of 0.1 inch or 2.5 mm when used with a standard US NEMA plug.
- (4) Professor Burrow did not challenge the accuracy of the ETP Chart and the Defendants relied on part of it themselves. I therefore find that the ETP Chart was an accurate record of the repeat experiments and that those experiments established that the range of ETPs for a single example of each of the 12xx series, for a single example of each type of plug was between 0.20 mm and 2.95 mm (depending on the outlet and the plug).
- (5) I also find that the ETP range for a single example of the 1171 Twist lock was between 1.00 mm and 3.60 mm (depending on the plug) and that:
  - (a) The maximum ETP for a single example of the US NEMA 1-15 Type A plug was 3.4 mm.

- (b) The maximum ETP for a single example of the US NEMA 5-15 Type B plug was 3.60 mm.
- (c) The ETP range of two examples of the 12xx series, namely, the 1235 outlet and the 1295 outlet was 0.5 mm to 2.9 mm.
- (d) There was an overlap of 1.9 mm in the ETP range of the examples of the 1171 Twist Lock outlet and the 12xx series outlets.

171. It was common ground that the ETP as measured in the experiments and recorded in the ETP Chart was accurate to within 0.1 mm. It was also common ground that the figures in the table had to be adjusted for variables which occur in the real-world including manufacturing tolerances, differences in the shape of plug pins within a particular manufacturing standard and the angle of insertion. Professor Paul Mitcheson, who is Professor of Electrical Energy Conversion at Imperial College London, observed the repeat experiments and gave expert evidence on behalf of Lufthansa. He fairly accepted that the maximum of all of the variables gave rise to a combined tolerance of about 1.10 mm. His evidence was that the largest single variable was up to 0.50 mm for manufacturing tolerances in the socket. He qualified his evidence by saying that it would be necessary to carry out a number of experiments and, in particular, a number of experiments with plugs from different manufacturers to get a more accurate view.

172. Lufthansa did not challenge the conduct of the experiments and in the light of Professor Mitcheson's evidence, I find that the repeat experiments were accurately performed for a single outlet of each product and a single plug of each type. I also find that the maximum ETP for the single example of the 1171 Twist Lock when used with a US NEMA 1-15 Type A plug was 4.50 mm after taking into account the variables which Professor Mitcheson accepted in evidence. Finally, I find that the maximum ETP for the single example of the 1171 Twist lock outlet when used with a US NEMA 5-15 Type B plug was 4.70 mm. I consider the weight which I should attach to this evidence below.

(2) *The 1171M*

173. Mr Jouper's evidence was that it was possible to produce a modified version of the 1171 Twist lock (which I will call the "1171M"). His evidence was that if Astronics had been asked to proceed on the basis of the construction of the Patent found by Morgan J, it

“would have produced an outlet that was a modified 1171 Twist Lock and used it with the rest of the EMPOWER™ System being unmodified”. He also gave evidence that three modifications would have been made:

“I understand that the Modified 1171 System would not have been caught by the protection of the Patent, as it would have been modified such that full insertion was not necessary for power to be supplied and the pin detectors would have been located at the side of the plug receptacles, not at the bottom of the receptacles. The modifications would have included:

(a) The modified outlet would have been utilized with one of the ISPS units described in the March 2024 PD (i.e. the 1191 Fusion ISPS or later ISPS/SPM/SPB designs that were designed to produce a true sign wave). Four blocking diodes and two pull-up resistors would have been incorporated within the Outlet (which were not found in the 1171 Twist Lock) in order to make the modified 1171 Outlet Unit compatible with the March 2024 PD ISPS Units;

(b) A minor modification to the software running on the microcontroller in the March 2024 PD ISPS Unit would have been incorporated to detect an active HIGH (rather than active LOW) upon plug insertion; and

(c) The twist lock functionality and rotating shutter functionality would have been removed and replaced with a faceplate based on the designs of the 1235 (and then as updated) to accommodate plugs conforming to further national or regional standards to achieve the same range of compatibility as the infringing outlets.”

(i) The Pleading Point

174. Lufthansa took four points in relation to Mr Jouper’s evidence. Mr Cuddigan put to Mr Jouper that paragraph (a) (above) was not reflected in the Defendants’ case as pleaded in its “Statement of Case in relation to Alternative Products” dated 2 August 2023. In particular, he put it to Mr Jouper that the pleaded case only contemplated a blocking diode on each of the control lines and not four blocking diodes and two pull-up resistors about which Mr Jouper had given evidence.
175. Mr Acland submitted that this was a pleading point and I agree. Mr Jouper could not see a real difference between Jouper 4 and the pleaded case when he was asked to compare them and even if the difference was a substantial one, Mr Cuddigan did not suggest to Mr Jouper that the solution which he proposed was not possible. Finally, Jouper 4 was dated 17 May 2024 but Mr Cuddigan did not suggest that Lufthansa had ever taken the point that there was difference between the pleaded case and Mr Jouper’s evidence or that Lufthansa was prejudiced in any way by the failure to amend if it wished to rely on

that evidence. I, therefore, dismiss this objection.

(ii) Design drawings

176. Mr Cuddigan also made a more substantial point to Mr Jouper, namely, that the Defendants had not pleaded or relied upon any design drawings of the 1171M and that the 1171M was not sufficiently realised. In support of his submission, he cited *Re Minnesota Mining & Manufacturing Co's (Suspension Aerosol Formulation) Patent* [1999] RPC 135. In that case, Pumfrey J held that a pharmaceutical patent was invalid for anticipation but that he would have made a declaration of non-infringement if it had not been. He gave the following guidance at the end of his judgment (at 153):

“There is always a risk that the adequacy of a description will be affected by the construction which is placed upon the claim and it is always preferable, in any case of an application for declaration of non-infringement, to aid the description furnished to the patentee by a sample of the alleged infringement, or by drawings, or whatever. The furnishing of such a sample, which is permissible as the decision of Falconer J. shows, will avoid the trap identified by the Court of Appeal in *Mallory v. Black Sivalls*, [1997] R.P.C. 321.”

177. I agree that it might have been better if the Defendants had produced design drawings of the 1171M outlet. But I do not accept that this is a reason in itself for finding that Astronics could not have designed or manufactured it. In my judgment, the question whether the Defendants could have found an NIA is not to be equated with a claim for a declaration of non-infringement. The Defendants never designed or manufactured the 1171M and the question whether they could have done so is a hypothetical Counterfactual. In my judgment, the Court is entitled to look at the evidence in the round, in order to make a qualitative assessment to decide whether the Counterfactual was technically possible and, if so, whether the Defendants would have adopted such a solution given the commercial constraints.

(iii) Plug Types

178. Lufthansa submitted that even if Astronics had been able to modify the 1171 Twist Lock, it would not have been able to accommodate all of the different plug types which Airbus and Boeing would have required it to do before accepting the design. Professor Wheeler gave the following unchallenged evidence in Wheeler 5:

“15. I am informed that as part of the Defendants’ counterfactual case based on the 1171 Twist Lock, they assert that they would have modified the 1171 Twist Lock to reconfigure its faceplate so as to accommodate additional plug types.

16. I agree that reconfiguring the faceplate itself of an outlet unit to accommodate additional plug types would have been a straightforward exercise. In particular, it would simply have involved modifying the shape and/or size of the holes in the faceplate. However, the 1171 Twist Lock outlet would also have had to be modified internally, so that plug pins of significantly different widths could all trigger the necessary internal sense contacts. Specifically, plug pins of various thicknesses would have needed to push past one internal sense contact and then touch the other before an electrical circuit could be created. In my view, redesigning the 1171 Twist Lock sense contacts to accommodate the wider range of different shapes of plug pins would have been non-trivial.”

179. When Mr Cuddigan put this point to Professor Burrow, he gave evidence that some of the design exercises were trivial but he was unable to say whether the 1171 Twist Lock could be re-designed to accommodate an “interface” between the different plug types and the contacts:

“Q. But the modified 1171 would accommodate nine different plug types, and we can show you them. They are on {D3/59/4}. So we're going to add in the UK plug, the Schuko plug, the Danish plug, the Swiss plug etc, all right? Now that's going to involve re-engineering the power in the sense contacts inside, isn't it? A. It is, yes. Q. Now you are aware that the 12XX outlets use a multifaceted plunger in order to interface with the various plug-ins? A. I wasn't, but it became evident through the testing that something like that was going on, yes. Q. Right, okay, well, you can take it from me that they do. A. Right. Q. And in effect that multifaceted plate acts as an interpreter, which sort of removes all the variation in pin geometry, so that the various pins can then interact with the microswitches in a standardised way. A. Okay, yes. Q. You agree with that explanation? A. From the experiments I concluded that something like that was going on, yes. Q. Right, and that's something you would expect has been done because, when you get a whole heap of different plugs, it's quite difficult to deal with them with a single switch or a single sense contact? A. I think the range that you would end up with having to cope with is nearly 4mm between the shortest short pin and the longest long pin, yes. Q. But it's not just the range of the length, is it, they are all in different locations in the XY? A. Of course that's what allows you to have a multifaceted plunger, because if they were all sat on top of each other you would be scuppered. Q. The mere fact that you turned to a multifaceted plunger indicates that these things are all coming in different locations? A. Yes, yes. Q. The power and sense contacts in here, obviously, don't have a multifaceted plunger. So if you were going to use power and sense contacts to accommodate all these different plugs, without analysing the geometry of



those pins, you wouldn't even know for sure if it was possible to make them all work? A. I haven't carried out that design exercise, but it's -- none of these design exercises, I would suggest, are simply trivial. They would require an engineer to look at the overlay and understand where you could put the sense contacts and the power contacts to try and accommodate all of them. Q. Right, and what I was putting to you is that it is possible, having done that exercise, that you say, "Yeah, we can't actually do this without an interface"? A. I -- I don't know. It is possible, but I don't know, I do -- I simply don't know."

180. Mr Jouper's evidence in cross-examination, however, was that this would not have been a difficult exercise because he had spoken to Mr John Lamb, who designed the 1171 Twist Lock and the 1200xx series:

"Q. You understand what I'm putting to you. You were faced with a difficult design -- Astronics was faced with a difficult design problem which is: how do we make all these plugs effectively interact with our outlet in the same way? The solution to that problem was to introduce multifaceted plungers and in the counterfactual you are getting rid of the multifaceted plungers and you are -- I put it to you, your evidence behaves as if there is no problem in doing so. But in fact you have got no idea whether there was a problem in doing so? A. My understanding from talking with John Lamb who is still there, it would not have been difficult to do and he's the mechanical engineer who designed both of these. Q. So is that a conversation you had with Mr Lamb in relation to this case? A. It is."

181. Mr Cuddigan then put Figure 4 (above) to Mr Jouper and suggested to him that looking at the location of the power and contact sensors the interaction between plugs of different kinds and the sense contact would be unpredictable:

"MR CUDDIGAN: But you see the difficulty, this is a good diagram to look at, the difficulty is when you introduce new plugs -- let's assume that that is a US pin going in in your diagram, right? A. Mm-hm. Q. Now you want it to work with a UK pin as well and the axis of the UK pin is going to be in a different place. There is going to be an offset in -- looking in plan there is going to be an offset in both the X and Y direction, isn't there? A. There will be some, yes. Q. And so the predictability of the interaction between that UK pin and the sense contact in particular is unpredictable? A. I wouldn't say it is unpredictable. If we look at the 1235 outlet, the example that you had in here that shows a multiple country aperture, you would design for that multiple country aperture. Q. With a multifaceted plunger? A. Maybe. That is what we did for one. But if you were using the wiper you would make the wiper so it would accommodate that. Q. But you don't know that you could make the wiper accommodate it. Unless you have done the 3D modeling that shows there is a position for that sense contact which works with the US, with the Australian, with the UK, with

the French, with the Swiss, all coming in different positions, unless you have done that work you don't know whether that piece of hardware can do the job. It might be able to do but you don't know? A. I believe it would be able to. Q. On the basis of what? A. The conversation -- Q. The discussions with Mr Lamb? A. Yes.”

182. I accept Mr Jouper’s evidence that it would not have been difficult to design the 1171M in order to accommodate the same plugs as the 1200xx series. I accept that it was based on his discussion of the issue with Mr Lamb and that it might have been better if Mr Lamb had given evidence himself. But Mr Jouper is himself an engineer and his evidence was both straightforward and reliable. Moreover, Mr Lamb was the designer of both the 1171 Twist Lock and the 1200xx series and could be expected to give a reliable answer to this question. Finally, Professor Wheeler’s evidence was not that it would be impossible to re-design the 1171 Twist Lock to accommodate different plugs but that this was a “non-trivial” problem. By this, I took him to mean not that such a solution was impossible but that a significant re-design of the outlet would be necessary. But Mr Lamb had found a design solution for this problem for the 1200xx series. I, therefore, dismiss this objection too.

(iv) Ground connections

183. Lufthansa also submitted that when Astronics moved to the microswitch arrangements in the 1200xx series, it had to introduce ground connections for all plug types and accommodate grounding pins. Mr Cuddigan put this to Mr Jouper in cross-examination:

“Q. And if we go back to your witness statement, you explain more about this at paragraph 145, {D1/6/40}. You say: "This new requirement stipulated that for [140VAC] systems, if the outlet accepted plugs with ground pins but the contact was not grounded by the outlet, then the ISPS must have GFI and galvanic isolation." A. Correct. Q. And then you say: "The new 1191 ISPS had been designed so that it would not have galvanic isolation." A. In its second version that's correct. Q. And so the result of using the 1191 ISPS is that the outlet unit had to be designed to accommodate and ground this wide range of grounding pins? A. That's correct. Q. Your 1171 modified outlet is intended to work with this 1191 ISPS? A. Yes, it is. Q. And so the result is that your modified 1171 outlet needs to accommodate ground contacts for all the plugs with ground pins? A. Correct. Q. And that includes any new plugs with grounding pins which were being introduced too? A. If there were any, yes. Q. What I mean is the ones that were being added to the 1171. So one of the changes you are making in the modified world is you are introducing new plugs as well? A. Yes. Q. And what I am saying is you would have to make sure they

were all grounded in accordance with the Airbus and Boeing requirements? A. Yes. Q. In fact, that was actually one of the motivations for moving to a mechanical switch arrangement, wasn't it? A. What was? Q. The ground -- the issue of grounding all these plugs was one of the reasons that you moved from the power and sense contacts to a mechanical switch arrangement? A. No. Q. You know that to be the case, do you? A. No, it was not to accommodate the ground pins."

184. Lufthansa submitted that this modification was not pleaded, that Mr Jouper had not anticipated or addressed this question in his written evidence and that there was no expert evidence to establish whether it could be achieved. Mr Acland's answer to this point was that Mr Jouper had addressed it elsewhere in his evidence. In particular, he had given evidence that in TS 001100 dated 11 September 2003 Airbus modified its specifications and required AC systems to have both galvanic isolation and a GFI if the outlet accepted plugs with a grounding pin. Mr Jouper gave evidence that Astronics addressed this issue in introducing the EmPower Fusion system:

"145. This new requirement stipulated that for 110VAC systems, if the outlet accepted plugs with ground pins but the contact was not grounded by the outlet, then the ISPS must have GFI and galvanic isolation. The new 1191 ISPS had been designed so that it would not have galvanic isolation (due to the changes made in order for it to produce a true-sine wave); therefore, any outlet used with the 1191 ISPS would need to ground all plugs with ground contacts that it accepted. The 1171 Outlet did not meet that requirement for the German Schuko plug (which would not have been a problem with the older 1170 ISPS, as that had both a GFI and galvanic isolation).

146. As a result, the AES engineering team realized that we needed to design a new AC outlet unit to use with Fusion 1191 power supply that allowed the outlet to ground all plugs with ground contacts (later systems designs dealt with this issue by including 2 GFIs) as well as excluding those that could not be grounded properly by the outlet.

147. Greg Trombley and John Lamb, two other members of the engineering team, were tasked with the design of this Outlet Unit. When you start over with a design, you get a blank slate, therefore, in the process of reviewing the existing designs, the team identified that there were other improvements that could be made alongside the required changes – in particular, following feedback from Airbus and Boeing, it was determined that the twist lock feature was not necessary. The electrical plug detect of the 1171 Twist Lock outlet was also not compatible with the new 1191 Fusion ISPS (without modification, see paragraph 210(a) below). Therefore, it was determined that the easiest solution was to move to the use of mechanical switches. The resulting new AC Outlet Unit was given the part number 1235. I refer to the system that included the 1191 ISPS and 1235 Outlet units as the "Fusion System"."

185. As Mr Jouper pointed out in this passage, Astronics' later designs dealt with the grounding pin issue by including two GFIs and he also gave evidence that in August 2009 Astronics began to develop the third generation of the 1191 ISPS and that it had an additional GFI (which he described in a table in Jouper 4 as a "Redundant GFI"). Mr Acland submitted, therefore, that the addition of a second GFI would have dealt with grounding pins and avoided the need for a separate feature in the outlet. Mr Cuddigan addressed Mr Acland's answer to his point in his oral reply submissions:

"We move on, then, to the 1171M. Grounding of the 1171M. My learned friend's response was to approach the facts on a rather more flexible basis than the evidence that the court received. Counterfactuals are addressed in this court as questions of fact to be proven by evidence in the usual way. My learned friend's answer to a problem which is insuperable for him is to refer to a subsequent technical development in -- which didn't occur until 2010, so he took you to a later iteration of the power supply. That doesn't work because the only evidence of when the 1171M would have been introduced is from Mr Jouper, and it is dated to 2004, so that is Mr Jouper {D1/6/63}, he says that the modifications which he calls minor would most likely have been carried out in 2004. Paragraph 211. There is no alternative case that they might have been done later, and that feeds in, necessarily, as the premise to Mr Bezant's analysis, so if we go, please, to {D2/5/22}, this is where he records the facts that are a necessary basis for his differential profits analysis, and you will read 2.5.2, the modifications would have occurred in 2004 and taken six months to develop and certify, so that was the case that was brought to court, and as a matter of logic, changing the date doesn't stack up, because they couldn't do this in 2004 to 2010. They would have been out of the market for six years. The whole counterfactual position collapses like a house of cards."

186. I reject Mr Cuddigan's submission and I accept Mr Acland's answer on this point. Mr Cuddigan did not challenge Mr Jouper's evidence and I find that by 2010 at the latest, Astronics had introduced an ISPS which addressed the ground connections issue which Mr Cuddigan put to Mr Jouper. I strongly suspect that Astronics would have been able to modify the initial design of the 1191 ISPS, if it had been necessary to do so. But it is unnecessary for me to decide this point because the Relevant Period did not begin until 2013. I accept that Mr Bezant, the Defendants' accountancy expert, made the assumption in his report that the modifications would have taken six months to make. But even if he had been instructed to assume that the modification could not have been made until 2009 it would have made no difference to his calculation which was based on an additional cost of US \$0.50 per unit over the relevant period. I, therefore, dismiss this objection.

187. For these reasons, therefore, I find as a fact that Astronics could have modified the 1171 Twist Lock and introduced the 1171M before the beginning of the Relevant Period. I also find on a balance of probabilities that Astronics would have introduced the 1171M before the beginning of the Relevant Period if it had been necessary to do so. Mr Jouper's unchallenged evidence was that it would have taken six months to develop the product at a total cost of [REDACTED]. If, say, Lufthansa had been successful in obtaining an injunction to restrain infringement in 2009 or 2010, then it would obviously been in Astronics' interests to spend that time and money designing and introducing an alternative product (assuming, of course, that it did not infringe the Patent).

(3) *Third Party Products*

188. Given my conclusion in relation to the 1171M, it is unnecessary for me to consider in as much detail the three third party products on which the Defendants relied in the alternative to the 1171M and I do so only briefly. Those products were (i) the IFPL 1225 Universal Outlet (the "**IFPL 1225**") which was certified by the FAA on 20 July 2015, (ii) the PowerBox in-seat system ("**PowerBox**") which was certified by the FAA on 20 December 2014 and (iii) the Emteq Intellicabin Universal AC Outlet ("**Intellicabin**") which was approved by the FAA for use in the Boeing 787-8 aircraft on 25 August 2016.

189. The Defendants did not call any witnesses of fact to give evidence that Astronics would have been able to acquire a licence to manufacture any of these three products if it had been unable to develop or produce the 1171M and, if so, when it would have done so. Given that the first product was not approved until 20 December 2014 and, therefore, three years after the Relevant Period began for Astronics and Safran, it is impossible for me to conclude that the Defendants could have avoided infringing the Patent at any time during the Relevant Period by licensing and manufacturing any of these products. I, therefore, dismiss the Defendants' case as pleaded in the Defence, ¶23(f). But in case I am wrong, I go on to deal with each product separately.

(i) The IFPL 1225

190. The IFPL 1225 was similar to *Neuenschwander* in that it used optical sensors to detect the presence of a plug. The agreed report of the repeat experiments included tests on this outlet and the second run of those experiments established that it had an ETP range of between 1.49 mm and 5.19 mm. Nevertheless, Professor Burrow had to accept in cross-

examination that there was no reliable material from which he could conclude that there was a material difference between the IFPL 1225 and the 12xx series in relation to the insertion test:

“Q. No. So I'll put the proposition again. There is no reliable material before the court upon which you can conclude that the tested IFPL outlet differs from all three Astronics outlets, 12XXs, in terms of its insertion test? A. You're quite correct, we have the data missing.”

191. The Defendants submitted in their written Closing Submissions that based on Lufthansa's construction of the insertion test, the IFPL 1225 did not infringe the Patent for the same reasons as the 1171M. However, for the reasons which I set out below I reject this submission and I find that on the true construction of Claim 1, the IFPL 1225 would have infringed the Patent. But in any event, I also reject the Defendants' submission given the concession made by Professor Burrow. I find that the Defendants would not have been able to demonstrate that there was any material difference between the ETP range of the IFPL 1225 and the 12xx series if they had licensed the IFPL 1225 but Lufthansa had brought infringement proceedings against them.
192. The Defendants did not advance a positive case that the IFPL 1225 did not satisfy the remoteness test or that it would have been able to achieve certification if it had not employed the remoteness feature. The Defendants called no evidence on this issue either but produced marketing information for the GLIDE IFE system of which the IFPL 1225 formed a part and which stated in terms that the system comprised a seat box, a remote power outlet and a power supply. Based on this document and the absence of any positive evidence from Professor Burrow that it was unnecessary for the IFPL 1225 to be remote from the seat box (in the sense used by Morgan J), I find that the IFPL 1225 made use of the remoteness feature taught by the Patent.

(ii) PowerBox

193. In his third report dated 5 July 2024 (“**Wheeler 3**”) Professor Wheeler gave unchallenged evidence that PowerBox used KID ISPS and outlet units. The Defendants did not advance a positive case or adduce any evidence that Astronics would have been able to obtain a licence from KID and this point was never put to Lufthansa's witnesses (and, in particular, to Mr Mosebach). Nor did they advance a case that PowerBox did not make use of the insertion feature of Claim 1 or satisfy the insertion test. But in case there is any

doubt I find that it did so for the simple reason that Astronics could not have made use of the KID outlet without doing so.

194. The Defendants submitted, however, that PowerBox did not infringe the Patent because there was insufficient physical separation between the ISPS and the “PowerBar” in which the outlet was located to satisfy the remoteness test. I reject that submission. Professor Wheeler gave evidence that the remoteness test was satisfied and Professor Burrow agreed with him when he was cross-examined on this issue:

“Q. So the way it works is that the PowerBox itself contains an ISPS and a single outlet unit, and it's at the back of the seat, and then the PowerBar contains multiple additional outlet units but no ISPS. A. I believe that that's what that describes, yes. Q. Yes, and so the additional outlet units that are in the PowerBar are remote from the ISPS in the PowerBox? A. They are remote from the ISPS in the PowerBox, yes. Q. Yes. So the distribution, so far as you're aware, there's no — there's no basis upon which the distribution of that — or the installation of that product could be carried out without infringing — the combined product, without infringing the patent? A. I think the — as I understand, the patent required the power supply to be remote from the passenger, because the socket was approximate, rather than requiring both the socket and the power supply to be remote. Does that distinction — Q. So it needs the power supply to be remote from the outlet unit and what I'm putting to you is that if you install this, the PowerBar outlet units are all remote from the power supply? A. They are remote from the power supply. As I said, my understanding was that it wasn't that both had to be remote from the passenger, it was that the power supply was remote from the socket which was proximate to the passenger. Q. I understand that, that's probably a matter best left for submissions.”

195. The Defendants argued that Lufthansa adopted a construction of the remoteness test which departed from the construction adopted by Morgan J, namely, that there had to be physical separation between the ISPS and the outlet: see the Liability Judgment. [88]. They placed particular reliance on a number of questions which Mr Cuddigan put to Mr Jouper and other witnesses the gist of which was that the remoteness test was satisfied if there was no power present at the socket when it was not in use. I am satisfied that Professor Burrow was fully familiar with the remoteness test as construed by the judge, that Mr Cuddigan did not put a different test to him in the exchange above and that he conceded without qualification that the remoteness test was satisfied.

(iii) Intellicabin

196. Professor Burrow gave evidence that Intellicabin did not achieve safety by satisfying the remoteness test. He drew the inference from its certification by Boeing that it achieved the necessary standard of safety by using “current limiting and a GFI transformer”. But he was unable to give any other evidence at all about the device. Mr Dennis Markert, Astronics’ Director of Business Development, also gave evidence that its power management model was inefficient and that it was ultimately unsuccessful. This evidence was very limited and I am not prepared to accept that Intellicabin was an NIA which the Defendants could or would have implemented. There was no evidence about the technical difficulties with the power management system and whether Astronics could have overcome them without it becoming necessary to satisfy the remoteness test. There was no evidence either to establish that Astronics could have developed and manufactured Intellicabin profitably either.

(iv) Issue Estoppel

197. Finally, the Defendants pleaded that Lufthansa was bound by an issue estoppel to prevent it from contending that the 1171M or each of the three third party products would have infringed the Patent. In their Further Information dated 11 September 2024 served shortly before trial they pleaded as follows:

“The Claimant’s construction of the inserted and remoteness features of claim 1, adopted by the Judge, was a necessary (and express) ingredient of the Judge’s finding that the Patent was valid over the pleaded prior art. The Defendants will contend that an issue estoppel operates to prevent the Claimant from contending in the account for a construction of claim 1 that would place the Twist Lock, Modified 1171-based EmPower Systems, IFPL 1225 or PowerBox or Intellicabin products within the scope of claim 1 of the Patent.”

198. In their Opening Skeleton Argument the Defendants submitted that Lufthansa was adopting a new construction of the insertion test and the remoteness test and that they should be held to the previous construction as found by the judge. They did not, however, advance this argument in their Closing Submissions and, in my judgment, they were right not to do so in relation to the third party products. Lufthansa did not attempt to depart from the construction of Claim 1 which Morgan J held to apply in the Liability Judgment in relation to either the insertion test as it applied to the IFPL 1225 or the remoteness test as it applied to PowerBox and neither construction issue arose in relation to Intellicabin.



(v) The “combination” point

199. Finally, the Defendants argued that the Patent was for an invention which combined all three features (insertion, remoteness and timing) and that an alternative product would not have infringed the Patent unless it made use of all three. Whatever the merits of this argument, I am satisfied that this was the case in relation to both the IFPL 1225 and PowerBox. I have made specific findings in relation to the insertion and remoteness features, the Defendants did not plead or rely on the timing feature and the issue does not arise at all in relation to Intellicabin because I am not satisfied that Astronics could have overcome the technical problems associated with it and developed it successfully. For these additional reasons, therefore, I dismiss the Defendants’ case as pleaded in the Defence, ¶23(f) that the IFPL 1225, PowerBox and Intellicabin were NIAs which Astronics would have supplied to Panasonic and which Safran would have combined in airline seats.

J. The 1171M: would it have been a Non-Infringing Alternative?

200. Having found that Astronics could and would have developed and manufactured the 1171M if it had been necessary to do so, I turn to the question whether the 1171M would have infringed the Patent. In opening submissions it appeared to me that this only gave rise to a legal argument over the scope of the insertion test. I say this because in their Opening Skeleton Argument the Defendants accepted that there was no material difference between the degree of insertion achieved by other products:

“264. It is no part of the Defendants’ case that there is any material difference between the degree of insertion achieved by the other products. But that is irrelevant. The finding of infringement was made without any consideration of the degree of insertion achieved by the EmPower System. Thus, whilst the Defendants are precluded from contending that the EmPower System does not infringe, the same cannot be said of the other products for the simple reason that they were not in play at the Liability Trial. The only question of infringement before Morgan J was whether the EmPower System infringed, as to which the Defendants advanced no positive case other than invalidity. There was therefore no evidence and no submissions as to the degree of plug insertion required in the EmPower Systems and that issue forms no part of Morgan J’s reasons for his judgment. In those circumstances, the finding of infringement does not and cannot resolve the issue of whether the Judge’s construction applies to different products which were not before him. Necessarily, the issues are not the same.”

201. In their Closing Submissions, however, the Defendants took what appeared to me to be a technical point too. They argued that even if I found in Lufthansa's favour on the scope of the insertion test, the 1171M would still have fallen outside it:

“222. The 1171M would not infringe on Lufthansa's construction of “full insertion”. It will be recalled that this construction requires an EPT of less than 4 mm for all plugs. Lufthansa says that this requirement is satisfied by the 1171M on the basis that the Defendant's repeat experiments gave a maximum ETP of 3.6 mm (for a NEMA 5-15 plug). However, this figure takes no account of the variables identified above, which (according to Lufthansa) have to be combined on a worst-case analysis (around 1.1 mm), regardless of the likely occurrence of that combination. On that analysis, the ETP of 1171M Outlets when used with NEMA 5-15 plugs and NEMA 1-15 plugs would extend to 4.7 mm and 4.5 mm respectively.”

202. Moreover, the Defendants' position in relation to the Liability Judgment changed during the course of the trial. In their Amended Response to Lufthansa's Request for Further Information dated 28 March 2024 the Defendants accepted that the precise degree of insertion of the pins was not addressed by the parties or the judge:

“In relation to the infringing EmPower System, the precise degree of insertion of the pins before power is provided (whether in relative or absolute terms) was not addressed by the parties at the liability trial. Furthermore, it did not form any part of the reasoning that supported Morgan J's decision in relation to infringement, still less was it fundamental to that decision. In the premises, the Defendants are not estopped from contending that the Twist Lock / IFPL 1225 (as appropriate) does not require a plug to be fully inserted before power is provided, even if there is no material difference between the degree of insertion in respect of such products as compared with that of the infringing EmPower System.”

203. However, in their written Closing Submissions the Defendants adopted the position that the judge had dealt with this issue and had decided that Claim 1 required a casing to casing test. They stated as follows:

“178. For the reasons set out above, we submit that the Judge's construction is unambiguous. By “full insertion”, he meant that the plug must be inserted all the way in the socket – effectively “casing to casing” contact. Furthermore, the plug detectors must be at the bottom of the plug holes – if they are arranged at the sides, the required “full insertion” will not be achieved.”

204. Lufthansa's position throughout the trial was that Morgan J did not address the technical

question whether Claim 1 required a casing to casing test or, as Mr Cuddigan and his team put it, he did not determine whether Claim 1 required an “ETP limit” of zero. Lufthansa also submitted that the Defendants were estopped from running this point at all because they had chosen not to take this point before the judge and, if they had done so, his determination of this point would have been critical to the finding of infringement. They did not, however, object to the Defendants taking the technical point about the claim limit or submit that they were bound by a concession in their Opening Skeleton Argument and Mr Cuddigan dealt with this issue in his oral submissions in reply at the very end of the trial.

205. I propose to deal with these over-lapping issues in the following way. First, I begin by considering what the judge actually decided and then declared in the Liability Order. If the Defendants are correct and he decided that Claim 1 required a casing to casing test and the plug detectors to be at the bottom of the plug holes, then I see no reason at all why the Defendants are not entitled to rely on the Liability Judgment. Indeed, I am clearly bound by it. Secondly, I consider whether it is open to the Defendants to argue that Claim 1 requires a casing to casing test (assuming that the judge left that issue open). Thirdly, I consider whether Claim 1 did require a casing to casing test and, if not, what (if any) ETP limit Claim 1 required (always assuming that the Defendants are entitled to run this point). Fourthly, I consider whether the insertion test requires the plug detectors to be at the bottom of the holes (assuming again that the judge left this point open too). Fifthly, and finally, I consider whether the 1171M would have infringed Claim 1 and, in particular, whether the 1171M would have fallen within the ETP limit (if any) required by the insertion test and thereby infringed the Patent. I also address two final arguments which were advanced by the Defendants at trial.

(1) *The insertion test: what did the judge declare?*

206. Morgan J declared that the “Empower In-Seat Supply System is a product falling within claims 1 to 3” of the Patent. He also declared that the Modified EmPower In-Seat Supply System is a product falling within “claim 1” of the Patent: see the Liability Order, ¶1 and ¶2. The judge did not use either of the defined terms referred to in those two paragraphs in the Liability Judgment but the form of the order was largely agreed as the judge recorded in his judgment on consequential matters following hand down and the only question which he had to determine was whether there should be permission to apply:

see [2020] EWHC 2296 (Pat) at [2] to [4].

207. It appeared to be common ground before me that the “EmPower In-Seat Supply System” in the Liability Order, ¶1 was referring to the product described in section A of the PPD and that the “Modified EmPower In-Seat Supply System” in the Liability Order, ¶2 was referring to the product described in section B. The difference between the two systems reflected the change which Astronics made to remove the timing feature following the finding by the German Courts that the EmPower Fusion system infringed Claim 2 but not Claim 1 (as I narrate above). But if there is any doubt about the meaning of these terms, I hold that this is the natural and obvious construction of the Order.

(i) Did the judge find that the insertion test was a casing to casing test?

208. The Liability Order did not recite the reasons why each system infringed Claim 1 and in order to determine this issue, it is necessary to look at the Liability Judgment itself. The judge decided that Claim 1 required “the insertion of a plug in a socket to such an extent that the tips of the pins of the socket make contact with the plug detectors at 45 and 46”. He also decided that Claim 1 was not satisfied by “any partial insertion short of that”: see [75]. The Court of Appeal upheld that decision. They rejected a number of arguments and, in particular, the argument that the judge should not have construed Claim 1 by reference to the numbers in Figure 3: see the Appeal Judgment, [41]. Moreover, it is clear that Birss LJ considered that the judge’s conclusion on the insertion test was set out in [75] and he expressly approved that conclusion: see the Appeal Judgment, [53] and [54].

209. Having decided that Claim 1 was novel over both *Sellati* and *Neuenschwander* and not obvious over either of them, Morgan J decided that the connection of the Primary Components together was the means by which Astronics put an essential element of Claim 1 into effect and that by supplying the components in that knowledge Astronics committed indirect or contributory infringement within the meaning of section 60(2) of the PA 1977: see the Liability Judgment, [276] and [277]. He also held that Safran committed a direct infringement by connecting the Primary Components together and that Panasonic infringed Claim 1 by reason of its common design with its customers: see [276] to [278] and [285].

210. The judge did not have to decide how the EmPower Fusion system (whether before or after its modification in 2014) put Claim 1 into effect and, in particular, how it satisfied

the insertion test because the Defendants admitted that it fell within Claim 1 if he rejected their arguments on construction and novelty or obviousness over prior art. In their Closing Skeleton Argument dated 30 June 2020 they stated as follows:

“308. First, we can clear out the way certain items not in dispute: a) There is no dispute that when assembled (for example in a seat by Safran), the combination of one or more OUs, an ISPS, SPM/SPB together with their connecting cables constitutes a voltage supply apparatus within claim 1. b) Nor is there any dispute that the supply of such components in the UK by Astronics constitutes an act of indirect infringement under section 60(2) of the Patents Act.”

211. The Defendants submitted that Morgan J adopted a narrow construction of the Patent and interpreted the insertion test as requiring casing to casing contact between the plug and socket. They accepted that there would inevitably be a small gap between the plug and the socket to accommodate the casing sensor but submitted that it was only on this narrow basis that the judge distinguished *Neuenschwander*:

“156. First, we used the term “fully inserted” and “full insertion” in opening 10 to mean that the plug has been inserted all the way into the socket, this being the construction which Lufthansa provided to Professor Wheeler and on which he gave his evidence in the Liability Trial ((C5/1/53 §232)). We also equated “full insertion” with what Professor Wheeler described as a “casing to casing” situation (Wheeler 3, 69 (C2/3/19 §69)) by which he meant that the casings would be touching, albeit with small gaps in places.

157. The Defendants’ construction permits a small gap to exist between the plug and socket at the point when power is triggered. However, the size of that gap has nothing to do with the variation in pin lengths specified in the NEMA or other standards or manufacturing tolerances in the distance between the front of the faceplate microswitches located at the bottom of the plug holes. Nor does it have anything to do with preventing finger access to a live pin when the plug is inserted or withdrawn from a socket. Rather, the size of the gap is as defined by altogether more prosaic matters, namely the characteristics of the casing sensor. As discussed below, a switch-based casing sensor would provide an ETP in the order of fractions of a millimetre, even allowing for manufacturing tolerances and imperfections in the face of the plug.”

212. I reject that submission. In my judgment, Morgan J did not construe the insertion test as requiring a separate casing to casing test or an ETP limit of zero subject to a small gap (whether to accommodate a casing sensor or to accommodate small tolerances for the manufacture of both products). I have reached this conclusion for the following reasons:

- (1) The judge did not use the words “full insertion” in his conclusion at [75]. What he decided was that the insertion test required the insertion of the plug to such an extent that the tips of the pins made contact with the plug detectors at the bottom of the pin holes (shown at (45) and (46) on Figure 3). In simple terms, this test required the plug to be pushed into the socket as far as it would go to make contact with the plug detectors.
- (2) The issue which the judge had to decide was whether the insertion test required the plug pins to make physical contact with the plug detectors at the bottom of the plug holes before they sent a signal to the power supply to turn on the power supply or whether the plug detectors detected the pins as they approached the detectors. This is clear from his judgment at [69] where he stated that: “There was no technical evidence to the effect that the detectors detect the pins of the plug as they approach the detectors as distinct from when they touch the detectors.” It also explains why he considered the use of the past participle in Claim 1, line 10 to be significant: “a plug (38) inserted in the socket (22)”.
- (3) Moreover, it is obvious why this was the technical issue which the judge was being asked to decide. If Claim 1 allowed for the plug detectors to detect the plug pins as they were approaching the bottom of the plug holes rather than on contact, then there would have been a reasonable argument (at the very least) that Claim 1 was obvious over *Neuenschwander*. As the judge recorded, it was common ground that *Neuenschwander* did not disclose any requirement for “complete insertion”: see [143]. But in any event, Mr Cuddigan put this point to Mr Barovsky and he confirmed it to be correct:

“Q. Can we look at what you said about the Neuenschwander prior art. This begins on page 11 {D5/1/11}. That's where you started reviewing the disclosure in Neuenschwander. If we turn forward to the next page {D5/1/12}, at paragraph 67 you say that Neuenschwander discloses two embodiments; do you see that? A. In paragraph 67, yes. Q. What happens is you go through the two embodiments. The first, you have seen the figures and coloured them in under your paragraph 68. And you explain there, if you look at that, you explain that the yellow element is a light barrier which contains a light conductor and the violet elements are two openings which received the pins of a plug; do you see that? A. Yes, I do. Q. That's correct, isn't it? A. Yes. Q. There are a pair of optical conductors shown in red and numbered 41 and 42? A. That is correct, yes. Q. The way this works is that when a plug is

inserted, the yellow light barrier is raised so that the light conductor aligns with 41 and 42 and allows light to pass from one of those optical conductors to the other? A. I believe that's correct, yes. Q. So the whole thing acts as an optical switch? A. Yes. Q. And the switch means is the light barrier which you can see -- it's the yellow bit, isn't it? A. Well, it's the mechanical portion of the switch, but yes. Q. Okay. MR JUSTICE LEECH: What is it made out of? A. Probably some plastic material. MR CUDDIGAN: As we can see, it's located towards the middle of the pathway that the pins follow on their route to being fully inserted, isn't it? A. Yes. Q. It's disposed slightly to the side or to the top? A. Yes. Q. You can see that from the right-hand view, figure 1B, can't you? A. That's correct. Q. If it was right in the middle the system wouldn't work? A. It would be a little more difficult to push the pin in and remove the barrier. Q. You can see it's disposed to the side so that the pin meets with the chamfered edge and therefore pushes the barrier up? A. Yes. Q. The ends of the holes which receive the plug pins are on figure 1B, they are violet, the ends of the holes are marked 26, aren't they? A. Yes, it is. Q. So it's absolutely clear that in Neuenschwander the switch is not at the bottom of those holes? A. That's correct. Q. In fact, it's outside those holes altogether? A. That's correct. Q. And you understood all that when you gave your evidence to Mr Justice Morgan? A. That I believe was my testimony, yes. Q. And the second embodiment is shown under paragraph 78. Move forward, please, to page 14 {D5/1/14}. Instead of a light barrier this uses light emitters and receptors which are shown in red, and then a light prism which is shown in yellow? A. That is correct. Q. This is what's called a "normally on" switch. So when no plug is present there are two light paths between the emitters and the receptor? A. That is correct. Q. And each plug pin, when it is introduced into the socket, breaks one of those light paths? A. Yes. Q. So the light path is the switch means? A. Correct. Q. And that switch means is disposed either side of the path of the pins? A. I'm sorry, I missed that. Q. The switch means is disposed either side of the path of the plug pins? A. I'm not sure what you mean by disposed. Q. It is located either side of the path of -- A. Yes."

- (4) It is also clear from the same paragraph what the judge meant by "complete insertion" in this context. He meant that the plug pins had been inserted into the socket and pushed as far as they would go in order to make contact with the plug detectors. He was not using it in the context of the casing of either the plug or the outlet at all. In my judgment, the judge was using the expressions "full insertion" and "complete insertion" earlier in his judgment in exactly the same way and as shorthand for the test which he set out in [75].
- (5) This interpretation of the Liability Judgment is consistent with both the Appeal Judgment and the decision of the German Court to which both Morgan J and Birss

LJ referred. For example, Birss LJ stated that having lost the issue over the meaning of the word “inserted” in Claim 1, then the Defendants’ case on obviousness over *Neuenschwander* could not succeed and that this was because “Neuenschwander’s plug detection approach was based on partial insertion”: see [78]. The German Court also concluded that the insertion test excluded a method of detection “which detects the plug and/or the contact pins already at the start of the process of insertion into the receptacle”.

- (6) I accept that the distance between the plug and a casing detector on the outside of the socket was likely to be very small, particularly, where it involved the use of a mechanical switch (as Mr Acland put to Professor Wheeler) rather than an optical sensor. But in my judgment, this is irrelevant. Claim 5 required the use of a casing detector and Morgan J held that this was irrelevant to the construction of Claim 1: see the Liability Judgment, [71]. Birss LJ agreed with him: see the Appeal Judgment, [42]. Indeed, it is clear from both passages that the Defendants not Lufthansa were relying on Claim 5 in support of their construction of Claim 1 and not to justify a casing to casing test but quite the reverse. As Morgan J recorded, it could be argued that if Claim 5 required a casing to casing test for contact between the plug and the socket (or something very close), then it was not necessary for Claim 1 to require full insertion at all.
- (7) I do not accept that Professor Wheeler adopted a casing to casing test for Claim 1 in his first report dated 1 November 2019 for the Liability Trial. In the paragraph upon which the Defendants relied, he used the expression “full insertion” but in exactly the same sense as the judge himself in the Liability Judgment and for the same purpose, namely, to contrast Claim 1 with *Neuenschwander*. He stated: “The skilled person would understand that Neuenschwander detects the approach of the pins, some time before the pins reach full insertion.”
- (8) Finally, and most tellingly, the Defendants offered no explanation for their own concession or the judge’s finding of infringement. If they are right and the judge held that Claim 1 required a very narrow casing to casing test with an ETP limit of zero (or something very close to it), then the claim for infringement ought to have failed because none of the 1200xx series satisfied that test (as their own experiments demonstrated).



(ii) Did the judge find that the plug detectors must be at the bottom of the plug holes?

213. Morgan J directed himself that the description and drawings in the Patent were to be used to interpret the Claims: see the Liability Judgment, [64]. He noted the description in [0024] stated that the plug detectors (45) and (46) were at the bottom of each plug hole and that Figure 3 showed them in the same location: see [71]. Finally, he stated that “the requirement apparently expressed in claim 1” was that “the plug is detected when the pins make contact with microswitches at the bottom of the plug holes”: see [74]. The Defendants submitted that in this paragraph the judge held that on its true construction Claim 1 required that the plug detectors had to be located at the very bottom of the plug holes.
214. To understand the argument between the parties, it is important to put both this sentence and the entire paragraph in context. The judge was dealing with a particular point upon which the Defendants relied in support of their argument that Claim 1 required a partial insertion test (and was not, therefore, either novel or obvious over *Neuenschwander*). The relevant text upon which they relied was a sentence in the Patent description at [0032]: “Moreover, the plug hole pairs can also be arranged so that they are not at right angles to each other rather overlay each other, in which case the microswitches are arranged to the sides of the plug holes.” The Defendants argued, therefore, that the authors of Claim 1 must have had a partial insertion test in mind because the plug detectors could be arranged not only at the bottom of the holes. The judge rejected that argument and to see why he did so, it is necessary to set out the entire passage from his judgment:

“72. Mr Acland drew attention to Figure 4. Figure 4 is described in paragraph [0032] of the description in the Patent. That paragraph refers to the location of the microswitches for the plug detector in a way which is consistent with the other parts of the description whereby the microswitches are at the bottom of the holes for receiving the pins of the plug. However, paragraph [0032] goes on to refer to the possibility that the pairs of plug holes (US and European) might be arranged so that they are not at right angles to each other (as shown in Figure 4) but overlay each other. With that possibility, paragraph [0032] states that the microswitches are to be arranged to the sides of the plug holes. There is no drawing dealing with this possibility which shows where precisely the microswitches should be placed.

73. Mr Acland suggested that if, for the purposes of this possibility, the microswitches were placed on the sides of the plug holes but not at the

bottom of the plug holes, then a plug would be detected when it was not fully inserted. The suggestion then seemed to be that when I come to construe claim 1, which refers to an arrangement which appears to require full plug insertion, I should reconsider what it means in order to accommodate the possibility referred to in paragraph [0032], but not illustrated, which might involve switches which are not at the bottoms of the plug holes. It then appears to be said that I should then hold that claim 1 permits the microswitches to be at the bottom of the plug holes or somewhere else on the sides of the plug holes.

74. Mr Acland's submission based on paragraph [0032] involves reading claim 1 in a way which is wider than the language in which it is apparently expressed and which dispenses with the requirement apparently expressed in claim 1 which is that the plug is detected when the pins make contact with microswitches at the bottom of the plug holes. I accept that the possibility which is identified in paragraph [0032] is part of the material which I should consider when I come to construe claim 1 but it is not the only material. I consider that taking the wording of claim 1, with its express cross references to the drawings and taking the other parts of the description and drawings altogether, claim 1 does identify a requirement that the plug is fully inserted in the socket and that is how it should be construed. On that basis, claim 1 and, indeed, the other claims do not appear expressly to deal with the possibility referred to in paragraph [0032]. I was not addressed on the implications of that position as regards that possibility and I will not deal with it further."

215. Lufthansa submitted that in this passage the judge was addressing an entirely different point and that the Defendants were adopting a position now which was inconsistent with the position which they adopted in evidence at the Liability Trial. They placed particular reliance on the evidence which Mr Barovsky gave at the Liability Trial in relation to *Neuenschwander* and Mr Cuddigan cross-examined him at this trial about the evidence which he had given:

"Q. You've accepted that both embodiments of Neuenschwander had switch means that were -- they are largely outside the holes, but they're certainly halfway down the holes; you have accepted that? A. They are to the side of the plug pins. Q. And about halfway down? A. Roughly, yes. Q. If it was a requirement of the claim that the switch means be at the bottom of the holes then that is something that was plainly absent from Neuenschwander? A. That's true, yes. Q. And Neuenschwander would therefore have been a weaker piece of prior art for the defendants? A. I guess, yes. Q. Professor Wheeler gave technical evidence on behalf of Lufthansa and we can see what he said at bundle C5, tab 1, page 53. {C5/1/53} He addresses this at the bottom of the page, paragraphs 231 and 232. If you could read that and then over to the next page, please. (Pause) So the only issue in dispute is whether Neuenschwander tests were applied, which is being -- has been inserted or it instead detects the approach of the

pins some time before the pins reach full insertion? A. That's correct. Q. Professor Wheeler did not suggest that the claim required plug detectors at the bottom of the holes which receive the pins? A. From what I can see, no, he did not. Q. You can take it from me that that was the position. Your response to Professor Wheeler's evidence on this issue is at {D5/2/13}, paragraph 45. You agree that Neuenschwander doesn't require full insertion of the pins or the spades, as you call them there, you suggest it could be easily modified? A. That's correct, yes. Q. So neither you nor Professor Wheeler had given evidence to the judge to the effect that it was a requirement of claim 1 that plug detectors had to be at the bottom of the holes which received the pins? A. I believe that to be accurate. Q. And if you had suggested it, it would have been contrary to your position in evidence that claim 1 was not valid over Neuenschwander? A. I'm not sure I follow that question. I'm sorry. Q. You gave evidence to the judge that claim 1 was not valid over Neuenschwander, it wasn't an invention over Neuenschwander. If you had taken this point about the location of the switch means, it would have been contrary to your position that claim 1 was not valid over Neuenschwander? A. Yes. I believe so.”

216. Mr Acland accepted that he had lost this argument before the judge but submitted that Lufthansa itself had relied on the position of the plug detectors in support of its case that Claim 1 taught a full insertion test. He also submitted that the position of the plug detectors formed an essential part of the judge's reasoning in rejecting his argument and deciding the issue in Lufthansa's favour. He argued, therefore, that the Defendants were entitled to rely now on the judge's finding about the location of the plug detectors whatever position they had taken at the Liability Trial.

217. I am not satisfied that Morgan J decided that Claim 1 required the plug detectors to be located at the bottom of the plug holes rather than by the sides. In my judgment, the judge was doing no more than rejecting the argument that the description in the last sentence of [0024] and Figure 4 provided material support for a partial insertion test. I have reached that conclusion for the following reasons:

- (1) Neither Professor Wheeler nor Mr Barovsky gave evidence at the Liability Trial that Claim 1 required plug detectors at the bottom of the holes which receive the pins. Mr Barovsky clearly accepted this in the passage set out above and the Defendants did not suggest that he was wrong in their written closing or oral submissions. It would be very odd if the judge had decided that this was a requirement of Claim 1 if neither expert had given evidence suggesting that this is how it would have been understood by the skilled person.

- (2) The judge did not make a clear finding to that effect either. He used the words “apparently expressed” in the Liability Judgment, [74] and made no reference to this requirement in [75]. If it was a critical part of his reasoning and formed an integral part of the insertion test, he would have made that clear in the passage where he articulated the test at [75].
- (3) Birss LJ analysed [72] to [74] (above) in meticulous detail in the Appeal Judgment but made no reference to this element of the test. His interpretation of that passage was that without expert evidence Morgan J was unable to conclude from the description in [0032] that the inventors must have had a partial insertion test in mind. He reached this conclusion because the alternative arrangement which the inventors had in mind might still have detected full insertion:

“47. In other words the judge was holding that what might be disclosed implicitly in [0032] as a possibility was not within claim 1 in any event. The appellants contend that this is another error by the judge in that, first the judge ought to have held that detectors which detect pins without full insertion was actually disclosed by paragraph [0032] and second that this supported their case that claim 1 was not limited to full insertion. The respondent supports the judge’s findings on disclosure and interpretation and also argues under the respondent’s notice that there was no evidence that paragraph [0032] did in fact disclose a system which necessarily would fall outside claim 1 on the judge’s construction.

48. The respondent is correct that there was no technical evidence from either expert to describe how the alternative in paragraph [0032] could or would necessarily work. Counsel submitted that without that evidence the appellants’ case was flawed. He supported his point with a submission that even without that evidence one could see that a switch could be arranged to the side of a plug hole in a manner whereby what it detected was full insertion. To achieve that you mount the switch to the side and at the bottom.

49. Having had the benefit of the assistance of the experts the judge was in a good position to read and interpret the patent. However like the judge I am not prepared to go further than seeing that the passage the appellants rely on might disclose an arrangement which detects partially inserted plugs rather than fully inserted plugs, but then again it might not. The passage certainly does not spell out that that is how it works nor is it clear that that must inevitably be how the alternative arrangement functions. If the disclosure had been clearer then no doubt expert evidence would not have been needed but without it the appellants’ case on this aspect founders. The words as they stand do not provide sufficient support for a conclusion that the inventors were here specifically describing a system which detected partial insertion such

that the skilled person would be caused to think that had an impact on their interpretation of claim 1. There is no error in paragraphs 72 to 74.”

- (4) It is clear from this passage alone that neither the judge nor the Court of Appeal considered it necessary to decide whether Mr Cuddigan was right and that the test set out in [75] could be satisfied if the switches were mounted at the bottom of the plug holes and to the side or, to use the language of the finding which I have made in relation to the 1171 Twist Lock, if the switches were “deep within the socket holes although on the sides”: see [170](1) (above).
- (2) *Are the Defendants estopped from asserting that Claim 1 requires a casing to casing test or would it be an abuse of process for them to do so?*

(i) Cause of Action Estoppel

218. There was no real dispute between the parties in relation to the law. Even if a point is not taken in earlier proceedings, the decision of the Court may give rise to a cause of action estoppel or an issue estoppel if the determination of that issue was or would have been essential to the Court’s decision. In *Virgin Atlantic Airways Ltd v Zodiac Seats UK Ltd* [2013] UKSC 46, [2014] AC 160, a patent case, Lord Sumption (who gave the decision of the majority) described the issue at [1] and [2]:

“1. In this case, Virgin Atlantic Airways Ltd wishes to recover damages exceeding £49,000,000 for the infringement of a European Patent which does not exist in the form said to have been infringed. The Technical Board of Appeal (“TBA”) of the European Patent Office (“EPO”) has retrospectively amended it so as to remove with effect from the date of grant all the claims said to have been infringed.

2. The TBA found that in the form in which the patent was originally granted the relevant claims were invalid because they had been anticipated by prior art. Virgin says that it is nevertheless entitled to recover damages for infringement because before the TBA had issued its decision, the English courts had held the patent to be valid and specifically rejected the objection based on prior art. Their case is that this conclusion and the finding of validity on which it is based are *res judicata* notwithstanding the later but retrospective decision of the TBA. A similar argument had succeeded before the Court of Appeal in very similar circumstances in *Coflexip SA v Stolt Offshore MS Ltd* (No 2) [2004] FSR 708 and *Unilin Beheer Unilin Beheer BV v Berry Floor NV* [2007] FSR 635. The Court of Appeal, conceiving itself to be bound by these decisions and regarding them as correct in principle, arrived at the same conclusion.”

219. In a well-known passage Lord Sumption began his discussion of the relevant principles by discussing the term “res judicata” and the various forms which it can take. It is a useful starting point in the present case because Lufthansa relied on cause of action estoppel, issue estoppel and *Henderson v Henderson* abuse of process. Lord Sumption stated this at [17]:

“17. Res judicata is a portmanteau term which is used to describe a number of different legal principles with different juridical origins. As with other such expressions, the label tends to distract attention from the contents of the bottle. The first principle is that once a cause of action has been held to exist or not to exist, that outcome may not be challenged by either party in subsequent proceedings. This is “cause of action estoppel”. It is properly described as a form of estoppel precluding a party from challenging the same cause of action in subsequent proceedings. Secondly, there is the principle, which is not easily described as a species of estoppel, that where the claimant succeeded in the first action and does not challenge the outcome, he may not bring a second action on the same cause of action, for example to recover further damages: see *Conquer v Boot* [1928] 2 KB 336. Third, there is the doctrine of merger, which treats a cause of action as extinguished once judgment has been given upon it, and the claimant’s sole right as being a right upon the judgment. Although this produces the same effect as the second principle, it is in reality a substantive rule about the legal effect of an English judgment, which is regarded as “of a higher nature” and therefore as superseding the underlying cause of action: see *King v Hoare* (1844) 13 M & W 494, 504 (Parke B). At common law, it did not apply to foreign judgments, although every other principle of res judicata does. However, a corresponding rule has applied by statute to foreign judgments since 1982: see Civil Jurisdiction and Judgments Act 1982, section 34. Fourth, there is the principle that even where the cause of action is not the same in the later action as it was in the earlier one, some issue which is necessarily common to both was decided on the earlier occasion and is binding on the parties: *Duchess of Kingston’s Case* (1776) 20 St Tr 355. “Issue estoppel” was the expression devised to describe this principle by Higgins J in *Hoysted v Federal Commissioner of Taxation* (1921) 29 CLR 537, 561 and adopted by Diplock LJ in *Thoday v Thoday* [1964] P 181, 197-198. Fifth, there is the principle first formulated by Wigram V-C in *Henderson v Henderson* (1843) 3 Hare 100, 115, which precludes a party from raising in subsequent proceedings matters which were not, but could and should have been raised in the earlier ones. Finally, there is the more general procedural rule against abusive proceedings, which may be regarded as the policy underlying all of the above principles with the possible exception of the doctrine of merger.”

220. In relation to cause of action estoppel Lord Sumption went on to consider *Arnold v National Westminster Bank plc* [1991] 2 AC 93 before summarising the principles as

follows (at [22]):

“*Arnold* is accordingly authority for the following propositions: (1) Cause of action estoppel is absolute in relation to all points which had to be and were decided in order to establish the existence or non-existence of a cause of action. (2) Cause of action estoppel also bars the raising in subsequent proceedings of points essential to the existence or non-existence of a cause of action which were not decided because they were not raised in the earlier proceedings, if they could with reasonable diligence and should in all the circumstances have been raised. (3) Except in special circumstances where this would cause injustice, issue estoppel bars the raising in subsequent proceedings of points which (i) were not raised in the earlier proceedings or (ii) were raised but unsuccessfully. If the relevant point was not raised, the bar will usually be absolute if it could with reasonable diligence and should in all the circumstances have been raised.”

221. The Supreme Court held that the infringer was not bound by a cause of action estoppel because it was not seeking to re-open the issue determined by the Court of Appeal but to advance a new defence which had arisen since the Court’s decision. Lord Sumption gave the reasons for this conclusion at [27]:

“If this case is to be determined according to these general principles of the modern law, there can, I think, be little doubt about the answer. The Court of Appeal decided, before the result of the opposition proceedings in the EPO, that in its unamended form the patent was valid and infringed. It follows that Zodiac are estopped from asserting on the enquiry as to damages that in its unamended form the patent was invalid or was not infringed. This estoppel is a true cause of action estoppel. The Court of Appeal has determined in favour of Virgin issues essential to the existence of the cause of action for infringement of the unamended patent, which are the basis of the claim for damages. However, the point which Zodiac seek to make on the enquiry is that the unamended patent has been retrospectively amended. It no longer exists, and is deemed never to have existed, in the form on which these issues were adjudicated by the Court of Appeal. Zodiac’s reliance on the retrospective amendment is a new point which was not raised before. It could not have been raised before, because the decision of the TBA retrospectively amending the patent was made after the order giving effect to the judgment of the Court of Appeal. There are two related reasons why Zodiac cannot be precluded from relying on the decision of the TBA on the enquiry as to damages. One is that they are relying on the more limited terms of a different patent which, by virtue of the decision of the TBA, must at the time of the enquiry be treated as the only one that has ever existed. The other is that Zodiac are not seeking to reopen the question of validity determined by the Court of Appeal. The invalidity of the patent may be the reason why the TBA amended the patent, but the defendant is relying on the mere fact of

amendment, not on the reasons why it happened.”

222. In the *FII Test Claimants v Her Majesty's Revenue and Customs* [2020] UKSC 47 the Revenue wished to withdraw a concession that section 32(1)(c) of the Limitation Act 1980 applied to mistakes of law and that the Claimants faced no limitation defence. Lords Reed and Hodge cited the passage in *Virgin Airways* at [22] (above) before deciding that there was no cause of action estoppel at [63]:

“63. From these authorities it is clear that cause of action estoppel operates only to prevent the raising of points which were essential to the existence or non-existence of a cause of action. The claimants' complaint in short is that the Revenue had conceded both in their pleadings and in counsel's submissions that section 32(1)(c) applied to mistakes of law and that BAT (and by implication other claimants which had raised proceedings within six years after 8 March 2001) faced no limitation defence. Those concessions relate to the defence of limitation. The effect of limitation is to render an otherwise valid claim unenforceable to the extent that the claim relates to periods beyond the period of limitation. The concessions had and have no bearing on the existence or non-existence of the cause of action which is a claim for restitution based on the payment of tax which was paid under a mistaken understanding of the relevant law. The Revenue therefore are not barred from their challenge by cause of action estoppel.”

223. In my judgment the Liability Judgment and the Liability Order do not give rise to a cause of action estoppel. The Defendants wish to advance the argument that Claim 1 required an ETP limit of zero (or very close to it) in relation to the 1171M which is a different and hypothetical product but they do not seek to challenge the declaration of infringement in the Liability Order or the reasons given by Morgan J for finding that the 12xx series (both in their original and modified form) infringed Claim 1. The fact that this argument was available to them in relation to the 12xx series does not give rise to a cause of action estoppel for this simple reason. The position would be different if the Defendants were seeking to argue now that the 12xx series did not infringe. But at all times they accepted that this was not open to them.

(ii) Issue Estoppel

224. It was common ground that an issue estoppel arises where three conditions are satisfied

- (i) an issue has been determined in a final decision in an action between the same parties,
- (ii) the issue determined in the earlier action was fundamental to the earlier decision and



(iii) the issue in the later action is the same as the issue in the earlier action. It is clear also that the principle of issue estoppel may apply to admissions. In *Thoday v Thoday* [1968] P 181 at 198 Diplock LJ stated as follows (in a passage cited by Lords Reed and Hodge in the *FII Test Claimants v HMRC* (above) at [65]):

“There are many causes of action which can only be established by proving that two or more conditions are fulfilled. Such causes of action involve as many separate issues between the parties as there are conditions to be fulfilled by the plaintiff in order to establish his cause of action; and there may be cases where the fulfilment of an identical condition is a requirement common to two or more different causes of action. If in litigation upon one such cause of action any of such separate issues as to whether a particular condition has been fulfilled is determined by a court of competent jurisdiction, either upon evidence or upon admission by a party to the litigation, neither party can, in subsequent litigation between one another upon any cause of action which depends upon the fulfilment of the identical condition, assert that the condition was fulfilled if the court has in the first litigation determined that it was not, or deny that it was fulfilled if the court in the first litigation determined that it was.”

225. In *Eli Lilly & Co v Genentech Inc* [2020] EWHC 261 (Pat) Roger Wyand QC (sitting as a judge of the Chancery Division) gave helpful guidance in relation to condition (ii) at [55] and [56]:

“55. Genentech summarises the relevant propositions it derives from the authorities as: a. Nothing but what is legally indispensable to the conclusion is precluded by issue estoppel; b. In matters of fact, the issue estoppel is confined to those ultimate facts which form the ingredients in the cause of action; c. Matters which are subsidiary or collateral do not give rise to an issue estoppel, so that findings which concern only evidentiary facts, and not ultimate facts forming the very title to rights, give rise to no preclusion – however deliberate and formal the findings; and, d. Decisions upon matters of law which amount to no more than steps in a process of reasoning do not give rise to an issue of estoppel.

56. I would add a note of caution concerning the adjudication as to what are the fundamental or necessary findings in any particular case and the application of the above identified propositions. Some of the cases involve a Claimant seeking to establish a right or entitlement where it is necessary for it to establish a number of facts and/or points of law. Failure on any one of those issues is fatal to its case. If it does fail on one issue then it would be estopped from asserting the contrary to that one issue in subsequent proceedings. On the other hand, the Defendant would not be estopped from challenging any of the other issues which were established in the Claimant’s favour as those issues were not essential to the decision. However, if the Claimant succeeds on all the

issues then the Defendant would be estopped in respect of each one of those issues as failure by the Claimant on any one of those issues would be fatal to its case.”

226. Spencer Bower and Handley Res Judicata 6<sup>th</sup> ed (2024) provides authority for condition (iii) and the editors provide a number of examples at 8.19 to 8.21. In the *FII Test Claimants v HMRC* (above) the Supreme Court also rejected the argument that the Revenue was bound by an issue estoppel. Lords Reed and Hodge rejected the argument on the basis that although they admitted on the facts that the claims were not barred by limitation, they never admitted the point of law which they now wished to argue (at [69]):

“The claimants did not argue in their written case that there is an issue estoppel, but Mr Daniel Margolin QC raised the possibility in his oral submissions and we must address it. The answer to this challenge lies in the terms of the GLO and the way in which the proceedings developed. The question of limitation was raised in Issue P in the GLO (“From what date does the limitation period commence?”) and the BAT claim was the test claim in relation to that issue: para 20 above. Issue P was not argued or determined in Henderson J’s first judgment (FII (HC) 1 [2009] STC 254) or in the appeals which arose out of that judgment. The only question relating to a limitation defence which was decided in the first trial was Issue Q, which concerned the effect of section 320 of the FA 2004 and section 107 of the FA 2007: paras 29 and 35 above. This is unsurprising, as in the first phase of the litigation the Revenue’s only limitation defence to BAT’s mistake of law claims was its reliance on those statutory provisions to exclude the application of section 32(1)(c). In the period leading up to the second trial before Henderson J the BAT claimants asserted in their revised pleadings that the mistake claims were not time barred, and the Revenue admitted those assertions: para 44 above. Notwithstanding that admission in relation to the BAT claimants, the Revenue wished to argue that the relevant date under section 32(1)(c) was 8 March 2001 because that date would support a limitation defence in relation to some of the other claims. As a result, the parties agreed that Issue 28 be decided at the second trial: para 45 above. It would not have been possible for the Revenue to argue at first instance or in the Court of Appeal that either *Kleinwort Benson* or *Deutsche Morgan Grenfell* was wrongly decided. But until June 2016 the Revenue gave no indication and made no reservation that they might seek to advance such an argument if the case were to return to the Supreme Court. With the benefit of hindsight, that is unquestionably unfortunate. But it does not give rise to an issue estoppel in circumstances where Issue P had to be determined in the second phase of the proceedings and the argument which the Revenue now wish to advance could be raised only in the Supreme Court.”

227. There was no dispute that condition (i) (above) is satisfied in relation to the issues of

construction and infringement given that the Defendants' rights of appeal against the Liability Judgment and the Appeal Judgment have now been exhausted. But in my judgment, condition (ii) is not satisfied and the question whether Claim 1 taught an ETP limit and, if so, what that limit was, was not fundamental either to the declaration of infringement which Morgan J made in the Trial Order or to his reasons for making that declaration in the Liability Judgment. Furthermore, I do not accept that by making an admission of infringement the Defendants admitted the ETP limit which Lufthansa advanced at the taking of the Account.

228. I have reached this conclusion for essentially the same reasons which I have given in rejecting the Defendants' argument in relation to "full insertion". It is clear from my analysis of the Liability Judgment (above) that the fundamental issue which the judge had to decide was whether Claim 1 had been anticipated by prior art and, in particular, by *Neuenschwander*. He distinguished *Neuenschwander* on the basis that the insertion test required the tips of the pins to make physical contact with the plug detectors at the bottom of the pin holes and that the plug detectors did not detect the pins on their approach down the plug holes.
229. It is highly likely that Morgan J, Birss LJ and the German Court all assumed that the distance between the casing of the plug and the faceplate of the outlet would be very close together by the time that the plug detectors detected the plug. As Mr Cuddigan put to Professor Burrow (and he accepted), the Patent used the pins of a mains voltage plug as an indicator of the plug casing and its objective was to ensure that the plug is "all the way in" before the power switched on. But the critical point is that the judge did not have to decide what ETP limit Claim 1 taught or, indeed, whether it taught a specific limit at all. After all, he decided that it was not necessary for the Patent to spell out how to comply with the remoteness test and that it was permissible to leave the implementation of the Patent to the skilled person: see the Liability Judgment, [94].
230. In my judgment, condition (iii) is not satisfied either. The judge had to decide the construction of Claim 1, whether that claim was anticipated by *Neuenschwander* and, if so, whether the 12xx series infringed the Patent. He did not decide whether the 1171 Twist Lock infringed the Patent or the hypothetical question whether the 1171M would have done so. The Defendants did not admit either of those propositions at trial and the judge made no declaration to that effect. For the reasons which I have given, he did not

have to.

231. I have considered whether I have taken too narrow a view of the issues in considering whether conditions (ii) and (iii) are satisfied. However, both the factual and the legal issues before the Court were highly technical and I take comfort from the way in which the Supreme Court addressed issue estoppel in the *FII Test Claimants v HMRC* (above), which seems to me to be an analogous case. Moreover, the conclusion which I have reached can be tested in a very simple way. If the Defendants had made the admission which they did in their Closing Skeleton Argument dated 30 June 2020 but reserved the right to argue whether Claim 1 taught an ETP limit (and, if so, what it was), I see no reason why they could not have done so. It would have made no difference to the evidence before the judge or his conclusions or to the declaration which he made. It may be unfortunate that they did not do so (as it was in the *FII Test Claimants v HMRC*) but it does not give rise to an issue estoppel.

(iii) Abuse of Process

232. The Defendants accepted that ordinarily a party who has been unsuccessful in challenging the validity of a patent should not be permitted to raise the issue of validity again. But they cited *Agilent Technologies Deutschland GmbH v Waters Corporation* [2004] EWHC 2992 (Ch) that this is not an invariable rule. In that case, a patent for a type of pumping apparatus was held to be valid and the Court of Appeal held that the infringer's rival apparatus infringed when it was used in its automatic mode. It also had a semi-automatic mode which was the subject of evidence at the first trial but was not the subject matter of any findings of infringement.

233. In a second action, the patentee asserted that a manual version of the infringer's apparatus infringed the patent. Pumfrey J (as he then was) dismissed that claim. He described it as "superficially astonishing" that a claim which only contemplated automatic tracking should be capable of covering a device in which there is no such automatic tracking: see [21]; and after a detailed analysis he reached the conclusion that the claim was limited to automatic tracking: see [22] to [30]. However, the infringer (rather than the patentee) also argued that it was an abuse of process to argue that the claim extended to the manual version of the apparatus as well as the automatic version because the infringer would have been able to raise a defence of obviousness. Pumfrey J described the nature of the

argument at [43] and [44]:

“43. These are powerful arguments, which could have been addressed at the first trial had the claimants suggested that the semi-automatic mode infringed. They are arguments of type usually called “squeezes”: if you construe the claim so that the defendant infringes, it is invalid, but if a reasonable construction is placed on the claim it is not. It is a particularly important consideration in the present case because the case advanced on validity at the first trial was directed only to automatic adjustment and had to be advanced on the basis of a publication of some obscurity. As the judgment of the Court of Appeal demonstrates, the objection did not even work as a squeeze, the document failing to provide the basis for a successful objection whether or not the claim covered stepwise automatic adjustment.

44. Mr Burkill submits that it is now unfair to permit the claimant to rely on a construction not considered by the Court of Appeal when an allegation of invalidity was open to him, and according he submits (1) that the claimant is now estopped from alleging that that construction of the claim is different from that placed on it by the Court of Appeal and that (2) this issue of construction was one which might have been considered in the first proceedings and accordingly is not now open to the claimants by reason of the rule in *Henderson v Henderson* (1843) 3 Hare 100.”

234. Pumfrey J accepted that the principles of estoppel and abuse of process could apply to claim construction and that in general a party is not entitled to have two bites of the cherry. But he held that it was unnecessary for him to decide the issue because he had already held that the claim for infringement failed. Nevertheless, he made the following observations:

“45. As I have indicated, the authorities appear to be clear that the defendant is estopped from again challenging validity. As between the same parties, I do not see why this principle should not be capable of extending to issues affecting the interpretation of the claim, but the present case presents a feature which seems to me to render a general discussion entirely inappropriate. This feature is the presence of the non-automatic mode in the apparatus in suit in the original action. Mr Wyand QC says that there was no point in investigating the manual mode in the previous action, because the claim is an apparatus claim and it was only necessary to demonstrate infringement by one mode. This is no doubt true, but there is a general principle that a litigant is not to have two bites of the cherry where one only is possible. The second action runs the risk of being considered an abuse of process—see *Johnson v Gore Wood* [2001] 1 All ER 482. It cannot be disputed that the allegation of infringement in this case opened up a whole range of considerations concerning validity which would not have been relevant, or foreseeable, in the earlier proceedings unless the contention

that the semi-automatic mode infringed, when they would have been directly in point. For what it was worth, the matter was indeed referred to in passing by the defendants' expert, but only to dismiss the possibility of infringement. Nobody bothered to challenge him because no attention was given to the possibility that automatic operation was not intrinsic to the requirements of the claim.

46. I think that in such circumstances it should in principle be possible for the defendant to re-open the question of validity to the extent that the claimant's contention on infringement is different from, or additional to, that which it has previously made, and makes possible grounds of invalidity not previously arguable. Alternatively, the claimant might be constrained to interpretations of his claim that do not raise new issues. I am less attracted to this possibility since a fresh infringing machine or method from the defendant may raise entirely fresh issues requiring a fresh examination of features of the claim which did not give previously give rise to difficulty. Either case is likely to be rare, and I am relieved from the duty to resolve this question by my primary conclusion on construction."

235. Lufthansa argued that the Defendants could and should have raised the question of the ETP limit at the Liability Trial and that it was now an abuse of process for them to do so. The primary basis for Lufthansa's submission was that Astronics knew that the ETP for the 12xx series was not zero and that it had suffered prejudice as a consequence of the Defendants' failure to take the point. In particular, Lufthansa submitted that if the Defendants had taken the point at the Liability Trial, they would have led evidence in relation to the ETP limit and that it had a legitimate expectation that Claim 1 would extend not only to the 12xx series but also to any other outlets which were not materially different.

236. The PPD was dated 18 November 2019 and was therefore produced before the Liability Trial. Diagrams 2 and 2A (above) showed that the plug detectors consisted of mechanical switches at the end of the plug holes. In particular, two plungers passed through a printed wiring board or "**PWB**" and rested against two "**leaf switches**". Once the plug pins had made contact with the plungers, the plungers would push back the leaf switches and break the circuit with the PWB. This then generated a signal to the power supply. Diagram 2A described the "closed" position and Diagram 2B (which I have not reproduced) the "open position". Diagram 2A contained the legend: "Switches closed to PWB. Plug not yet fully inserted." Diagram 2B contained the legend: "Switches opened to PWB. Plug fully inserted." The PPD provided a longer, and more technical, description (my emphasis):

“5.2 The Outlet Unit is a plug socket. It comprises a "female" socket, that is, a housing, which contains two or more holes intended to receive the pins of a "male" plug to which electric devices can be connected. Each of the holes in the female socket contains a connector or contact. When the plug is properly inserted into the Outlet Unit, the Outlet Unit sends a signal via each of the CNTL\_1 and CNTL\_2 signal lines to instruct the ISPS Unit microcontroller to supply power to the Outlet Unit via the power cable (labelled “Power Leads” in Diagram 2) which is contained within an Interconnect Cable. Electrical power is then transmitted to the prongs of the male plug via power contacts in the Outlet Unit if the criteria for a properly inserted plug are met.

5.3 Mains power is not present at the Outlet Unit until a suitable plug is properly inserted. There is a mechanical leaf switch inside each of the two plug pin sockets. These switches are composed of a leaf spring, Printed Wiring Board ("PWB") contact and multi-faceted plunger (as shown in Diagrams 2A and 2B). The leaf switches are installed at the end of the plug pin travel so only a properly inserted plug pin is detected by the switches (see Diagram 2B). Both switches are closed until a plug pin is inserted (as shown in Diagram 2A). When a pin is inserted into either of the plug pin sockets, the corresponding leaf switch is opened and it sends a signal to the ISPS Unit.

5.4 The presence of a plug is signified by two signals from the Outlet Unit - CNTL\_1 and CNTL\_2. When the plug is inserted, leaf spring switches connected from LED Return signal ("RTN") to CNTL\_1 and CNTL\_2 open in response to the plunger pushing the leaf spring and separating one end of the leaf from the PWB contact CNTL\_1/\_2. Once the microcontroller receives a signal from either one of the leaf switches in the Outlet Unit, the ISPS Unit then sets a timer of 50 or 300 milliseconds depending on the model of ISPS Unit. When the timer expires, the ISPS Unit monitors signals from the Outlet Unit to check if both leaf switches are open, signifying that both plug pins are inserted in to the Outlet Unit and properly engaged. If this criterion is met, a further 0.5 second timer is set. If both plug pins remain properly inserted throughout the second timer, the central AC voltage source is engaged, a corresponding output relay is closed and power then flows, via the Interconnect Cable, to the Outlet Unit and the user's device.”

237. When Mr Cuddigan put all three diagrams to Mr Jouper, it was clear from his evidence that the power supply was not activated until the plug pins touched the leaf springs and they opened away from the PWB. But it was also clear from his evidence that the ETP for the outlet identified in the PPD was 0.1 inch:

“Q. Can we look at the PDD, please. It is {B2/3/1}. If we could turn forward to page {B2/3/7}, there is a schematic diagram of the 12xx outlets, isn't there, at the bottom, diagram 2A? A. I see that. Q. And you can see that there are plungers, and a printed wiring board and a pair of leaf springs? A. Yes. Q. And the diagram indicates that these switches, these

leaf springs are closed because the plug is not yet fully inserted? A. That's correct. Q. And on the next page we see a second diagram, {B2/3/8}, and that diagram indicates that the switches are now open because the plug is fully inserted? A. It is inserted on this diagram to the level where they open, yes. Q. Yes, but it is a bit more than that, isn't it, because it says: "Switches opened to PWB "Plug fully inserted". A. Oh, "fully inserted". I agree. Q. So taking the two together this is indicating that the trigger point is a plug which has been fully inserted? A. This is showing when the plug is fully inserted, which could be further than the trigger point. Q. It could be, but do you not think the better view of what you were trying to communicate with this document is that the trigger point for the switch's opening was full insertion of the plug? A. No, what I meant by this diagram was the difference in operation between closed and open. Q. Right. Well, let's go to the text then. Let's go down to paragraph 5.3, which says: "Mains power is not present at the Outlet Unit until a suitable plug is properly inserted." Now, there is no difference between the use of the phrase "properly inserted" there and the phrase "fully inserted" in the diagrams, is there? A. There is. Q. Mr Jouper, are you saying you intended a different meaning by those two phrases? A. No, I'm saying that the diagram shows when the plug is fully inserted, which shows the leaf springs further away from the printed wiring board. The point of activation is when it first touches the leaf springs and they first barely pull away from the printed wiring board. So there is a difference between fully inserted there, which is the plug moving all the way to the end, and the point of activation. (Pause). Q. I think what you are saying is that this document was meaning that the trigger point was before full insertion? A. This diagram shows there's two and -- or 2A and 2B, correct? Q. Yes. A. Or 2A and -- I can't see the other one here. Q. Do you want to go back to them? A. Certainly, we can go back to them. We can even stop on this one on 2B, {B2/3/8}. Q. Okay. A. Okay. Looking at the leaf springs, you can see the distance between the end of the leaf spring and the printed wiring board because the plug is pushed all the way in. There is a fair distance between those two, right? If you were to pull that plug back out, even a small amount, it would still be open switches until you get to the point of activation. Q. I understand what you're saying. What you are saying is that this diagram actually indicates, because of its scale I think you are relying upon, that the outlets trigger before the plug is fully inserted? A. They do. Q. Okay. Well, that's an interesting development, certainly. (Pause). Perhaps we are slightly at cross-purposes. Is it your position that it indicates that because this could be a plug that's a little bit longer according to the specification or are you actually saying that this was designed so as to trigger early? A. It was designed to trigger with the shortest length of pin and the switches allow for overtravel to get to fully inserted. MR JUSTICE LEECH: Let's try and put a but [sic] of distance on this, and I won't hold you to this. So the distance between the printed wiring board and the leaf springs as shown on the diagram 2B, how much are we talking about there? A. I don't know the exact -- we are talking 0.1 to 0.15 inches, in that rough area. MR JUSTICE LEECH: Right, so that is where your 0.1 inches come from. A. The 0.1 inches comes from what the mechanical engineers told me. MR JUSTICE LEECH: But you are saying it is almost as a consequence of the



design because the leaf springs have to go back. A. Because the shortest pin must activate it, the longest pin must be allowed to overtravel in order for the plug to get fully inserted, face-to-face contact. MR JUSTICE LEECH: So there has got to be enough play in the -- A. So there has to be play in those switches which is what we call overtravel. MR JUSTICE LEECH: Overtravel, right. So it is a consequence of the design -- well, it is not a consequence, it has been designed that way, hasn't it? A. It has, yes. MR CUDDIGAN: Can we go then back to paragraph 5.3, {B2/3/8}, and the first sentence: "Mains power is not present at the Outlet Unit until a suitable plug is properly inserted." Can I suggest what you mean by that in the light of the explanation you have just given. You don't mean that it is all the way in. You mean that it's up to about 0.1 inch away so that the leaf springs open? A. That's correct."

238. Mr Jouper also accepted that the two leaf switches shown in the diagrams on the PPD were not capable of applying a casing to casing insertion test. In answering this question, Mr Cuddigan asked Mr Jouper to make the assumption that this was the purpose of the product:

"Q. Now, this may be a difficult question and it may be too tortuous, in which case please tell me, but I want you to assume an opposite meaning. I want you to assume that what was being described in this document was that the casings had to be touching in order for the outlet to be triggered. Do you understand what I'm asking you to assume? A. I do. Q. Any competent engineer reviewing that document would appreciate that that was not a test which could be reliably performed by those switches? A. That would depend. It would depend -- is the plug being pushed in always the same way or do you have the variability? You are asking a hypothetical without full knowledge of what that hypothetical is supposed to mean and I have to be careful on the answer that I give based on that hypothetical. Q. That's absolutely fine. Yes, so let me answer your question which is I am assuming that the reader appreciates that there is variability in plug pin length according to standards? A. So in light of that please ask the question again. Q. Absolutely. A competent engineer reading your PDD would appreciate that the switch mechanism that's shown is not capable of reliably testing for a casing-to-casing situation? A. I would accept that that's true."

239. Mr Cuddigan put the same point to Mr Barovsky when he gave evidence by reference to the evidence which Mr Jouper had himself given in the passage which I have set out immediately above:

"Q. On Friday, Mr Jouper gave evidence to this trial about this document. He had been involved in drafting the PPD and indeed he gave a witness statement to Mr Justice Morgan attesting to the accuracy of the PPD. Last Friday -- I want to see if you agree with the evidence he gave to my Lord

last Friday; okay? A. Okay. Q. He gave evidence in response to these two documents. He said -- and the evidence he gave was in the context of any competent engineer; okay? A. Okay. Q. So the proposition is any competent engineer looking at those drawings. He said: "Any competent engineer looking at those drawings, who knew that there was some variability in the pin lengths of plugs..." Right? A. Correct. Q. So in other words, your skilled person? A. Yes. Q. "... would appreciate that this switch mechanism was not capable of reliably testing for a casing-to-casing situation." Do you understand what I'm putting to you? A. I believe I do, yes. Q. In other words, that switch couldn't reliably test for the situation where the plug casing is touching the outlet face plate? A. I believe that would be accurate due to the variability and length of the pins. Q. You agree with his position? A. Yes."

240. I am satisfied that the Defendants could have raised this issue at the Liability Trial if they had wished to do so. Mr Jouper accepted that for plugs with the longest pin length, the power supply would be activated where the ETP was 0.1 inch. He also accepted that this is what he meant by "properly inserted" in the PPD, ¶5.3. Mr Barovsky and he also accepted that the 12xx series could not reliably test for a casing to casing insertion test. If the Defendants had argued that Claim 1 taught a casing to casing insertion test, Mr Cuddigan could have put the same questions to both witnesses and elicited the same answers from them in support of a submission that this was not the correct test.
241. Moreover, I consider *Agilent* (above) to be distinguishable. In that case, the question was whether the patentee (not the infringer) should be entitled to reopen the question of claim construction and argue that it extended to a very different product. This is clear from the Judge's observation at [37]: "As Mr Burkill observed, you cannot turn a manual gearbox into an automatic one by giving the driver instructions as to the points at which to change gear." In the present case, however, the question whether Claim 1 taught a casing to casing insertion test was a point which the Defendants could have taken in relation to the 12xx series and if they had been successful, it would have provided a complete defence to the infringement claim.
242. Nevertheless, I am not satisfied that the Defendants should have raised this issue at the Liability Trial. As I have pointed out a number of times, this was not the issue which Morgan J had to decide in order to establish whether the Patent had been anticipated by *Neuenschwander* and the Defendants are not seeking to resile from their admission of infringement. Moreover, I am not satisfied that it was foreseeable that this would be a critical issue for the taking of the Account. The Defendants did not know that Lufthansa

would elect for an account of profits or, indeed, that they would challenge the widely accepted legal proposition that it was not open to the Defendants to rely on an NIA. Finally, I am not satisfied that the technical issues were so fully developed that I am able to find that the Defendants should have appreciated the significance of the issue by the Liability Trial.

243. But putting all that to one side, I can see no reason why the Defendants should not be able to take this point now when the parties have not only had a full opportunity to call evidence and make submissions on this issue but have actually done so. This is not a case which has been finally determined. It is a case in which the issues were bifurcated and the parties and the Court have now reached the quantum stage. In my judgment, the parties ought to be entitled to plead and take all points reasonably open to them unless those issues have already been decided. The position might have been different if, say, the action had been settled and the Defendants had sought to re-open the issue in new proceedings. But that is not this case. I, therefore, hold that it is open to the Defendants to argue that Claim 1 taught a casing to casing insertion test and that the 1171M did not satisfy that test or, in the alternative, that it did not satisfy the ETP test for which Lufthansa argued.

(3) *What is the ETP limit for Claim 1?*

(i) The principles of construction

244. The Defendants cited *Virgin Atlantic Airways Ltd v Premium Aircraft Interiors Ltd* [2009] EWCA Civ 1062, [2011] RPC 18 in their Opening Skeleton Argument as authority for the principles of claim construction. Lufthansa did not challenge them or their relevance and I therefore adopt them. Lewison J set out those principles in his judgment at first instance and Jacob LJ adopted them at [5]:

“The task for the court is to determine what the person skilled in the art would have understood the patentee to have been using the language of the claim to mean. The principles were summarised by Jacob LJ in *Mayne Pharma v Pharmacia Italia* [2005] EWCA Civ 137 and refined by Pumfrey J in *Halliburton v Smith International* [2005] EWHC 1623 (Pat) following their general approval by the House of Lords in *Kirin-Amgen v Hoechst Marion Roussel* [2005] RPC 9. An abbreviated version of them is as follows:

(i) The first overarching principle is that contained in Article 69 of the

European Patent Convention;

(ii) Article 69 says that the extent of protection is determined by the claims. It goes on to say that the description and drawings shall be used to interpret the claims. In short the claims are to be construed in context.

(iii) It follows that the claims are to be construed purposively—the inventor’s purpose being ascertained from the description and drawings.

(iv) It further follows that the claims must not be construed as if they stood alone—the drawings and description only being used to resolve any ambiguity. Purpose is vital to the construction of claims.

(v) When ascertaining the inventor’s purpose, it must be remembered that he may have several purposes depending on the level of generality of his invention. Typically, for instance, an inventor may have one, generally more than one, specific embodiment as well as a generalised concept. But there is no presumption that the patentee necessarily intended the widest possible meaning consistent with his purpose be given to the words that he used: purpose and meaning are different.

(vi) Thus purpose is not the be-all and end-all. One is still at the end of the day concerned with the meaning of the language used. Hence the other extreme of the Protocol—a mere guideline—is also ruled out by Article 69 itself. It is the terms of the claims which delineate the patentee’s territory.

(vii) It follows that if the patentee has included what is obviously a deliberate limitation in his claims, it must have a meaning. One cannot disregard obviously intentional elements. It also follows that where a patentee has used a word or phrase which, contextually, might have a particular meaning (narrow or wide) it does not necessarily have that meaning in context. It further follows that there is no general “doctrine of equivalents.”

(viii) On the other hand purposive construction can lead to the conclusion that a technically trivial or minor difference between an element of a claim and the corresponding element of the alleged infringement nonetheless falls within the meaning of the element when read purposively. This is not because there is a doctrine of equivalents: it is because that is the fair way to read the claim in context.

(ix) Finally purposive construction leads one to eschew the kind of meticulous verbal analysis which lawyers are too often tempted by their training to indulge.”

245. Lufthansa’s team also cited three further propositions in their Closing Submissions which they described as “well-established principles of patent law”. Again, the Defendants did not challenge any of those propositions and I accept them:

“There are some well-established principles of patent law in play here:

i. A patent is addressed to those skilled persons likely to have a practical interest in putting the invention into effect (see e.g. *Glaxo Group Ltd’s*

*Patent* [2004] RPC 43 at [23], citing Lord Diplock in *Catnic v Hill & Smith* [1982] RPC 183).

ii. A skilled person can conduct routine experiments in the process of implementing the invention (see Terrell 20th ed. 8-52, citing *Regeneron v Kymab* [2016] EWHC 87 (Pat)).

iii. The skilled person is required to approach the Patent in the expectation that it is teaching an invention (that is to say, something useful) of industrial application (see s.4(1) of the Patents Act 1977 and Terrell 20th ed. [2-19], quoting Lord Neuberger in *Human Genome Sciences v Eli Lilly* [2011] UKSC 51; [2012] R.P.C. 6).

246. It is also useful for me to set out the first proposition in the passage from the judgment of Lord Neuberger in *Human Genome Sciences v Eli Lilly* (above) upon which Lufthansa relied. In that passage, he stated that the patent must disclose “a practical application” and “some profitable use” so that the ensuing monopoly “can be expected to lead to some commercial benefit”.

(ii) The Evidence

247. The Patent description refers to both the US and European standards for plug types and it is clear from the text that it intended the inventive concept to be sufficiently adaptable for use with both types. It provides as follows at [0032]:

“Figure 4 shows the insertion side of the round socket 22, in the middle of which is the reflection sensor 48, the two plug holes 40,41 for plugs complying with the US plug standard and two further plug holes 68,69 for mains plugs complying with the European standard. The respective plug hole pairs 40,41, 68,69 are arranged at right angles to each other so that both a plug 38 complying with the US Standard and also a plug complying with the European standard both cover the middle area of the socket in which the reflection sensor 48 is located. The plug holes 68,69 for the European plug also each have a contact element and a microswitch which are each connected to the relevant signal and supply cables 18,18',20 of the other plug holes 40,41. However, it is also possible for a second separate power supply of 230V, 50 Hz to be provided for the plug holes 68,69 of European plugs. Moreover, the plug hole pairs can also be arranged so that they are not at right angles to each other rather overlay each other, in which case the microswitches are arranged to the sides of the plug holes.”

248. *Professor Wheeler*. In his third expert report dated 5 July 2018 (“**Wheeler 3**”) Professor Wheeler gave evidence that the skilled person would recognise that the Patent discloses a way to achieve safe delivery of power to the user which involves supplying power when

the gap between the casing of the plug and the casing of the socket is at a minimum. He gave evidence about the different plug types in use in the US, UK, Europe and Australia and the minimum and maximum plug pin lengths which were governed by the national standards. The two significant issues between Professor Wheeler and Professor Burrow were whether the socket could be expected to work for all plugs and, if so, what a skilled person would consider to be the maximum ETP to satisfy the insertion test. Professor Wheeler gave the following evidence on the first issue:

“69. The skilled person would recognise that the patent discloses a way to achieve safe delivery of power to the user, and that this will therefore involve supplying power when the gap between the casing of the plug and the casing of the socket is at a minimum. To be clear, they would understand that the significance of the plug having been inserted was that in that circumstance the casings would be touching. They would appreciate that that is a sensible objective because as the gap between casings is reduced, the possibility of unsafe access to power via the plug pins through that gap is also reduced. However, the ideal of sensing for a ‘casing to casing’ situation can only be approached subject to two important constraints.

70. The first constraint is the requirement that the system reliably provides power when a genuine plug is properly inserted. It would be unacceptable to airlines and their passengers if the socket only worked in some instances. In other words, it must work for all plugs within the applicable specification(s), and in particular those with pin lengths at the shortest end of the permissible range.”

249. The second constraint to which Professor Wheeler referred was that the skilled person would allow for manufacturing tolerances. He also pointed out that Figure 3 envisaged micro-switches to be used to trigger the power supply. He gave evidence that taking these factors into account, the skilled person would consider any ETP below 4 mm to be fully inserted for the purposes of the invention taught by Claim 1:

“77. Taking into account (i) the 2.4mm variation in pin lengths in the US standard; (ii) manufacturing tolerances; and (iii) the need for the microswitches specified in the Patent to operate reliably, the skilled person would consider it routine for something in the region of 3.5mm of plug pins to be exposed from a socket even when they were understood the objective was to supply power only when the plug and socket were ‘casing to casing’. I do not think the skilled person would draw a hard line between full insertion and partial insertion, but for the reasons above they would in my view certainly consider any level of pin exposure below 4mm to be fully inserted for the purposes of the invention taught by claim 1 the Patent.”

250. Mr Acland challenged each of these figures and suggested to Professor Wheeler that he had been guilty of “tolerance stacking”. Professor Wheeler did not accept this characterisation although he accepted that he had added together the worst case for each variable in order to ascertain the limit at which the invention would work reliably. Mr Acland also put it to Professor Wheeler that the use of a casing sensor with a mechanical switch would ensure that there was no pin exposure (or virtually no pin exposure):

“Q. Yes. And if the skilled person were to use a mechanical casing sensor and were aware of the tolerance issues that would arise in terms of manufacture, that could be catered for in terms of ensuring as close a contact point as possible; is that right? A. Well, just like all the other bits of design, there's the manufacturing tolerances, there's wear, there's deformation, and so on. Q. Okay. And if the skilled person combined plug detectors at the bottom of the holes with a casing detector, such that all three sensors had to be activated before power was supplied to the socket -- are you with me, Professor? A. Yes. Q. Subject to the manufacturing tolerances, that would be a way of ensuring that there's no pin exposure when the power is supplied to the socket, even where the NEMA range of pin lengths is taken into account, correct? A. As it says in the patent, it would give you a certain minimum separation.”

251. *Professor Burrow*. In his second report dated 7 August 2024 (“**Burrow 2**”) Professor Burrow gave evidence that the skilled person would not have expected the invention to work with every pin length and that the Patent itself provided a ready solution in a casing to casing sensor:

“44. In paragraph 70, Professor Wheeler refers to the variation in plug pin lengths permitted by national standards, for example NEMA where the minimum and maximum pin lengths are 15.9 and 18.3 mm respectively. In paragraph 71, he says that if the specific embodiment of the Patent (by which I understand him to mean the arrangement shown in Figure 3) were made to work with US NEMA plugs, it would inevitably supply power to a plug with 18.3 mm pins when 2.4 mm of the pins was still exposed. I do not believe that the skilled person would regard such exposure as inevitable or unavoidable for the following reasons.

45. First, as explained above, the skilled person would not regard the NEMA standards as indicative of the US pin lengths likely to be encountered in practice. Instead, the skilled person would be guided by the nominal pin lengths found on modern plugs associated with laptops, chargers and other electronic devices typically used on aeroplanes. I am not in a position to say what the outcome of that exercise would have been in 1997 (or any other date) but the skilled person would be surprised if such modern day plugs spanned the full range of pin lengths permitted by NEMA for the reasons given in paragraph 14 above.

46. Second, the skilled person would not expect for the system to work for every pin length as discussed in paragraph 20 above.

47. Third, for the reasons discussed below, the skilled person would have no difficulty in achieving the objective of ‘casing to casing’ contact in the sense described in paragraph 42 above before power is supplied to the socket with variable pin lengths.

48. The Patent provides a ready solution in the form of a casing sensor. For example, the embodiment shown in Figures 3 and 4 (the embodiment to which Professor Wheeler refers in paragraph 66) includes microswitches at the bottom of the socket holes (labelled 45 and 46) and an optical infrared reflection sensor (labelled 48) 3. Paragraph [0025] explains that this sensor comprises an infrared emitting LED and a receiver diode which can detect whether the plug casing is present at the socket. The skilled person would know that a reflection sensor could be configured to send a signal requesting power only when there was ‘casing to casing’ contact. Used in combination with the appropriately configured microswitches at the bottom of the socket holes (as I discuss further in paragraphs 51 and 54 below), a casing sensor would achieve the objective of ‘casing to casing’ contact before power is supplied to the socket with variable pin lengths. The skilled person would appreciate that a mechanical casing sensor could also be used to detect the presence of the plug casing at the socket.”

252. Professor Burrow accepted in cross-examination that the objective of the Patent was to ensure that the plug was “all the way in” when the power to the socket was switched on. Subject to a minor disagreement about the maximum length of a UK plug in 1999 Professor Burrow accepted Professor Wheeler’s evidence about plug types in cross-examination. He also accepted that the skilled person would know that both plugs and sockets varied between countries, that there were standards governing them, that the skilled person would know where to look those standards up and that they formed part of the common general knowledge. However, he was unable to point to any guidance about the nominal pin lengths of laptops or chargers. He also accepted that the knowledge and experience of Astronics’ engineers who designed the EmPower systems reflected the knowledge and experience of the skilled person:

“Q. So my question was particularly related to evidence that you have given. You have said the skilled person would be guided by the nominal pin lengths found on modern plugs associated with laptops and chargers, right? The proposition I understand you're putting is that there is some guidance out there that would help you say, "Well, we don't have to worry about the whole span of the US NEMA standard, we can concentrate on a bit of it"; do you understand what I'm asking you about? A. I do, yes. Q. There is no such guidance, is there? A. The second part of that statement was if you conducted an exercise to measure them and I haven't -- I haven't



and I do not know whether someone has. Q. But it's possible, if you conducted that exercise, you would find that the plugs go all the way across? A. That's perfectly true. Q. You've got absolutely no reason to believe they don't? A. No, the point was to establish their range, yes. Q. Ah, right, so you could do this exercise, you haven't done it, you're not aware that anyone has done it? A. That's true. Q. Now, Astronics' own engineers worked directly in this field, you are aware of that? A. Yes. Q. And you would expect their knowledge and experience at the time when they were designing their AC power supply systems to reflect that of the skilled person? A. Yes. Q. Indeed their knowledge and experience in this regard is greater than yours? A. Absolutely, yes. Q. This guidance that you consider was not followed by Astronics, you can take it from me, okay? Instead, Astronics assumed that the plugs that they were designing for would fall anywhere within the geometrical limits of the applicable national standards, okay? A. Yes. Q. I suggest that their approach is a more reliable guide to that of the skilled person in this field than any suggestion to the contrary in your report? A. The -- the skilled person, in the case of Astronics, was designing to the requirement specs set out by Boeing and Airbus, which I believe is slightly different in its focus on safety."

253. Mr Cuddigan also cross-examined Professor Burrow about his reliance upon the casing detector to support a casing to casing insertion test and he quite fairly accepted that the mechanism described in Claim 1 was not testing for a casing detector at all:

"Q. No. Could we look at the language of claim 1, please? It is {A1/2/7}. Could I draw your attention, please, to lines 15 to 17: "... The supply device, applying the supply voltage to the socket, when the plug detectors... Indicate the presence of the plug..." Now I would like you to assume that the plug detectors referred to there are the pin sensors, all right? A. Yes. Q. So what the claim requires is that when the pin sensors sense pins, the socket goes live, yes? A. Yes. Q. So if that's right, the casing sensor can have nothing to do with this, can it? A. I suppose this is -- going back to my -- we were still under your assumption that we're ignoring the original liability? Q. I'm not interested in the judgment. I'm not inviting you to consider the judgment, that's correct. A. Right, okay. So from the wording there, you're right, it doesn't involve the casing sensor and it talks about indicating the presence of the plug, yes. Q. But it's more than it doesn't involve the casing sensor; it doesn't actually allow for the casing sensor to determine the socket going live? The supply device, applying the supply voltage, when the plug detectors indicate the presence of the plug; do you see that? A. Yes, yeah. Q. It is saying that there is one determining factor and it is the presence of the plug detectors? A. Yes, yeah. Q. Now, if one designs in accordance with that, then the mechanism which is discussed in claim 1 is not apt to test for casing to casing, is it? A. We now, with hindsight, look at the physics and say, yes, there are limitations, because of the physics we've discussed of varying pin lengths, yes, I agree with you."

254. Finally, Professor Burrow conceded that in putting the Patent into practice the skilled person would see the issue from reading the Patent and that when they went about implementing it, they would accept that an ETP limit of zero was an unrealistic design objective:

“Q. And what I want to put to you is that the skilled person reading the patent and seeing that claim one uses pin detectors, they would realise that a zero ETP was an unrealistic objective using those detectors and therefore would interpret the patent as seeking to minimise the exposure trigger point and not to concentrate on eliminating it? A. Yes, perhaps I put my previous answer the wrong way. I think the skilled person would read the patent and then, when they went about implementing it, would think, "Ah, there is an issue here." I don't think it would pop out initially when they were reading it, unless they had had previous experience. Q. Right, so in putting the patent into practice, they would appreciate that zero ETP was an unrealistic design objective for that construction? A. And -- yes, the construction that doesn't include the casing sensor, yes. Yes, that's right.”

255. *Mr Jouper*. Mr Cuddigan asked Mr Jouper about the installation requirements for the EmPower 1235 outlet dated 4 March 2010 which was annexed to the PPD. It contained a table which showed the range of different plugs which the 12xx series accepted. When Mr Cuddigan put that table to him, he accepted that the product had to be compatible with all of them:

“Q. And if we go forward to page 30, {D3/67/30}, there is a table there of plugs accepted? A. I see that. Q. And we have US NEMA 1-15 and 5-15. Do you see that? A. Yes. Q. Australia, AS 3112? A. Yes. Q. Euro CEE 7/16 and so on? A. Yes. Q. Those are references to the technical standards which are applicable to each of these types of plugs? A. Yes. Q. And if you looked up the technical standards, they would give you precise manufacturing requirements for the plugs? A. They give you -- yes, basically, yes. Q. And they would give you maximum and minimum dimensions for pin width and depth and length? A. Yes. Q. And when the Airbus technical specification says that your ISPS must work with North American plugs, Euro type plugs and French/German plugs, what that means is so long as those plugs comply with these standards your product has to work? A. Yes, it needs to be compatible with those, yes. Q. So let's take, for example, the Swiss plug that we see here. In fact, no, let's take the French/German because it is referenced by Airbus. If you had a French/German plug and it was out of specification because the pins were too short, and you plugged it into an Astronics outlet and couldn't get any power, that wouldn't be a problem for Astronics because that's the plugs out of specification. You are with me so far? A. Yes. Q. But if it was within specification and you plugged it in and couldn't get power, that would be a problem? A. Yes. Q. Because you wouldn't have complied with the Airbus requirements? A. Correct. Q. And in effect, Astronics is saying

much the same thing in this installation document. You are saying that your products, your outlet units, are suitable for use with all these types of plugs subject to them complying with the applicable standards? A. Yes, well, I'm not sure if it says that there or not, but -- Q. But that is the meaning of this table -- A. In the general reference, yes. Q. -- and the reference to the standards within it? A. Yes. Q. Now, if we consider a US NEMA mandated plug, you can take it from me that the standard says that the pins must be at least 15.9 millimetres long, okay? A. Yes. Q. So that was a design constraint, wasn't it, for all Astronics' outlet units? A. Yes, for that, yes. Q. They were designed to turn on in response to a plug with pins of that length? A. Yes. Q. And what that means is that when the pins were longer, the outlet units would turn on before the plug had been pushed all the way in? A. Yes. Q. So if the pins were 1 millimetre longer, there would necessarily be a gap of at least 1 millimetre? A. At the point of activation, yes. Q. At the point of activation. And if the pins were 2.4 millimetres longer, there would necessarily be a gap of at least 2.4 millimetres at the point of activation? A. That's correct. Q. And any engineer involved in designing safety outlets which responded to the position of pins would understand that this was going to be the position? A. Yes, one would understand that there would be variability between pins. Q. Yes, but also that you would have to design for that variability? A. Yes, and there may be a number of ways of getting to that point, but yes, those would be considerations as part of the design."

256. *Mr Barovsky*. Mr Barovsky accepted that a skilled person would have known that there was some variation in pin dimensions and that national standards provided for maximum and minimum widths, depths and heights. At the Liability Trial Mr Barovsky had also given evidence about *Sellati*. When Mr Cuddigan put to him his first report dated 31 October 2019, he accepted that he had given evidence that *Sellati* disclosed a test for "full insertion" even though there was a small gap between the casing of the plug and faceplate of the socket:

"Q....Over the page on page 17 {D5/1/15}, you included a figure 4 of *Sellati*, and at paragraph 99 you explain that: "Figure 4 shows the arrangement when the switches are closed." A. That's correct. Q. The arrangement of *Sellati* in this respect is no different to the arrangement of the PPD, it is using the pins of a plug to estimate when the plug has been fully inserted? A. To detect that the plug is inserted, that's correct, yes. Q. Right. Therefore, just like the PPD, it is susceptible to the variability in plug pin length? A. That's correct. Q. So any competent engineer would appreciate that this switch mechanism was not capable of reliably testing for a casing-to-casing situation? A. That's correct. Q. And indeed, you can see, can't you, from figure 4 that there is a clear gap between the plug casing and the faceplate of the outlet? A. As illustrated, there is a gap, yes. Q. That reflects the fact that typically there would be a small gap between casing and faceplate when power was triggered to the socket of *Sellati*? A.

That's a possibility; I didn't draw the diagram. Q. But it was nonetheless your evidence to Mr Justice Morgan that Sellati disclosed a test for full insertion of a plug? A. I believe that's correct, yes. Q. And it would do so even when there was this small gap between socket and face plate? A. It was a plug detect scheme, but yes, that's correct."

257. *Other Witnesses.* Mr Markert accepted that safety and reliability were priorities of the airlines. He also accepted that in its promotional material Astronics highlighted the fact that the EmPower systems accepted nearly all AC plug types in use around the world. Mr Seager gave very similar evidence to Mr Markert in cross-examination:

"Q. Yes, starting at paragraph 92, there's a heading "Factors Driving the Sales of IFE During the Relevant Period". Page {D1/9/20}, paragraph 92. Do you see that? A. Yes. Q. Before getting down to the sort of concern that's you deal with here about cost or weight or passenger experience, Virgin would have required any equipment being installed on their planes to be certified as safe by the authorities. A. That is correct. Safety was number one priority. Q. Right. It was a non-negotiable, wasn't it. A. Absolutely. Q. And Virgin would not have countenanced high-power electrical equipment in the passenger cabin which was not certified or did not comply with published FAA guidance. A. No, they would not. Q. Now, another matter you mention as being important is reliability. That was always an important consideration for the airlines when it came to equipment for use by passengers, wasn't it? A. Yes it was. Q. Passengers expected the equipment provided for their use to work? A. Absolutely, yes. Q. And they could get very annoyed if it didn't work. A. Absolutely correct, yes."

(iii) Does Claim 1 teach an ETP limit at all?

258. I have held that the Judge did not decide the question whether Claim 1 required a casing to casing insertion test. I was initially attracted to a construction of Claim 1 which only prescribed the test set out by Morgan J in the Liability Judgment at [75] and did not impose any particular ETP limit provided that the plug pins made physical contact with the plug detectors at bottom of the holes. Neither party adduced evidence that the plug holes of plug sockets varied in length or that it was necessary to prescribe a particular plug length. But neither party advanced such a construction and, on reflection, I consider that they were right. Both Professor Wheeler and Professor Burrow were agreed that the ultimate objective of the insertion test was to achieve safety by minimising the distance between the casing of the socket and the casing of the plug.

259. Moreover, Morgan J clearly had this objective in mind when he construed "plugged in"

or “inserted” as meaning “fully plugged in or inserted” at [71] even if he was not required to decide whether Claim 1 taught a casing to casing insertion test or wider ETP limit (or, indeed, what that limit was) to enable him to decide whether the Patent was novel or obvious over *Neuenschwander*. I accept, therefore, that the full insertion test requires both (1) the insertion of a plug in a socket to such an extent that the tips of the socket make contact with the plug detectors at (45) and (46) before the power is activated and (2) that the effect of compliance with (1) is to minimise or reduce the distance between the casing of the plug and the casing of the socket to an acceptable or permissible ETP limit. The critical question which I have to decide, therefore, is what acceptable or permissible limit Claim 1 teaches.

(iv) What would the skilled person have understood?

260. The Defendants submitted that it was not necessary for the invention of the Patent to work with all NEMA plugs or with all plugs within all given standards. They criticised Lufthansa’s construction based on Professor Wheeler’s evidence for two particular reasons in their written Closing Submissions (original emphasis):

“197. Second, it assumes that the invention must work with all plugs within the NEMA standards (i.e. with the largest variation in pin length of 2.4 mm). The Patent makes no such demand.

198. Third, it assumes that the invention must work with all plugs within all given standards. In this respect, Professor Wheeler’s evidence was that it would be “completely unacceptable to airlines and their passengers for only a proportion of correctly manufactured plugs to be able to extract power” (Wheeler 4, §8 (C2/8/4)). However, the Patent is for a technical solution. Whether the invention satisfies the commercial demands of an airline or the those of its customers is neither here nor there. Indeed, in response to Mr Cuddigan KC’s suggestion during the cross-examination of Professor Burrow on the correct interpretation of the Patent that “*what you’re being asked to do [as the skilled person] is to produce a sensible product, a product that can sell in the market, that the airlines are going to be content with*”, the Judge responded (emphasis added) “***That’s not necessarily what the patent requires.***” (D7/126<sub>22</sub> -127<sub>15</sub>).”

261. I reject those submissions and I accept Professor Wheeler’s evidence that in deciding whether the Patent taught a casing to casing insertion test, a skilled person would have understood that it would be unacceptable to airlines and their passengers if the socket or outlet worked with some plugs but not with others. I have reached this conclusion for the following reasons:

- (1) I found Professor Wheeler to be a good witness. Mr Acland explored Wheeler 3, ¶¶69 and ¶70 (above) with him in some detail in cross-examination and he stood by that evidence. Moreover, Mr Acland was unable to put a good reason to Professor Wheeler why the skilled person would not have expected the invention of the Patent to be of general commercial application and to work with all NEMA plugs or all plugs within all given standards.
- (2) I reject Professor Burrow's evidence that the skilled person would regard the NEMA standards as indicative only but would be guided by the nominal pin lengths found on modern plugs associated with laptops, chargers and other electronic devices typically used on aeroplanes. When he was challenged in cross-examination, he could point to no guidance which would have been available to the skilled person and had carried out no experiments himself. He also accepted that when reading Claim 1 the skilled person would appreciate that zero ETP was an unrealistic design objective. In my judgment, he effectively conceded that Professor Wheeler was correct.
- (3) Professor Wheeler's evidence was consistent with the evidence given by the Defendants' other witnesses. It was consistent with Mr Jouper's evidence that Astronics' own design objective was to ensure that the 12xx series was compatible both with NEMA standards and also with other international standards. It was also consistent with the evidence of both Mr Markert and Mr Seager that both safety and reliability were priorities of the airlines and that passengers would expect equipment provided for their use to work. Finally, it was consistent with Mr Barovsky's evidence that *Sellati* disclosed a full insertion test but that typically there would be a small gap between casing and faceplate when power was triggered to the socket.
- (4) But in any event, the Defendants offered no reason why the invention of the Patent should not be expected to work with all plugs if the objective of safety was met. They did not submit that the socket did not achieve its safety objectives or did not comply with FAA or JAA standards if there was an ETP of up to 4 mm. Indeed, the Defendants themselves appear to accept this in their Closing Submissions (although they attempted to deflect this point by relying on the fact that the risk of finger access is not mentioned in the Patent):

“196. First, it assumes that preventing finger access to a live power pin is the key (or even one of the) safety objectives that the invention seeks to address. As indicated above, the risk of finger access to a live pin is not mentioned anywhere in the Patent. If it was relevant to the invention, Professor Wheeler would have said so in his evidence at the Liability Trial. Furthermore, if preventing finger access really was understood to be the key safety objective in the Patent, the maximum ETP would be significantly larger than 4 mm given that the accepted width of a child’s finger is 8.6 mm (Wheeler 4 §20 (C2/8/7)).”

- (5) I accept that the risk of an electric shock to a child who handles the plug pins is not a safety objective of the Patent. But that is for the reason which the Defendants themselves gave, namely, that the maximum ETP of a standard plug would have to be significantly larger than 4 mm in order to give rise to any real risk of harm. This only serves to prove that the invention of the Patent requires no sacrifice in safety to achieve the airlines’ objective of reliability.
- (6) Finally, I attribute no weight to the comment which I made in the course of Mr Cuddigan’s cross-examination of Professor Burrow. I was doing no more than challenging the premise of the question which Mr Cuddigan put to the witness. I recognised that there was serious dispute between the parties about the commercial applicability of the product and he was asking the witness to assume the answer in his favour. In the event, I have decided that issue in Lufthansa’s favour after a detailed consideration of the evidence (including the evidence of Professor Burrow).

262. I also accept Professor Wheeler’s evidence that a skilled person would have understood that any level of pin exposure below 4mm to be fully inserted for the purposes of the invention taught by Claim 1. As I have stated above, I found him to be a good witness and I am satisfied that the criticism of “tolerance stacking” which Mr Acland put to him was unjustified. I am also satisfied that he was not attempting to exaggerate the ETP limit by manipulating the figures. Moreover, his evidence was consistent with the experiments which showed that the range of ETPs for the 12xx series was between 0.25 mm and 3.4 mm (excluding any margin for manufacturing tolerances). Finally, it was consistent with the evidence of Professor Mitcheson (which I consider again below).

(v) Does Claim 1 teach a casing to casing insertion test?

263. The judge found that the natural meaning of the terms “plugged in” or “inserted” in the description of the Patent meant “fully plugged in or inserted”: see the Liability Judgment, [71]. He decided that this test required the pins to be pushed into the holes so that they made physical contact with the pin detectors but he did not decide what level of exposure (if any) between the casing of the plug and the casing or faceplate of the socket, or outlet, satisfied the test. I must now decide that issue. In my judgment, the test is not a casing to casing test but is satisfied by any level of pin exposure below 4 mm. I have reached this conclusion for the following reasons:

- (1) The real issue between the parties was whether Claim 1 should be construed by reference not only to the technical purpose of the Patent (i.e. safety) but also by reference to its commercial purpose (i.e. reliability). Lufthansa submitted that it made no technical sense for Claim 1 to be limited to an ETP of zero. By contrast, the Defendants submitted that the demands of the airlines and their customers were “neither here nor there”.
- (2) I have accepted Professor Wheeler’s evidence about the understanding of the skilled person. In particular, I have accepted his evidence that the skilled person would have regard to what was acceptable to airlines and their passengers. I am satisfied that I can and should have regard to that evidence. The Defendants did not submit that the principles of purposive construction were limited to the technical purpose of the Patent only and, in my judgment, Lord Neuberger’s judgment in *Human Genome Sciences v Eli Lilly* (above) provides clear authority for the proposition that the Court is entitled to have regard to the profitable use and the commercial benefit of the invention.
- (3) The authors of Claim 1 clearly had both the specifications of the airframe manufacturers and the relevant standards of both US and European plug manufacturers in mind when they were drafting the claim. The very first sentence of the Patent description refers to a supply voltage for electric devices “in an aeroplane cabin”: see [0001]. It also refers in terms to the relevant standards: see [0032]. Moreover, there was a very close relationship between the requirements of the FAA and other regulatory and certification authorities and the requirements of the airframe manufacturers. Mr Barovsky gave evidence that for equipment to be installed on the airframe manufacturer’s aircraft, i.e. to be “linefit offerable” or



“retrofit operable”, the equipment manufacturer used similar documentary evidence and test data: see Barovsky 5, ¶61 (above).

- (4) There was, of course, a difference between meeting the requirements of the airframe manufacturers and meeting the requirements of the airlines when Mr Muirhead and his colleagues wrote Claim 1. But Mr Markert also gave evidence that the linefit offerability of Astronics’ products drove its sales. In his second witness statement dated 17 May 2024 (“**Markert 2**”) he stated as follows:

**“Linefit offerability of AES products:** AES worked directly with and maintained an excellent relationship with the airframe OEMs (e.g. Airbus, Boeing) to ensure that its products (including new EmPower System components as they were launched) met the OEMs’ requirements and therefore were linefit offerable. This was hugely important, as going through the OEMs’ linefit offerability process was a very complex, expensive, and time-consuming process that required meeting rigorous standards. In short, there is a large barrier to entry in this market space. The AES’s consistent success in achieving linefit offerability for its products eliminated the need for its airline customers to allocate time and resources for this process when considering the installation of AES’s products on their aircraft. This conferred a significant advantage to AES over suppliers whose products were not yet offerable or lacked a proven track record of achieving offerability. This was a big advantage of AES’s products over suppliers whose products were not yet offerable or that did not have a track record of achieving offerability.”

- (5) Mr Brady also gave evidence that from an engineering perspective the reliability of PED power components was a significant factor for IFE manufacturers. In his first witness statement dated 16 July 2024 (“**Brady 1**”) he stated as follows:

**“Reliability:** From an engineering perspective, the reliability of PED Power components was a significant factor which the team at Thales considered. Once PED Power had become integrated into the IFE system, its failure had a greater impact on the performance of IFE. PED Power equipment providers would provide data on the reliability of their components, such as their Mean Time Between Failures (MTBF) values. However, reliability was not such an important issue for PED Power components as it was for IFE systems – the visibility from an airline/passenger perspective of a failed power outlet was not as significant (on any given flight, most went unused), whereas the visibility of a failed IFE display was very obvious. Integration made reliability substantially more important. Phase 1 integration made IFE dependent on a reliable MCU. Phase 2 integration made IFE dependent on the reliability of the Seat Power Box in addition to the MCU.”

- (6) Given the emphasis which their own lay and expert witnesses placed on reliability, I reject the Defendants' submission that the demands of the airlines and their customers were "neither here nor there" and I accept Lufthansa's argument that it made no technical sense for Claim 1 to be limited to an ETP of zero and that the invention of the Patent must have been intended to be both safe and reliable. The Defendants did not suggest that these objectives were in conflict or that reliability involved any trade off in safety. As I have set out above, they accepted that an ETP of 4 mm or less did not involve any risk of finger access.
- (7) Finally, I have accepted Professor Wheeler's evidence that a skilled person would have understood that any level of pin exposure below 4mm to be fully inserted for the purposes of the invention taught by Claim 1. Professor Wheeler accepted that this involved a "worst case" analysis whereas Professor Burrow adopted a probabilistic tolerance analysis in his evidence. When Mr Acland put this point to him, he stressed the importance of reliability:

"Q. It's not really out of the ordinary for something to go wrong and what I'm suggesting to you, Professor, is your approach, by way of statistical stacking, identifies a potential concern, but in reality a concern which the designer of a socket like this wouldn't necessarily have to take into account. They may approach matters on the basis of probabilistic likelihood of these eventualities happening at the same time. A. I suppose they could choose to do that, but the approach I've put here is the approach -- you know, is an approach to look at how to get something that works as reliably as possible. Q. Right. A. But if -- I do accept that statistically you could go in a different direction."

- (8) Again, given the emphasis which the Defendants' own witnesses placed on reliability, I reject the Defendants' case that the authors of Claim 1 would have had a probabilistic tolerance analysis in mind. In my judgment, given that no trade off with safety was necessary, they would simply have wanted the invention of the Patent to be as reliable as possible.

(vi) What is the relevance of Claim 5?

264. Finally, Lufthansa submitted that Claim 5 was irrelevant and the casing detector which it taught had no relevance to the construction of Claim. The Defendants argued, however, that Lufthansa's construction ignored the "casing detector functionality" which supported a casing to casing insertion test. I accept Lufthansa's submission on this issue.

Professor Burrow effectively accepted in cross-examination that the presence of a casing detector was irrelevant to the construction of Claim 1 because power was exclusively activated by the detection of the plug pins at the bottom of the plug holes. In my judgment, he was right to do so and for this reason.

265. The Defendants' argument on this issue is also inconsistent with both the argument which they advanced before Morgan J and his own reasoning in the Liability Judgment. The Defendants relied on Claim 5 in support of their case that Claim 1 only taught a partial insertion test that because an optical casing detector would detect the plug at some distance from the socket. Before me, however, they argued the opposite, namely, that a casing detector using a mechanical switch would only detect the plug when the casing of the plug was almost touching the casing or faceplate of the socket. In any event, the judge construed Claims 1 and 5 as referring to "two different methods of detection of a plug in a socket" and decided that the additional detection process in Claim 5 did not detract from the clear requirements of Claim 1: see [70].

(4) *Plug detectors at the side*

266. The Twist Lock PPD stated that in the 1171 Twist Lock outlet unit design, the sense contacts and power contacts were located on the sides of the plug holes: see paragraph 3.5. Figure 4 confirms this to be accurate and that as the plug is pushed in, it meets the Sense Contact first and then the Power Contact. However, section 4 of the Twist Lock PPD stated that the depth from the face of the socket to the sense contacts was 14.7 mm and recorded that the ETP of the socket with the NEMA 1-15 and 5-15, the Schuko, Europlug and Australian had been measured with a calliper and the maximum ETP varied between 2.66 mm and 3.6 mm.

267. The Defendants argued that on Morgan J's construction of Claim 1, the 1171 Twist Lock, the 1171M (and also the IFPL 1225) would not have infringed the Patent because the plug detectors were located at the side of the plug holes. In particular, they argued that the judge construed Claim 1 as requiring the plug detectors to be at the bottom of the plug holes. Lufthansa argued that the judge did not construe Claim 1 in this way and that the Defendants had seized on his language on a different point. But they also argued that even if he did construe the Patent in this way and I myself adopted this construction of Claim 1, both the 1171 Twist Lock and the 1171M would have infringed as equivalents.

268. I have held that Morgan J did not construe Claim 1 as requiring the plug detectors to be at the bottom of the plug holes. I now go on to consider whether on its true construction Claim 1 was limited in this way. I also go on to consider whether the 1171 Twist Lock and 1171M would have infringed as equivalents if Claim 1 was limited in this way and required the plug detectors to be located at the bottom of the holes and not to the sides.

(i) The Law

269. I have already set out the general principles of claim construction which have been adopted by the English Courts more generally. In *Actavis UK Ltd v Eli Lilly & Co* [2017] UKSC 48, [2017] RPC 21 Lord Neuberger explained the legislative context of the doctrine of equivalents in the following passage at [28] to [32]:

“28. The domestic provision governing direct patent infringement is section 60(1) of the Patents Act 1977. However, section 130(7) declares that certain provisions of that Act, including section 60, are “so framed as to have, as nearly as practicable, the same effects in the United Kingdom as the corresponding provisions of the European Patent Convention ... have in the territories to which [that Convention applies]”. Accordingly, it is common ground that it is appropriate to consider the present case by reference to the EPC 2000.

29. Article 69(1) EPC 2000 provides that “[t]he extent of the protection conferred by a European patent ... shall be determined by the claims”, although it is followed by another sentence, namely “[n]evertheless, the description and drawings shall be used to interpret the claims”.

31. In these circumstances, The Protocol on the Interpretation of article 69 as amended in 2000 (“the Protocol”) is crucial to Lilly’s contention that the scope of protection afforded by the Patent extends to the Actavis products. The Protocol provides:

“Article 1

*General principles*

Article 69 should not be interpreted as meaning that the extent of the protection conferred by a European patent is to be understood as that defined by the strict, literal meaning of the wording used in the claims, the description and drawings being employed only for the purpose of resolving an ambiguity found in the claims. Nor should it be taken to mean that the claims serve only as a guideline and that the actual protection conferred may extend to what, from a consideration of the description and drawings by a person skilled in the art, the patent proprietor has contemplated. On the contrary, it is to be interpreted as defining a position between these extremes which combines a fair protection for the patent proprietor with a reasonable degree of legal certainty for third parties.

## Article 2

*Equivalents*

For the purpose of determining the extent of protection conferred by a European patent, due account shall be taken of any element which is equivalent to an element specified in the claims.”

The original Protocol was agreed in 1973; the amendments made in 2000 effected very slight modifications to what is now article 1, and introduced article 2 for the first time.

32. The drafting of the Protocol bears all the hallmarks of the product of a compromise agreement. This is unsurprising. There is an inevitable conflict between the desirability of giving an inventor an appropriate degree of protection in a particular case and the need for clarity of principle as to the extent of such protection generally; and, of course, there is an unavoidable tension between the appropriateness of giving an inventor a monopoly and the public interest in maximising competition. In addition, the EPC 2000 and the Protocol apply in many different states which have different traditions and approaches in relation to the law of patents. In that connection, as the Supreme Court observed in *Schütz (UK) Ltd v Werit (UK) Ltd (Nos 1 to 3)* [2013] Bus LR 565; [2013] RPC 16, para 40, “complete consistency of approach” between different national courts of the EPC states “is not a feasible or realistic possibility at the moment”, but nonetheless “it is sensible for national courts at least to learn from each other and to seek to move towards, rather than away from, each other’s approaches”.”

270. Lord Neuberger then considered in detail the relevant authorities including *Improver Corp v Remington Consumer Products Ltd* [1990] FSR 181 in which Hoffmann J (as he then was) had formulated three questions. Lord Neuberger considered the first to involve a satisfactory approach at [60]:

“The first *Improver* question, which asks whether the variant has a material effect on the way in which the invention works, seems generally satisfactory. It is a question which was framed in the context of a mechanical patent, and is not wholly aptly expressed for every type of case. However, in practice, the question as framed by Hoffmann J, with its emphasis on how “the invention” works, should correctly involve the court focussing on the “the problem underlying the invention”, “the inventive core”, or “the inventive concept” as it has been variously termed in other jurisdictions. In effect, the question is whether the variant achieves the same result in substantially the same way as the invention. If the answer to that question is no, then it would plainly be inappropriate to conclude that it could infringe. If, by contrast, the answer is yes, then it provides a sound initial basis for concluding that the variant may infringe, but the answer should not be the end of the matter.”

271. Lord Neuberger was critical of the second question but considered the third to be an

acceptable test provided that it was applied correctly. He also considered it appropriate for the Supreme Court to reformulate the questions and he did so at [66]:

“In these circumstances, given the weight that has been given by courts in this jurisdiction (and indeed in some other jurisdictions) to the three “*Improver* questions”, I think it must be right for this court to express in our own words our reformulated version of those questions. In doing so, it is right to emphasise, as Lord Hoffmann did in *Kirin-Amgen* [2005] RPC 9, para 52, that these questions are guidelines, not strict rules (as indeed the Oberlandesgericht indicated in Case No 6 U 3039/16, when saying that it was “generally” true that “three requirements must be met”). While the language of some or all of the questions may sometimes have to be adapted to apply more aptly to the specific facts of a particular case, the three reformulated questions are as follows:

i) Notwithstanding that it is not within the literal meaning of the relevant claim(s) of the patent, does the variant achieve substantially the same result in substantially the same way as the invention, ie the inventive concept revealed by the patent?

ii) Would it be obvious to the person skilled in the art, reading the patent at the priority date, but knowing that the variant achieves substantially the same result as the invention, that it does so in substantially the same way as the invention?

iii) Would such a reader of the patent have concluded that the patentee nonetheless intended that strict compliance with the literal meaning of the relevant claim(s) of the patent was an essential requirement of the invention?

In order to establish infringement in a case where there is no literal infringement, a patentee would have to establish that the answer to the first two questions was “yes” and that the answer to the third question was “no”.”

272. The parties referred to questions i), ii) and iii) (above) as “*Actavis 1*”, “*Actavis 2*” and “*Actavis 3*” and I adopt that terminology. In his oral submissions Mr Hall also took me to *Icescape Ltd v Ice-World International BV* [2018] EWCA Civ 2219, [2019] FSR 5 in which both parties made and leased mobile ice rinks and the invention of the patent provided a cooling member for an ice rink which could be installed and dismantled rapidly and which also permitted the rink to be made with different surface areas. The embodiment of the patent and the product description of the infringer’s product looked completely different on the page because each ice rink was folded up in a different way. But Mr Hall provided me with colour-coded versions of each diagram and the claim in the patent in suit which went to show that the infringer’s system involved all the same elements as the claim, save for one particular feature.

273. Lord Kitchin adopted the principles of purposive construction but came to the conclusion that, on the true construction of the claim, the disputed product did not infringe the patent because integers D and E of the claim required the connection of two manifolds in series. He then went on to consider the three Actavis questions and answered them in the following way at [72] to [74]:

“72. The first Actavis question requires me to consider whether, notwithstanding that the Icescape system is not within the literal meaning of claim 1, it achieves substantially the same result in substantially the same way as the invention. Here I must have regard to the problem underlying the invention and the patent’s inventive core. I do not think there can be any doubt about the answer to this question. The inventive core of the patent is the provision of the joint member (70). This forms a connection between the rigid pipe sections which is fluid tight and flexible and allows the connected pipe sections to fold relative to one another for the purposes of transportation. It is this feature which makes the patented system different from the conventional systems which formed part of the common general knowledge. By contrast, integers D and E are simply common general knowledge ways of implementing that inventive concept. Focusing on that inventive core, as I must, I am satisfied the variant does achieve the same result in substantially the same way as the invention. It satisfies the aims of the patent, namely to provide a cooling member which can be installed rapidly and is reliable in operation, with which it is possible to proceed rapidly to the ice-forming stage, and with which a mobile ice rink can be made with a large number of different surface areas. It is true that the Icescape system has a parallel rather than a series connection between the manifolds and that this may itself confer certain advantages but also carry with it certain disadvantages, as I have explained at [53] above. But this has nothing to do with the inventive core of the patent. I would therefore answer the first Actavis question in the affirmative.

73. The second Actavis question is whether it would be obvious to the person skilled in the art, reading the patent and knowing that the variant achieves substantially the same result as the invention, that it does so in substantially the same way as the invention. I would answer this question in the affirmative too. In my judgment it would be entirely obvious to the skilled person that, so far as the inventive core of the patent is concerned, the Icescape system achieves substantially the same result as the invention and does so in substantially the same way. Indeed it does so in precisely the same way.

74. That leaves the third Actavis question: would the skilled reader of the patent have concluded that Ice-World nonetheless intended that strict compliance with the literal meaning of the claim and, in particular, features D and E, was an essential requirement of the invention? Here I must have in mind that the fact that the language of the claim does not cover the variant is certainly not enough to justify holding that Icescape does not satisfy this question. I must also consider whether integers D and E are an

essential part of the invention and here must have regard once again to the inventive concept and inventive core of the patent. In my judgment the answer to this question is plainly “no”. There is no reason why the skilled reader would have thought that strict compliance with integers D and E was an essential requirement of the invention. The inventive core of the patent has nothing to do with the coupling of the elements together or whether the fluid flows through them in series or in parallel.”

274. Floyd LJ agreed with Lord Kitchin that the claims were limited to a connection in series between the individual elements of the product described in the patent but that a connection in parallel between them was an alternative way of implementing the multiple elements. He stated this at [98]:

“As Lord Kitchin has explained, on a purposive interpretation of the patent, the claims must be taken to be limited to a “series” connection between the adjacent “elements”. Nevertheless, a “parallel” connection is an alternative way of implementing multiple elements, and the difference from the claimed means of connection has nothing whatever to do with the core inventive contribution of the patent. There is nothing to suggest that the patentee regarded series connection as essential in any relevant sense, given that the language of the claim alone is not to be taken to be sufficient to give rise to this inference. It follows that, had the patent been valid, a finding of infringement would have followed.”

275. The Defendants relied on *Edwards Lifesciences Corporation v Meril GmbH* [2020] EWHC 2562 (Pat) in which Birss J (as he then was) cited both *Actavis* and *Icescape* before summarising the test for *Actavis I* at [223]: “In other words one should examine what is the problem underlying the invention and how does the patent solve that problem.” The Defendants also relied on the “disclosed but not claimed” principle which is a well-established principle under German law and which Arnold LJ (sitting as the trial judge) formulated in *Akebia Therapeutics Inc v Fibrogen Inc* [2020] EWHC 866 (Pat) at [454]:

“If the description discloses a plurality of possibilities for achieving a specific technical effect, but only one of those possibilities is catered for in the patent claim, the utilisation of any of the other possibilities properly does not constitute infringement of the patent with equivalent means.”

276. This principle has been applied in three subsequent decisions of the Patents Court: see *Facebook Ireland Ltd v Voxer IP LLC* [2021] EWHC 1377 (Pat) at [201], *Shenzhen Carku Technology Co Ltd v The Noco Company* [2022] EWHC 2034 (Pat) at [106] to [112] and *Philip Morris Products SA v Nicoventures Trading Ltd* [2023] EWHC 2616



(Pat). In the last decision, to which Mr Acland took me in his oral closing submissions, HHJ Hacon (sitting as a judge of the High Court) described the background as follows at [2]:

“2. This litigation is between two large tobacco businesses, the Philip Morris group and the British American Tobacco group. It concerns what are known in the industry as “heat not burn” or “HNB” products. As the name suggests, the tobacco they contain is heated to vaporise nicotine and other compounds without burning the tobacco, the point being that the user does not inhale smoke, only the aerosol containing the nicotine and other compounds. The damaging effect of smoke entering the lungs is avoided.”

277. The difference between the HNB system which was the subject matter of the patent in suit and the HNB system which was alleged to infringe was that the heater of the tobacco was in the consumable substance itself and that it was not fixed by reference to the same scientific process. The judge defined the inventive concept of the patent in suit at [76] and [77]:

“76. PMI’s version of the inventive concept is: “The use of the Curie point of the heating material in the apparatus inherently to self-regulate the maximum temperature to which the heater is heatable, in order to prevent over heating or combustion of the heating material, so that [the] system is able to be free of any other means to limit the temperature to which the heater is heatable.”

77. PMI’s use of the word “apparatus” implies that the inventive concept is (like the claims) confined to a system in which the “article” – the consumable containing the smokable material – does not contain the heater. BAT expressly accepted that the IQOS ILUMA System is a variant on the inventive concept in part because its heater is in the consumable. Therefore, even though BAT’s formulation of the inventive concept does not confine the heater to the apparatus, it was in fact common ground that the inventive concept is confined in the manner implied by PMI.”

278. The description or specification of the patent in suit disclosed and even illustrated in two diagrams an HNB system in which the heater was in the consumable as opposed to forming part of the apparatus of the product: see [91] and [92]. HHJ Hacon answered both *Actavis 1* and *Actavis 2* in the affirmative but held that the claim for infringement failed in relation to *Actavis 3* on the disclosed but not claimed principle. He stated as follows at [92] to [94]:

“92. This form of an HNB product is not expressly identified as a comparative example but I think that the skilled reader of EP 830 would

take it to be such. It is not claimed.

93. BAT's answer was to emphasise that the patent claims the system as whole, not the article and apparatus separately, and that a skilled reader would understand that it is immaterial whether the heater is in the consumable or the apparatus. BAT argued that the "disclosed and not claimed" principle, if applied in a case such as the present one, would mean that a patentee must claim every possible configuration even when the reader would understand that selecting this or that configuration would be immaterial to the inventive concept.

94. I am not persuaded. Not all the claims relate to the system as a whole: claims 8 to 12 are to the apparatus only, though this is a minor point. Without exception, the method, apparatus and system claims require the heater to be in the apparatus, not in the consumable. It could be said that BAT's complaint that a patentee would have to claim every configuration disclosed if it wished to protect every such combination is correct. But that is the patentee's option. Where instead the patentee says in the description that the technical effect identified can be achieved either by means A or B but goes on to claim only means B, this is a clear indication from the patentee that means A does not fall within the scope of the claims, whether as a matter of normal construction or equivalence. Any other approach to construction would sanction patents likely seriously to mislead the public."

(ii) The evidence

279. *Professor Wheeler*. In Wheeler 5, section 5 Professor Wheeler gave evidence about the position of the plug detectors. His evidence was that he had been asked to assume that Claim 1 required the plug detectors to be at the bottom of the holes but he challenged that assumption:

"18. This assumption does not reflect how I consider the skilled person would read the Patent. Paragraph [0008] of the Patent says that the socket has a socket detector, the purpose of which is to detect the presence of a plug inserted in the socket. In this regard, the intended result is increased safety of the overall arrangement – see paragraph [0006]. I have discussed these safety considerations in my third report. The Patent does not at this point say how that detection is to be achieved, but it does say in [0007] that the task is solved inventively by the features in claim 1. Claim 1 says it has a socket detector for detecting the presence of a plug inserted in the socket (line 8). At line 20 it explains that this works by detecting the presence of the contact pins. The skilled person thus learns that the aim of detecting a plug inserted in the socket is achieved by using what I will call a 'pin detector'. Claim 1 does not tell the skilled person what kind of pin detectors must be used, or where they must be located.

19. Going back to the specification, paragraph [0011] says that reliable detection of a plug inserted in the socket is achieved by designing the socket detector so that it detects the presence of a contact pin of the plug

in the socket. This is one of the features of claim 1, as I have explained. Again, however, the Patent does not specify how the pin detector is to be designed.

20. At [0014] the Patent teaches that in a preferred embodiment the pin detector can use mechanical switches. As is apparent from claims 1 and 3, this is not a requirement – it is just a preferred embodiment.

21. Paragraph [0019] then introduces in more detail one particular embodiment of the invention. Within this embodiment, paragraph [0024] refers to Figure 3, and states (at line 12) that there are microswitches (numbered 45 and 46) at the bottom of each plug hole. This is shown in Figure 3, which includes a diagrammatic representation of microswitches 45 and 46 located at the ends of each of the plug holes. Paragraph [0026] explains that the contact pins activate these microswitches. In this embodiment, the pin detectors are therefore located at the bottom of the holes.

22. Paragraph [0032] refers to Figure 4, and explains at line 14 (towards the top of column 7) that in this embodiment the microswitches are arranged to the sides of the plug holes. The Patent doesn't tell the skilled person how to do this, but envisages that it can be done.”

280. Professor Wheeler also gave evidence that one way in which a product could be designed to give effect to the invention of the patent was to take advantage of the fact that plug pins have rounded or chamfered ends and to place mechanical switches at either side of the plug hole so that when the pin reaches the end of the hole, the chamfered end pushes the switch to one side activating the power. He produced a diagram of such a design using an extract from British Standard BS1363, which Mr Barovsky had exhibited for the purposes of the Liability Trial. After considering *Neuenschwander* he gave the following evidence:

“30. I have also been asked to consider the position if the requirement in claim 1 as regards the degree of insertion is, as I addressed in my third and fourth reports, that it allows for a few mm of exposed pin at the power trigger point (in particular, for a plug with ‘long pins’ within the applicable standard). If that is right, then the skilled person would expect there to be a corresponding degree of ‘tolerance’ in the assessment of whether the pin detectors were at the bottom of the socket holes. Their starting assumption would be that the meaning of ‘at the bottom’ includes pin detectors located within a similar few mm of the bottom of the socket holes. For example, the switch may be sprung in such a way that it could (just) be activated by short pins, but could also accommodate longer pins within the hole.

31. In other words, the skilled person would, in my view, consider it a matter of no inventive significance whether the switches were placed in either of the two positions shown below at Figure 7. In both positions, the

plug shown has ‘long pins’ within the standard, and is shown with zero mm of pin exposure, with the switch having already activated.”

281. *Professor Burrow*. In his reports Professor Burrow stated that he had not been asked to comment on the two sections of Wheeler 5 dealing with the position of the plug detectors (section 5) and infringement by equivalents (section 6) his instructions were that they involved legal issues. I have dealt with section 6 above: see [165] and [170]. But Mr Cuddigan also took Professor Burrow through section 5 in cross-examination and, subject to very minor qualifications, he accepted Professor Wheeler’s evidence in that section in its entirety.
282. The principal difference between Professor Wheeler and Professor Burrow related to the inventive concept of Claim 1. I have set out the relevant evidence at [165] to [169] (above). But in summary, Professor Wheeler gave evidence that the key objective of having switches at the bottom of the plug holes was to ensure that the length of pin exposed at the ETP was kept to a safe level and that the inventive concept of Claim 1 achieved this result “through the use of pin detectors which are triggered once the pin is inserted”. Professor Burrow disagreed. His evidence in cross-examination was that the mechanism of the 1171 Twist Lock was so different that it did not achieve that objective in the same way.

(iii) Does Claim 1 require detectors at the bottom of the plug holes?

283. In my judgment, Claim 1 does not require the plug detectors to be located at the bottom of the plug holes and I find that, on its true construction, it permits them to be located to the side of the plug holes provided that the two limbs of the insertion test are satisfied, namely, that the plug pins make physical contact with the plug detectors and at a point at which the level of pin exposure is no more than 4 mm. I have reached this conclusion for the following reasons:
- (1) As Lufthansa submitted, Claim 1 itself makes no reference to the plug detectors being at the bottom of the holes. In particular, the first characterising features of Claim 1 is that the plug detectors are “formed such as to detect the presence of two contact pins in the socket” and the second characterising feature is that the ISPS only supplies power if the presence of the two contact pins are detected simultaneously. Neither feature specifies the precise location of the plug detectors.

- (2) I accept that the first characterising feature of Claim 1 includes reference numerals (45) and (46) which are the plug detectors shown in Figure 3 at the bottom of the plug holes. But this is no more than a single embodiment of the claim and I remind myself, as did the judge, that claims may be narrower or wider than their embodiments: see the Liability Judgment, [65] and the Appeal Judgment, [41].
- (3) Moreover, the patent description clearly contemplates the use of microswitches to the sides of the plug holes: see [0032]. The judge and the Court of Appeal did not attribute any weight to this because there was no expert evidence to show how such an alternative arrangement was intended to work: see the Appeal Judgment, [49] (above). However, Lufthansa adduced the relevant expert evidence from Professor Wheeler before me to show how exactly it was intended to work and that evidence was not challenged in any material respect by Professor Burrow.
- (4) Finally, although Mr Acland cross-examined Professor Wheeler in an attempt to demonstrate that such an arrangement would be more unpredictable and less controllable than locating the detectors at the bottom of the hole, Professor Wheeler did not accept that there was a material difference between the two locations and I accept his evidence both that the objective of the patent can be achieved by locating the plug detectors by the side of the plug holes and also that it is a matter of no inventive significance whether they are located at the bottom or the side.

(iv) Do the 1171 Twist Lock or the 1171M infringe as equivalents?

284. If I am wrong and Claim 1 did require the plug detectors to be located at the bottom of the plug holes as opposed to at the sides, I now consider the question whether the 1171 Twist Lock and the 1171M would infringe the Patents as equivalents. For this purpose, it was common ground that the sensors in the plug holes of the 1171M would be in the same place as the sensors in the plug holes of the 1171 Twist Lock and would use the same mechanism to activate the power supply as shown in the Twist Lock PPD schematic diagrams.
285. *Actavis I*. On those assumptions I find that the 1171 Twist Lock and the 1171M achieve substantially the same result in substantially the same way as the invention of the Patent and that the answer to *Actavis I* is yes for the following reasons:

- (1) Professor Wheeler gave evidence that the problem underlying the invention was to provide a safe arrangement for detecting a plug inserted in the socket and that Claim 1 solved this problem by using pin detectors which are triggered only when the pin is inserted. He described this as the inventive concept of Claim 1. He also gave evidence that the 1171 Twist Lock achieved substantially the same result in substantially the same way.
- (2) I accept that evidence and I reject Professor Burrow's conclusion that the mechanism of the 1171 Twist Lock was so different that it did not achieve the objective in the same way. There may have been a difference between the mechanism of the 1171 Twist Lock and the mechanism of the 12xx series or the embodiment of the Patent in Figures 3 and 4. But that is not the test. The critical question is whether the 1171 Twist Lock solved the problem underlying the Patent by using the same inventive concept: see *Edwards Lifesciences Corporation v Meril GmbH* (above).
- (3) As Mr Hall persuasively demonstrated by reference to *Icescape*, the infringing product may differ substantially from the embodiment of the patent in suit or the patentee's own product but use the same inventive concept to solve the same problem. In my judgment, that is the case here. The Twist Lock PPD, ¶3.3 states in terms that the plug is detected using the power contact and that power is only supplied when each plug pin has made contact with both the power and sense contacts of each sensor. This is the first limb of the insertion test as found by the judge.
- (4) I have found that the pin detectors of the 1171 Twist Lock were deep within the socket holes although on the sides rather than at the end of each one and that the purpose of locating the pin detectors at that depth was to ensure that the ETP was kept at a safe level. I have also found that the 1171 Twist Lock and the 1235 outlet were designed to have the same ETP target of 0.1 inch or 2.5 mm when used with a standard US NEMA plug. I find, therefore, that the 1171 Twist Lock was designed to meet the second limb of the insertion test as I have found it to be (above).
- (5) The Twist Lock PPD, ¶4.1 also demonstrates that the depth of 14.7 mm at which

the sensors were positioned was adopted to ensure that the maximum ETP would be 3.7 mm when the power supply is activated. Equally, the repeat experiments confirm that the figures stated in the Twist Lock PPD are accurate (subject to manufacturing and other tolerances) and both the document itself and the results of the repeat experiments are broadly consistent with the original design objective of the 1171 Twist Lock.

- (6) Finally, I have found that the purpose of locating the plug detectors at the side of the plug holes was to ensure that the outlet was compatible with all plug types and not to give effect to a partial insertion test. In my judgment, this has nothing to do with the “inventive core” of the Patent (to use the language of Lord Kitchin in *Icescape*). The second limb of the insertion test was intended to be satisfied by locating the sensors at a depth of 14.9 mm.

286. *Actavis 2*. The Defendants accepted in their Closing Submissions that if *Actavis 1* was answered in Lufthansa’s favour, the answer to *Actavis 2* was likely to follow suit. In my judgment, they were correct to do so. I also answer *Actavis 2* in the affirmative and I find that it would be obvious to the person skilled in the art, reading the Patent and knowing that the 1171 Twist Lock achieves substantially the same result as the invention, that the product does so in substantially the same way as the invention. Professor Wheeler gave clear evidence to that effect and I have accepted that evidence.

287. *Actavis 3*. The Defendants approached *Actavis 3* on the basis that Morgan J found that it was a requirement of Claim 1 that the plug detectors be located at the end of the plug holes and they did so in their written Opening Skeleton and Closing Submissions. I have found that he made no such finding. I have also held that the inclusion of reference numerals (45) and (46) in the first characterising feature of Claim 1 did not require the plug detectors to be located at the end of the plug holes and that their inclusion was intended to do no more than illustrate the inventive concept of the Patent by reference to Figure 3. I must, however, approach *Actavis 3* on the basis that this construction is wrong and that the inclusion of those numerals was intended to limit Claim 1 to a device with those characteristics.

288. Nevertheless, I answer *Actavis 3* in the negative even if I approach the issue on that basis. In my judgment, the “inventive concept and inventive core” of Claim 1 (to use the

language of Lord Kitchin in *Icescape* at [74] above) is the insertion test and a reader would not have concluded that it was an essential requirement of Claim 1 that the plug detectors must be located in precisely the same location as (45) and (46) if both limbs of the insertion test are satisfied. As Professor Wheeler pointed out, one way in which the skilled person might give effect to Claim 1 but also detect pins of different dimensions, would be to use mechanical switches located to the side of each hole.

289. Further, this is not a case in which the patentee has disclosed a variety of possible methods for achieving a specific technical effect but chosen to make a narrower claim to only one of those methods : see *Akebia Therapeutics Inc v Fibrogen Inc* (above). If Claim 1 requires the plug detectors to be located at the end of the plug holes, this is only because the inclusion of the reference numerals (45) and (46) from Figure 3 are an integral part of the claim and limit the words “plug detectors” and “plug detector” which immediately precede them. However, Figures 3 and 4 are two drawings of the preferred embodiment of the invention: see [0019]. A skilled person reading the last sentence of [0032] would appreciate that the inventors were stating in terms that it was not essential to Claim 1 itself that the plug detectors should be located at the bottom of the holes but that the microswitches could be arranged to the sides to accommodate a wider range of plug types.
290. Accordingly, I distinguish *Philip Morris v Nicoventures* (above) where the description of the patent contained a separate embodiment illustrated by different drawings but both the inventive concept and the preferred embodiment of that concept excluded that means of achieving the technical effect of the patent. Instead, this is a case in which the patentee was pointing out that there was an alternative means of achieving the inventive concept shown in the preferred embodiment to accommodate the flexibility of different plug types. In my judgment, that is exactly what the 1171 Twist Lock was designed to achieve.
291. I find, therefore, that Claim 1 did not require the plug detectors to be at the bottom of the plug holes and that even if it did so, the answer to the first two *Actavis* questions is positive but the answer to the third is negative. I also find that the 1171 Twist Lock and, therefore, the 1171M would have infringed Claim 1 as equivalents even though the plug detectors of each product are located at the side rather than the bottom of the holes. This conclusion assumes, of course, that both products employed the inventive concept of Claim 1 and satisfied both limbs of the insertion test.



(5) *Would the 1171M have infringed Claim 1?*

(i) The insertion test

292. I have accepted Professor Wheeler's evidence and found that on the true construction of Claim 1 the insertion test is not a casing to casing test but is satisfied by any level of pin exposure below 4 mm and I have described this as the second limb of the test. I have also found that the repeat experiments were accurately carried out, that the maximum ETP for a single example of the 1171 Twist Lock when used with a single example of the US NEMA 1-15 Type A plug was 4.50 mm and that the maximum ETP for the same 1171 Twist lock outlet when used with a single example of a US NEMA 5-15 Type B plug was 4.70 mm. The Defendants submitted that, as a result of these findings, the 1171 Twist Lock did not infringe Claim 1 and that the 1171M would not have done so. I have set out their submission in full (above) at the beginning of this section of the judgment.
293. In the course of Mr Acland's oral Closing Submissions it became clear that this was an argument about the construction of the Patent rather than about the evidence. Mr Acland submitted that the 1171M would only have infringed Claim 1 if all plug and socket combinations fell within the threshold of 4 mm. He made that submission and then repeated it as follows:

“Now, my learned friend's case is that has to be achieved for all plugs, and when he says "all plugs", I hope your Lordship knows what he means, that is to say all NEMA plugs, all pin lengths that are within the specification, taking into account manufacturing tolerances in the socket, and also taking into account variations in shapes of pins and so on. So in order to satisfy the claim, everything has to be within that 4mm range, and if it is not -- if there is something that falls outside that 4mm range, then it is -- then it doesn't satisfy the test. Now, given that the object of the patent is to improve safety for passengers in airline cabins, and those airline passengers will, of course, carry on board plugs of varying sizes, certainly in terms of pin lengths, we are content to adopt my learned friend's approach, that is to say whatever the relevant threshold is, whether it is less than 4mm, or whether it is casing to casing contact, it has to be achieved for all plugs within the specification, and taking into account manufacturing tolerances and variations in pin profile and so on. So that's the nature of the dispute between the parties. It's where that threshold should be set.”

“Now, because the claim construction which we are proceeding on for this purpose is that whatever the degree of -- whatever the threshold, it has got to be satisfied by all plugs that the socket is likely to encounter, or that sockets manufactured with a bit of tolerance, the two combined are likely

to encounter, what that means is that if you spread, for example, the NEMA 115, there will be a -- there will be some plugs, some plug socket combinations which will achieve facing to facing contact, or effective facing to facing contact, but a very substantial number of plugs which will exceed casing to casing or something that is close to casing to casing, and in those circumstances it must follow that the 1171 outlet would not achieve casing to casing contact with substantially all the plugs which were required of it. Does that make sense?"

"MR ACLAND: Let's use 4mm as the threshold. The question is this: in light of variations in sockets and pins, is it the case that that threshold will be satisfied that there will be no triggering of the power provided that the insertion is less than 4. If that is the case, then that outlet will infringe. If all circumstances that are encountered in terms of combinations of sockets and plug pins is such that taking into account variations in tolerance and all of the other factors, you will always fall within the scope of the 4mm threshold, then that infringes. MR JUSTICE LEECH: Yes. MR ACLAND: However, if there are circumstances in which an outlet, based on manufacturing tolerances and variations in pin lengths, if there are circumstances in which plugs will trigger power, not only when they are less than 4mm, but there are also plugs and socket combinations which will trigger outside of that range, then that is not infringement, and it is not infringement because the claim requires the threshold to be satisfied by all plugs. MR JUSTICE LEECH: Yes. I have understood. It has taken me a while to get there. MR ACLAND: And I have garbled this a number of times. MR JUSTICE LEECH: It has taken me a while to get there, so it is a point about the construction. It is a matter of construction. Is it to do with the object, namely safety, or is it to do with the -- MR ACLAND: Sorry, the object? MR JUSTICE LEECH: The construction point. I arrive at that as a sort of purposive construction, is that right? MR ACLAND: Yes. Well -- MR JUSTICE LEECH: And the purpose here is -- bear in mind the purpose is not commercial exploitation but safety. Is that right? MR ACLAND: That's right. You arrive at that because that was Professor Wheeler's approach which I'm adopting for these purposes, which is the invention, in order to meet this safety objective, has to work with all plug types, and then the question of construction beyond that is, well, actually, what is the threshold, whether it is casing to casing or something other than that."

294. Mr Acland did not cite any authority in support of the proposition that no outlet or socket could be found to have infringed Claim 1 unless every single outlet or socket could be found to have done so. I tested this submission by asking Mr Acland whether the Court would refuse to grant an interim injunction restraining the use of the 1171M on this basis. He finally accepted that it would have done so although it is only fair that I should set out his response in full:

"MR JUSTICE LEECH: So, I mean, let's say Mr Cuddigan -- we had this

argument in front of me on an application for an injunction, what would you be arguing here? And I say to you, well, Lufthansa says you can't be sure that you won't be infringing. How would I -- just tell me how I would decide an application in those circumstances, where it was unclear whether every plug would -- whether a plug would or would not infringe? I mean, you wouldn't be able to tell before you actually put it in the socket, unless you actually measured the pin -- every customer getting on to the plane actually measured the pin length, or that -- and Panasonic and Astronics couldn't tell in advance whether their -- they were infringing because it would all depend on what pin lengths the individual customers had."

MR JUSTICE LEECH: So your submission to me is, on this application for an injunction, is that, well, is it what -- he can't prove that I'm infringing or that -- MR ACLAND: On an application for an injunction against me on the basis of 1171, in the light of that experiment and the evidence that your Lordship has got, I'm not sure what I would be able to say on -- sorry, on his construction -- on my construction -- MR JUSTICE LEECH: Leave aside your construction. On his construction. MR ACLAND: On his construction, I would say the overwhelming likelihood is I'm not going to be able to satisfy the safety objective that is set by his specification. The overwhelming -- what is going to be the position, given the variations to sockets' pin lengths, and so on. Yes."

295. Mr Cuddigan submitted in answer to this case that in order to prevent an injunction being granted and a finding of infringement, the Defendants had to prove that they had "a consistently reliable way to avoid the patent":

"MR CUDDIGAN: My Lord, they have conceded that there's no material difference in relation to ETP between 1171, 1295 and 1235. So you can turn back to my chart, which shows that 1235 and 11 -- and 1292 are way lower. 1292 is below 0.25 of a millimetre. So their concession about no material difference drives you directly to: there isn't a construction in the world in which 1171 is non-infringing. MR JUSTICE LEECH: Yes. MR CUDDIGAN: Now, built into that last proposition is the question of: what does it mean to infringe in this context? It is trite law that, if you infringe on a Wednesday, but not on a Thursday, you don't have a non-infringing product. And therefore, it is not for me to prove that at all times, in all instances, with all plugs, with all sockets, they're within the claim. My learned friends need freedom to operate, so they have to prove that their proposed non-infringing alternative is precisely that. MR JUSTICE LEECH: Yes. MR CUDDIGAN: A consistently reliable way to avoid the patent. That's why they don't have any case to that end."

296. I was originally attracted by the logic of Mr Acland's argument on the basis that Lufthansa had put forward a bright line test supported by Professor Wheeler's evidence and that it would have been for Lufthansa to prove that each 1171M socket or outlet would have infringed the Patent if Astronics had manufactured and supplied it. However,

on reflection I accept Mr Cuddigan's submission on this issue and I find on a balance of probabilities that the 1171M would have infringed Claim 1 of the Patent for the following reasons:

- (1) Morgan J found as a matter of law that Astronics infringed the Patent for the purposes of section 60(2) of the PA 1977 by supplying the Primary Components in the United Kingdom: see the Liability Judgment, [277]. He also held as a matter of law that Safran directly infringed by connecting the Primary Components together and that Panasonic infringed by participating in a common design to do so: see [279] to [286]. There was no appeal against those findings.
- (2) Even if I adopt a strict construction of Claim 1 and accept that the insertion test teaches a specific threshold of no more than 4 mm, all of the 1171 Twist Lock outlets or sockets which Astronics supplied to airlines or airframe manufacturers were capable of satisfying that test. Whether they would have done so, however, would have depended on the dimensions of the plugs which individual passengers would have inserted into them when in use.
- (3) Based on the results of the repeat experiments recorded in the ETP Chart I find on a balance of probabilities that the insertion test would have been satisfied for each and every 1171M outlet at one time or another. As Mr Cuddigan pointed out, the ETP Chart shows a range of 1.0 mm to 3.6 mm (even before adjustment for tolerances). The fact that there might have been other occasions on which the insertion test would not have been satisfied would not, in my judgment, have prevented the Court finding that each outlet in question infringed the Patent.
- (4) The position might well have been different if the results of the repeat experiments had not shown that the overlap between the ETP range of the 1171 and the 12xx series was 1.9 mm (before any adjustment for tolerances). If there had been a much smaller overlap, I might have been prepared to accept that there would be a very few isolated occasions on which the insertion test was satisfied. However, based on the limited evidence before the Court, I find that the threshold of 4 mm would have been met and the insertion test would have been satisfied more frequently than it would not. Moreover, I can test this very simply. Based on the same evidence I would have been prepared to grant an injunction restraining the supply

of the 1171M and Mr Acland had to accept this.

- (5) But in any event, I am not satisfied that Professor Wheeler intended the threshold of 4 mm to be a bright line test for infringement as opposed to one of degree. He stated in terms that a skilled person would not draw a hard line between full insertion and partial insertion and I accept that evidence. Morgan J did not consider the remoteness test to be too uncertain to apply and, in my judgment, a threshold of 4 mm or thereabouts for the insertion test is not uncertain either.
- (6) Finally, I find that there was no material difference between the ETP range of the 12xx series and the ETP range of the 1171 Twist Lock and I attach little weight to the variation of 0.7 mm between the range of the 1171 Twist Lock and the 1235 and 1295 because of the very limited nature of the repeat experiments. The variation was generated by results from experiments using a single outlet and two examples of different NEMA plug types. Professor Mitcheson's evidence (which I accept) was that it would be necessary to carry out an "experimental campaign" before one could reach any reliable conclusions about the variation:

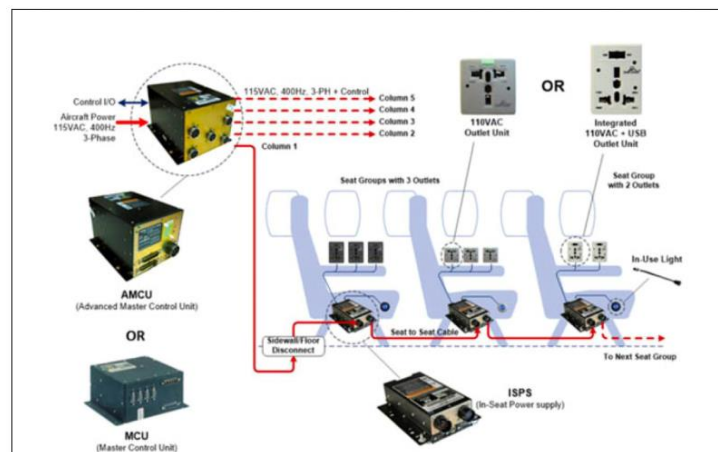
"MR CUDDIGAN: Just one question really, professor. My learned friend has asked to you put numerical estimates on a series of possible sources of variation in measured ETPs. I wonder if you could help the court with this. Could you explain, please, how you regard the value of those estimates as against the value of experimental data properly derived with a comprehensive experimental protocol? A. I understand, counsel. Certainly. To get a proper handle on the variability of this, you would need to take a number of experiments, and if we were just concerned with the plugs you would want to do a number of different experiments with plugs from, for instance, different manufacturers. There's a number of things you could look at. You could look at variability among plugs from one manufacturer and across different manufacturers, but I would certainly -- if I had that experimental data of course I could be much more certain about the numbers that we're talking about here in terms of variability. Q. And in relation to sockets? A. We have almost no data in terms of variability in sockets here. All we have is some early numbers from the original notice of experiments and of course we have the repeats. Some of those sockets may be different, some may be the same, we don't actually have that conclusively. Again I would want to perform a much more complete experimental campaign in order to be able to understand the variability across both of those sets of elements."

- (7) In my judgment, the Defendants were right to concede in their written Opening

Skeleton that there was no material difference between the 12xx series and the other products including the 1171 Twist Lock. That concession was made after they and their legal and expert advisers had seen the evidence of Professor Wheeler and Professor Mitcheson. Both witnesses gave clear and consistent evidence in cross-examination which did not change the position.

(ii) The remoteness test

297. It was common ground that the 12xx series outlets were located in the arm rests of the airline seats and the ISPS for the infringing EmPower Fusion system was located under each airline seat or row of seats. Mr Jouper incorporated into Jouper 4 the following block diagram taken from Astronics' marketing material:



298. Morgan J found that the location of the ISPS in each of the seats or rows of seats shown above satisfied the remoteness test and the Defendants admitted that the Components shown in the diagram constituted a voltage supply apparatus within Claim 1 when assembled together with the other Primary Components. They did not advance a positive case that the ISPS used with the 1171M would have been located anywhere else. Indeed, in their Statement of Case in relation to Alternative Products dated 2 August 2023 they pleaded a counter-factual that the same voltage supply apparatus would be supplied with 1171M outlets: “The PPD ISPS Units and Interconnect Cables complained of in this account would have been supplied for use in 110VAC in-seat power supply systems comprising Modified 1171 Outlet Units.” It follows that the 1171M would have made use of the remoteness feature and satisfied the remoteness test in exactly the same way as the 12xx series.

299. In any event, Mr Jouper fairly accepted this in cross-examination. Mr Cuddigan took him first to a safety assessment in relation to the EmPower Classic system which made use of the 1171 Twist Lock:

“The EmPower classic AC system is designed to meet stringent safety standards as set forth by the FAA and the airframe manufacturers.” Do you see that? A. I do. Q. The next paragraph describes the function of the ISPS, and halfway down you say this: “In addition to the addition to the listed safety features, output power is only available when the MCU indicates additional power is available and a user plugs in an appropriate plug and no output faults exist. When an appropriate plug is installed, both contacts of the plug must be inserted with a short time period in order to allow for power to be applied. The time out is less than 0.1 seconds to ensure that an object inserted in one contact of the outlet will not enable the output to be active.” You are discussing a mains voltage plug there? A. This was a mains voltage system, yes. Q. So this is a description of the remoteness feature, power not at the outlet when it is not in use? A. For all of our systems, yes. Q. And it is a description of the insertion test, isn't it? A. It is. Q. And there is also the timing test which you are aware is in claim 2 of the Lufthansa patent? A. Yes, I am. Q. That was another feature of the KID Système, wasn't it? A. Yes, it was. My understanding -- I don't know the internals of the KID Système -- Q. I understand. A. -- so I can't really comment on that. Q. Your witness statement doesn't tell us where the idea for a timing feature came from. Do you recall? A. I don't recall, no. Q. You also exhibit a safety assessment document which is at {D3/55/1}. And if we go forward to health and safety on page {D3/55/13} towards the bottom of the page there, the very first requirement is: “Cabin system equipment shall be designed to adequately protect flight crew, cabin attendants, maintenance crew and passengers from injury due to moving parts, electrical shock ...” And Astronics' submission as to why that is satisfied starts: “Passenger contact with [outlet unit] power contacts is prevented by a latching shutter and power switching that removes power from the [outlet unit] when a valid plug is not inserted.” Do you see that? A. I do. Q. So passenger contact with outlet unit power contacts, that is children with thin metal objects, isn't it? A. Yes. Q. And you relied on all three of these features to address this concern: shutters, remoteness and the insertion test? A. That, yes. Q. Can we consider the shutters. The 1171 outlet had shutters which retracted when a plug was partially inserted and then twisted? A. Yes. Q. And that was a safety feature? A. It was a safety feature, yes. Q. And it was a safety feature which was intended to and did in part address what we have called the knitting needle problem? A. Yes. Q. And there were three other features which addressed that knitting needle problem. The first was remoteness: there was no power in the socket when it wasn't in use? A. Yes. Q. The second was the insertion test: you needed to put something in both of the live and the neutral pin receptacles before the power would be turned on? A. Yes. Q. And the third was the timing test? A. Yes.”

300. The Defendants complained again that Mr Cuddigan did not put the remoteness test as correctly to Mr Jouper. I reject that submission. It is necessary to read the passage in full and also to put in context. Like Professor Burrow, Mr Jouper was fully aware of the test as found by the judge. Mr Jouper also signed the statement of truth for the PPD. He understood that the ISPS in both the EmPower Classic system and the infringing EmPower Fusion system were located under the seats (as shown in the diagram above) and that the socket would be isolated from that power supply when not in use. In my judgment, he fairly accepted that the 1171 Twist Lock and, therefore, the 1171M would have employed the remoteness feature and satisfied the remoteness test. Accordingly, I find that it did.

(iii) The timing feature

301. The Defendants did not plead or advance a positive case that the 1171M would not have made use of the timing feature. But in case there is any doubt, I find that it would have done so. Mr Jouper gave evidence to this effect in Jouper 4 where he stated that the 1171 Twist Lock and the 1235 both had timing circuitry to detect if the mechanical switches were opened at the same time:

“157. As with previous EMPOWER™ Systems, mains power was not present at the 1235 Outlet Unit until a suitable plug was detected. There was a mechanical leaf switch inside each of the two plug pin sockets. These switches were composed of a leaf spring, Printed Wiring Board (“PWB”) contact and multifaceted plunger (as shown in Figures 16 and 17 below). The leaf switches were installed at the bottom of the outlet so that the end of the pins were detected by the switches. In the absence of a plug, both switches would be closed. When a pin (of a plug) was pushed sufficiently far into either of the plug pin sockets, the corresponding leaf switch was opened, and a signal was sent to the ISPS Unit (as shown in Figure 17).

158. As with the 1171 Twist Lock, the 1235 Outlet Unit also had timing circuitry to detect if the mechanical leaf switches had been opened at the same time. The presence of a plug was signified by two signals from the Outlet Unit – CNTL\_1 and CNTL\_2. Once the microcontroller received a signal from either one of the leaf switches in the Outlet Unit, the ISPS Unit then set a timer of 50 or 300 milliseconds depending on the model of ISPS Unit. When the timer expired, the ISPS Unit monitored signals from the Outlet Unit to check if both leaf switches were open. If this criterion was met, a further 0.5 second timer was set. If both leaf switches remained open throughout the second timer, the central AC voltage source was engaged, a corresponding output relay was closed and power then flowed, via the Interconnect Cable, to the Outlet Unit and the user’s device.”



(iv) Issue Estoppel

302. I have made detailed findings about the scope of the Liability Judgment and the scope of the Declarations in the Liability Order. I am satisfied that Lufthansa did not advance a case before me in relation to the insertion test which was inconsistent with the Liability Judgment. I am also satisfied that Mr Cuddigan did not state or characterise the remoteness test incorrectly either in argument or in evidence. No question of issue estoppel arises, therefore, in relation to the 1171M and whether it would have employed the remoteness feature or satisfied the remoteness test.

(v) The “combination” point

303. The Defendants primarily relied on the combination point in the context of certification and whether the Patent was a barrier or gateway patent and I return to the point in much greater detail in that context below. But whatever the merits of that argument, I find that the 1171 Twist Lock made use of all three features of Claim 1 and that the 1171M would also have done so.

(6) *Conclusion*

304. In conclusion, therefore, I reject the Defendants’ Counterfactual that they would have been able to market and develop a Non-Infringing Alternative to the 12xx series. Although I have accepted Mr Jouper’s evidence that Astronics could have developed and marketed the 1171M cheaply, I have found that it would have infringed the Patent. I have also found that the Defendants would not have developed or marketed any of the third - party products upon which they relied during the Relevant Period and that two of them (the IFPL 1225 and PowerBox) would have infringed the Patent. Finally, I am bound to observe that if the 1171M had not infringed the Patent and Astronics had a cheap NIA readily available, the Defendants offered no reason why it did not develop and market this product when either KID or Lufthansa threatened proceedings.

**V. Causation**

305. The principal issue between parties was whether the Court should undertake a “differential profits” analysis or an apportionment of the profits made by the Defendants from exploiting the Patent. There is no doubt that there was a fundamental difference

between Lufthansa's legal approach and that by the Defendants and that both sides presented it to the Court as an issue of law. On analysis, however, the difference between them on the law was more nuanced and the dispute turned on certain key issues of fact. I record this at the outset because, in my judgment, the critical issue which I had to decide was how to apply agreed principles of causation to the facts.

## K. The Law

### *(1) Terminology*

306. It is important to begin with matters of definition and what is meant by “differential profits” and “apportionment” in this context. As I understood Lufthansa's argument, the term “differential profits” refers to the balance between those profits which the Defendants made by infringing the Patent and those profits which they would have made if they had not infringed the Patent. In their Opening Trial Skeleton the Lufthansa team cited the following passage in the decision of the Supreme Court of Canada in *Monsanto Canada Inc v Schmeisser* [2004] 1 SCR 902. In that case McLachlin CJ and Fish J delivered a joint judgment with which the other members of the Court concurred and they stated this at [102]:

“The preferred means of calculating an accounting of profits is what has been termed the value-based or "differential profit" approach, where profits are allocated according to the value contributed to the defendant's wares by the patent: *N. Siebrasse*, "A Remedial Benefit-Based Approach to the Innocent-User Problem in the Patenting of Higher Life Forms" (2004), 20 C.I.P.R. 79. A comparison is to be made between the defendant's profit attributable to the invention and his profit had he used the best non-infringing option: *Collette v. Lasnier* (1\_887), 13 S.C.R. 563, at p. 576, also referred to with approval in *Colonial Fastener Co., v. Lightning Fastener Co.*, [1937] S.C.R. 36.”

307. In *Celanese International Corporation v BP Chemicals Ltd* [1999] RPC 203 Laddie J described this as the “incremental approach”. I will have to return to *Celanese* in a number of contexts and it is convenient to begin by setting out the facts of the case which were helpfully explained in Lufthansa's Opening Trial Skeleton:

“*Celanese International Corp v BP Chemicals Ltd* [1999] R.P.C. 203 concerned the quantum stage of a patent infringement dispute. Celanese's patent claimed a guard bed used in the process of manufacturing acetic acid in order to remove iodide impurities. BP's use of guard beds in their

Hull plants was held to have infringed the patent, and Celanese elected for an account of profits, contending that it was entitled to BP's total profits from the plants, or a proportion thereof. BP alleged that it only had to account for the difference between the value of the benefit derived from using the guard beds and the benefit of having used the most likely alternative."

308. It is important to note at the outset that in *Celanese*, unlike the present case, it was the *infringer* not the patentee which was arguing for differential profits rather than apportionment. Laddie J recorded the argument which BP advanced before him at [16]:

"16. BP argued that the order made after the trial, and indeed the only order which I could have made after HC had made its election, was to BP to account for profits "derived from infringement". This meant that it had to show how much it had profited or benefited by use of the invention and it had to pay the financial measure of that benefit over to HC. This was defined by BP as the additional profits arising as a result of its acid having been treated in infringement of the patent. BP said that the benefits, and therefore profits, derived from infringement can be assessed properly in one of two ways. The first is to calculate the difference between on the one hand the profits BP have received by the use of the guard bed and subsequent sale of the acid so treated and on the other hand the profits which would otherwise have been achieved but for its use. This gives rise to a figure which can be called a differential profit. This BP said was an example of the preferred incremental approach. The alternative is to determine what proportion of the total (i.e. gross) profits made from sale of the treated acid is attributable to the use of the guard bed. This is called an apportionment. It also said that the incremental approach is the best guide to apportionment. BP claimed that if the two approaches are adopted independently they ought to arrive at essentially the same figure but the incremental approach is more accurate and involves less guess work."

309. This passage shows that although Laddie J did not use the term "differential profits" to describe the exercise set out in *Monsanto* (above), this is what he meant by the "incremental approach". It is also clear from the following passage in [20] and [21] that he had in mind the same comparison as the Supreme Court of Canada:

"20. BP argued that the incremental approach adopted by it in the account is supported by or consistent with a number of decided cases but it relied particularly 25 strongly on three: *Siddell v. Vickers* (1892) 9 RP.C. 152, *My Kinda Town v. Soll* [1983] RP.C. 15 and the decision of the Canadian Federal Court of Appeal in *Imperial Oil v. Lubrizol* [1996] 71 C.P.R (3d) 26. 21. It is on the basis that BP argued that it is proper to compare what in fact happened during the period of infringement with what was likely to have happened had there been no infringement. If the defendant has not been financially advantaged by taking the infringing course instead of the

likely non-infringing alternative, he has not been unjustly enriched by the infringement. Alternatively if, for example, the costs savings made by taking the infringing rather than the most likely non-infringing route are, say, £100,000 and there is no alteration in overall revenue to BP, then the benefit which it has obtained by reason of the infringement is the £100,000. In non-technical language, the infringement was worth £100,000 to the defendant. That is what he should pay to the plaintiff.”

310. It is important to note at this point that Celanese’s primary position was not that the Court should apportion the profits but that it was entitled to the total profits made from two different chemical processes at two different plants: see [28]. However, by Closing Submissions counsel accepted that the Court should apportion the profits and argued for 50% of them: see [28]. Laddie J began his analysis by rejecting BP’s submission that differential profits and apportionment were alternative ways of looking at the same thing. He stated this at [31]:

“31. Before turning to the case law, I should start by explaining why I reject the suggestion that the incremental route is an alternative way of working out an apportionment. If these two routes arrive at similar figures it is a coincidence and no more. That this is so can be demonstrated as follows. If an infringer's process makes no profit overall, then whether infringement accounts for 10 per cent or 100 per cent of the profits, on an apportionment the plaintiff will recover nothing. A large percentage of zero is still zero. This was accepted as correct by Mr Watson. He said it was inherent in his case that if BP made no profits, HC would recover nothing. On the other hand an infringer may benefit very significantly from infringing even though the whole process makes no profit overall. For example if a process makes a loss of £1m p.a. with the infringing step but would have made a loss of £3m p.a. without it, the benefit to the infringer is £2m p.a. Mr Young accepts and asserts that on his incremental approach to an account, the latter sum would have to be paid to the plaintiff. The two approaches are quite different and in most cases are likely to produce different figures.”

311. He then explained at [34] that apportionment is the process of calculating the profits on the process or product and apportioning them between those parts which infringe and those which do not:

“34. The reason for this difference is apparent. Apportionment looks at the profits actually made on the whole process or article and, where appropriate, splits them between those parts which infringe and those which do not. In the incremental approach it is neither necessary or relevant how many steps or integers there are in the process or article nor is it relevant what each one contributes, if anything, to overall profitability. Indeed whether the whole process or article is profitable or not is

irrelevant. Under the incremental approach one is only looking at whether the infringing step is financially advantageous to the defendant when compared to the most likely alternative. As such it does give one indication of whether or not the defendant has benefited or enriched himself by use of the infringement. It also readily explains why it is a valuable analysis to the management of a company since it is one way of assessing which of a number of alternatives is likely to be most cost effective or whether it is worthwhile making a change to an existing plant. If a plant is loss-making, modifications designed to reduce the loss will be attractive. Figure 1 above does not illustrate that the apportionment and incremental approaches are alternative ways of arriving at the same result. Mr Mainz said (Transcript page 1009) the value chain as illustrated by that Figure was a way of visualising the apportionment of profits between the stages in a multi-stage business but that this was not an incremental approach as suggested by BP. I agree with him. Figure 1 does not illustrate the financial comparison between two alternative routes, one infringing the other not. On the contrary, both left and right sides of Figure 1 depict visually the same process containing exactly the same infringing and non-infringing integers. It follows that I do not accept Mr Boulton's evidence, quoted above, that Figure 1 illustrates BP's approach to the account."

312. Following this analysis I use the term "differential profits" in the sense used by the Supreme Court of Canada in *Monsanto* (above). It is the net profits after a comparison between the profits which the infringer made by infringing the patent and the profits which it would have made if it had not done so. I will also use the term "apportionment" in the sense used by Laddie J in *Celanese*. It involves assessing the profits which are derived from a single infringing product and process and then splitting or dividing up the profits between that element of the profit which is attributable to the use which the infringer has made of the invention and that element of the profits which is attributable to the non-infringing parts of the product or process. I also agree with Laddie J that they are not alternatives or two different ways of looking at the same thing.

(2) *Account of Profits*

313. Section 61 of the PA 1977 is headed: "Proceedings for infringement of patent" and subsections (1) and (2) provides for a range of statutory remedies for patent infringement including an account of profits. It also provides that an award of damages or an account of profits are exclusive remedies:

"(1) Subject to the following provisions of this Part of this Act, civil proceedings may be brought in the court by the proprietor of a patent in respect of any act alleged to infringe the patent and (without prejudice to any other jurisdiction of the court) in those proceedings a claim may be

made— (a) for an injunction or interdict restraining the defendant or defender from any apprehended act of infringement; (b) for an order for him to deliver up or destroy any patented product in relation to which the patent is infringed or any article in which that product is inextricably comprised; (c) for damages in respect of the infringement; (d) for an account of the profits derived by him from the infringement; (e) for a declaration or declarator that the patent is valid and has been infringed by him.

(2) The court shall not, in respect of the same infringement, both award the proprietor of a patent damages and order that he shall be given an account of the profits.”

314. In *OOO Abbott v Design & Display Ltd* [2016] EWCA Civ 95, [2016] FSR 27 Lewison LJ described the principle underlying section 61(1)(d) as follows at [7]:

“Section 61(1)(d) of the Patents Act 1977 entitles a patentee to claim against an infringer an account of the profits “derived by him from the infringement”. An account of profits is confined to profits actually made, its purpose being not to punish the defendant but to prevent his unjust enrichment. The underlying theory is that the infringer is treated as having carried on his business (to the extent that it infringes) on behalf of the patentee. The broad principle is that the patentee is entitled to profits that have been earned by the use of his invention. If the patentee does not recover those profits, the infringer will have been unjustly enriched. So the purpose of the account is to quantify the extent to which the infringer would be unjustly enriched if he were to retain the profits derived by him from the infringement. That requires the fact finder first to identify the patentee’s invention and second to decide what (if any) profits the infringer derived from the use of that invention. The second of these questions may give rise to difficulty where the infringer sells products associated with the subject matter of the patent (often called “convoyed goods”) or products into which the subject matter of the patent is incorporated. The court must determine what profit has been earned, in a legal sense, by the infringer’s wrongful acts. It is clear, then, that an account of profits looks at the facts through the lens of what the infringer has done; and what the patentee might have suffered by way of loss in the real world is irrelevant.”

315. The remedy of account of profits has recently been considered at the highest level. In *Lifestyle Equities CV v Ahmed* [2024] UKSC 17, [2024] 2 WLR 1297 the Supreme Court held that the purpose of an account of profits was not to punish or deter wrongdoing but to enable the owner of an intellectual property right to enjoy the fruits of its exploitation. Lord Leggatt JSC (with whom all of the other members of the Court agreed) articulated this principle at [155] to [156]:

“155. A central purpose of intellectual property rights is to encourage and

reward creativity and innovation by enabling the owner of the right to enjoy the fruits of its exploitation. That purpose is promoted by allocating profits made from exploiting the right to the owner, including where the right is infringed by commercial use made without the owner's consent. For this purpose it does not matter whether the infringement is deliberate or innocent. The reason for redirecting the profits to the owner of the right is not to punish or deter wrongdoing. It is to achieve the goals which the right exists to further. As Robert Stevens puts it in a valuable discussion of this subject in *The Laws of Restitution* (2023) at p 306: "The remedy of an account of profits is here the continuation of the reason for the right." This explains why, in the words of Kitchin LJ in *Hollister Inc v Medik Ostomy Supplies Ltd* [2012] EWCA Civ 1419; [2013] Bus LR 428, para 55, the infringer "is treated as if he has conducted the infringing business on behalf of the claimant."

156. Seen from this perspective, ordering an account of profits against an innocent infringer is in fact easier to justify than awarding compensatory damages. Whereas an award of damages may make the infringer worse off than if the infringement had not occurred, an account of profits does not have this effect. The effect is simply to put the infringer back in the same position financially as if no infringement had taken place. It is hard to see how an innocent infringer can legitimately object to such restitution. Thus there is no irrationality in the approach adopted in the Copyright, Designs and Patents Act 1988 of establishing a defence based on lack of knowledge to a claim for damages but not to a claim for an account of profits. But I find it hard to see how the converse approach could be justified. As, therefore, lack of knowledge is no defence to a claim for damages for infringement of a trade mark, it should not defeat a claim for an account of profits."

316. Lufthansa submitted that the principle underlying the test which Lord Leggatt articulated in this and other passages was causation and that the Court should approach the Account on that basis. One of the issues which the Supreme Court had to decide was whether a loan made to one of the Defendants amounted to a profit. Lord Leggatt dealt with that issue at [175]:

"I would comment in passing that, although the Ahmeds who were acting in person at the second trial did not take the point, the profit for which a trader who sells infringing goods is liable to account is not necessarily the difference between the proceeds of sale of such goods and the costs attributable to those sales. As pointed out by Windeyer J in *Colbeam Palmer Ltd v Stock Affiliates Pty Ltd*, at p 37, the profit for which the infringer of a trade mark must account is not the profit made from selling the article itself but the profit made from selling it under the trade mark. In *My Kinda Town Ltd (trading as Chicago Pizza Pie Factory) v Soll* [1982] FSR 147, for example, the claim was for passing off by using a name confusingly similar to the name used by the claimant for a chain of restaurants. Slade J, after an extensive review of cases involving trade

mark infringement as well as passing off, held that the profits for which the defendant was liable to account were those caused by the confusion, and not all the profits made by the defendant from its restaurant business. The principle was clearly explained by Lewison LJ in *OOO Abbott v Design & Display Ltd* [2016] EWCA Civ 98; [2016] FSR 27, para 36 (a patent case but where the same principle applies):

“In a case in which the infringement does not ‘drive’ the sale it seems to me that it is wrong in principle to attribute the whole of the profit to the infringement. In particular it does not follow from the fact that the customer wanted a slat wall that incorporated an insert that the customer wanted a slat wall that incorporated the *infringing* insert.” (emphasis in original).”

317. *Lifestyle Equities* was concerned with trademark infringement. Lufthansa relied upon the decision and the Defendants did not argue that it did not apply by analogy to patent infringement. I accept that it does. Lufthansa also submitted that *Lifestyle Equities* was high authority for the proposition that the Court should assess profits by reference to the causative effect of the infringement in the same way as an action for damages and that Lord Leggatt adopted the differential profits approach.

318. In broad terms I accept that submission. Lord Leggatt’s comparison between an award of damages and an account of profits demonstrates that the issue for the Court is essentially one of causation and in dealing with the loan argument he approved *My Kinda Town Ltd v Soll* in which Slade J held that the defendant was only liable for the profits which were caused by the wrong. But he did not decide when (if ever) it was appropriate to apportion the profits. Moreover, it is highly significant that he approved the decision of the Court of Appeal in *OOO Abbott v Design & Display Ltd* for reasons which I will explain.

### (3) *Differential Profits or Apportionment*

319. The principal issue between the parties in the present case was when (if at all) it was appropriate to undertake an apportionment exercise. In *Celanese* Laddie J rejected BP’s argument in favour of the differential profits approach and decided in favour of apportionment. It is not entirely clear whether he decided that the differential profits approach was never appropriate or simply not appropriate on the facts of that case: see [72]. But it is clear that one of his principal reasons for that decision was his concern that the *United Horseshoe* rule (as I will call it) would apply to any assessment of differential profits.



320. In *United Horseshoe and Nail Co Ltd v Stewart & Co* (1888) 13 App Cas 40 the House of Lords decided by a majority that a defendant infringer is not permitted to rely on a Non-Infringing Alternative. In *Celanese* Laddie J stated the rule at [35]:

“35. A plaintiff who is successful in patent litigation has an entitlement to elect between damages and an account. The differences between them are considerable. Where the plaintiff seeks damages, the purpose of the inquiry is to determine what loss he has actually suffered. That loss may far exceed any gain made by the infringer through the infringing activity. Furthermore if the activity of the defendant infringes different rights held by different plaintiffs, he will have to compensate them all for the damage they have suffered. In this respect there is no upper limit on the compensation he may have to pay. The more damage he inflicts, the greater the financial burden imposed on him. In working out quantum the court has to determine what acts of infringement have been committed (an issue which may have been resolved on the trial as to liability) and what damage has been caused, in the legal sense, by them. In doing this the court is not allowed to speculate on whether the defendant could have avoided infringement and, if so, what damage would have been inflicted on the plaintiff by such alternative legitimate activities. It may be that a non-infringing activity would have inflicted the same or more financial damage on the plaintiff. If so it could be said that the plaintiff is no worse off as a result of the infringement than he would have been if a non-infringing course of action had been adopted by the defendant. But this is irrelevant to an inquiry as to damages. As Jacob J said in *Gerber v. Lectra* [1995] 5 RP.C. 383, the courts have consistently rejected this approach. The fact that the plaintiff could have been damaged by actions of the defendant for which it had no legal redress does not detract from the fact that the damage was inflicted by activities for which it is entitled to redress.”

321. In this passage Laddie J referred to *Gerber Garment Technology Inc v Lectra Systems Ltd* [1995] RPC 383 in which Jacob J described the application of the *United Horseshoe* rule and his decision was largely upheld on appeal: see [1997] RPC 443. It is also clear from a subsequent passage at [39] that Laddie J considered that the *United Horseshoe* rule would apply to an account of profits for patent infringement if the differential profits approach were to be adopted:

“A further consequence of these common principles is that it should be no answer to an account that the defendant could have made the same profits by following an alternative, non-infringing course. The question to be answered is "what profits were in fact made by the defendant by the wrongful activity?". It should not matter that similar profits could have been made in another, non-infringing way. Subject to the impact of *Siddell v. Vickers*, *My Kinda Town v. Soll* and *Imperial Oil v. Lubrizol* which I will consider below, this proposition appears to be supported by a number of decisions including *Peter Pan Manufacturing Corporation v. Corsets*

*Silhouette Ltd* [1963] RP.C. 45 and *Baker Energy Resources Corp. v. Reading & Bates Construction* (1994) 58 C.P.R (3d) 359. In the latter the Federal Court of Appeal in Canada said at page 368:

"Counsel for the respondents claims that the respondents are entitled to all the profits made by the appellant and that the amount of such profits is obtained by deducting from the revenue received by the defendant from the infringing acts only those bona fide expenses or disbursements incurred by the defendant in the course of the [infringing] operation .... Counsel for the appellant proposes a different method of computing the profits. He contends that the amount of profits is determined by comparing the profits made from the infringing activity with those that could have been made from a non-infringing activity. The difference represents the profits that a defendant is accountable for and has to disgorge. To put it another way, the amount of profits is the difference between the actual profits earned and the profits that would have been earned through use of an alternative, non-infringing method that the appellant would most likely have used instead of the infringing method .... On this accounting procedure, I believe one has to look at the profits that the appellant actually made through the infringing acts, not the profit that he could have made had he used a non-infringing method."

322. The judge then carried out a detailed analysis of the authorities concluding that the three authorities upon which BP relied did not support the differential profits approach. Lufthansa advanced a sustained attack on *Celanese* both in writing and in oral submissions. Mr Cuddigan submitted that Laddie J was wrong to conclude that the *United Horseshoe* rule applied to an account of profits and wrong to accept that the correct approach to follow was apportionment. He submitted that because the purpose of the exercise was to establish those profits caused by the infringement, it was always appropriate to adopt the differential profits approach.
323. Mr Cuddigan and his team plainly anticipated that this issue would be contested. But the Defendants did not adopt that position. They accepted in their Opening Skeleton Argument that *Celanese* should be treated with caution and submitted that I should not follow *Celanese* in relation to the *United Horseshoe* rule. They accepted in terms that Laddie J was wrong to say that it should be no answer to an account that the infringer could have made the same profits by following an alternative, non-infringing course: see [39] (above). They also accepted that the Court should apply the differential profits approach first as a matter of causation but placed significance on both legal and factual causation. They submitted that there were two questions for the Court and that it must decide both:

“(a) determine the profit which is attributable to the infringement as a matter of factual causation. This requires the court to be persuaded on the balance of probabilities what, if any, profit the Defendant would not have achieved ‘but for’ the infringement. If no profit is attributable as a matter of factual causation, there is no liability to account at all; and

(b) additionally, if any profit is attributable to the infringement as a matter of factual causation, apply the filters of legal causation, including a determination of the extent to which the profit is causally attributable to the infringement, having regard to other important causal sources of the profit, and reflect the relative weighting or potency of causal inputs in the account.”

324. In the light of the Defendants’ concession it is not necessary for me to determine whether *Celanese* was correctly decided either in relation to the question whether the *United Horseshoe* rule applies to an account of profits or in relation to the question whether Laddie J was right to prefer the apportionment approach either on the facts before him or more generally. It is also, perhaps, unnecessary for me to decide the *United Horseshoe* point because I have already decided that Astronics would not have been able to develop and supply a Non-Infringing Alternative to the 12xx series.

325. However, in deference to the depth and quality of the argument which the Lufthansa team presented in writing and Mr Cuddigan’s oral submissions, I record that, in my judgment, their submissions were correct, that *Celanese* was wrongly decided, that the Court should adopt the differential profits approach to every account of profits and that in doing so the Court should not apply the *United Horseshoe* rule. As will become clear, the critical issue between the parties was whether this was just the start of the exercise (as the Defendants submitted) or the start and finish of the exercise (as Lufthansa submitted). The determination of that issue turns on the application of the principles of causation to which I now turn.

(4) *“But for” or factual causation*

326. It was common ground that the differential profits approach requires the Court to decide whether the infringement caused the Defendants to make or earn the relevant profits. It was also common ground that the Court should address this question by asking whether the Defendants would have made the profits which they did from the EmPower Fusion system but for the infringement of the Patent. The Defendants also submitted that this test was inherently counterfactual and involved constructing a hypothetical in which the

infringer did not breach the relevant duty but replacing that conduct with conduct in which it would have infringed if it had behaved lawfully. I did not understand Lufthansa to dissent from that proposition but in case there is any doubt I accept it. I will refer to this requirement as “factual causation”.

(5) *Legal causation*

327. The Defendants cited a number of authorities from the law of damages for the proposition that even if the “but for” causation test is satisfied the Court must consider and decide separately whether the infringement should be treated as the legal cause of the relevant profits and that this was a matter of law: see *Chester v Afshar* [2004] UKHL 41, [2005] 1 AC 134, *Hughes-Holland v BPE Solicitors* [2017] UKSC 21, [2018] AC 21 and *FCA v Arch Insurance (UK) Ltd* [2021] UKSC 1, [2021] AC 649. I will refer to this separate requirement as “legal causation” and a cause which is held to satisfy the test for legal causation as a “legal” or “proximate” cause.

328. The Defendants placed particular reliance upon the decision of the Court of Appeal in *Anan Kasei Co Ltd v Neo Chemicals & Oxides (Europe) Ltd* [2023] EWCA Civ 11, [2023] FSR 14 where Arnold LJ (with whom Coulson and Peter Jackson LJJ agreed) gave the lead judgment. In that case Rhodia, one of the claimants, was the exclusive licensee of the patent in suit and Roger Wyand QC held that it was valid and that Neo, one of the defendants, had infringed the patent. He held that it had done so by supplying HSA cerium oxide to Johnson Matthey, a mutual customer of both parties, which had then used the samples and initial quantities which Neo had supplied in the UK to obtain approval from car makers for its catalyst system which was used to reduce emissions: see [2018] EWHC 843 (Pat). His decision was upheld on appeal: see [2022] EWCA Civ 1646.

329. On the subsequent inquiry as to damages, Neo argued (amongst other things) that the infringing supplies were not an effective or substantial or proximate cause of the lost sales claimed by Rhodia: see [2023] FSR 14 at [5]. At first instance, Bacon J held that Neo’s infringement was not the “common sense” or proximate cause of those sales: see [2022] EWHC 708 (Pat). In his judgment in the Court of Appeal Arnold LJ set out her preliminary findings at [23] to [27] and quoted her detailed analysis at [28]:

“185. It is undoubtedly the case that the infringing supplies of development

samples and initial commercial C100N to the UK created an opportunity for Neo to make substantial subsequent overseas supplies of the product. Neo was not only aware of the possibility of those future overseas supplies, but intended that.

186. In the early stages of the development process, however, that outcome was speculative and uncertain. Thus when Neo supplied initial development samples to JM, neither it nor JM knew whether those would lead to any commercial orders whatsoever. JM had first to test the product, to ascertain whether it was suitable for its requirements, and then had to submit catalysts formulated with the product for approval by car maker customers. As the witnesses made clear, in that process JM was frequently competing in a 'shootout' with other catalyst suppliers. Any supplies by Neo were therefore entirely contingent upon JM being selected by a car maker using a catalyst formulation that included C100N - in which the car maker's decision would inevitably turn on the assessment of the performance of the catalyst as a whole rather than any individual assessment of the specific individual components of the catalyst.

187. Even when JM was selected to supply the catalyst for a particular vehicle platform, it would (as I have described above) be necessary to do further vehicle testing including fleet trials before full commercial supplies of the catalyst started. That is why Mr Williams described the 200kg order of C100N on 4 December 2013 as an order that would 'open the door to bulk production' thereafter if the product proved to be successful in the customer fleet trials that were intended.

188. The chain of events from the supply of samples for testing (whether laboratory testing by JM or catalyst testing by car makers) to commercial orders for Neo's product therefore involved a series of contingencies resting on decisions taken initially by JM and subsequently by the car makers.

189. It is fair to say that once a catalyst containing Neo's product was ultimately approved by a car maker for use on one of its platforms, Neo could at that point have expected commercial orders to follow, given the evidence that a car maker would select a catalyst for the lifetime of a particular platform. There are, however, two important points to make about those orders.

190. The first is that there was no overarching supply contract, nor any minimum order guarantee, nor were the orders placed together with orders for UK supplies. Rather, orders were placed depending on the requirements from time to time of each of JM's production plants (which in turn depended on the orders placed by the car makers for the vehicles on which Neo's product was a catalyst component).

191. Secondly, where Neo's and Rhodia's products were both approved for use in a catalyst on a particular vehicle platform, the volume of C100N ordered from Neo would have depended upon the allocation of JM's requirements from time to time for that platform as between Neo and Rhodia. That decision would have been made on the basis of factors such as price and capacity, as the evidence set out above indicated.

192. I have concluded on the evidence above that all four of the platforms for which Neo was approved as at March 2015 were platforms on which Rhodia was also qualified. There was no evidence before me as to whether Neo was qualified on any other platforms after that date. On the evidence before me, therefore, all of the platforms for which Neo is known to have been qualified were platforms for which there was a choice as between Neo's and Rhodia's products.

193. Drawing together the strands of the above, this is a case in which (i) there were multiple intervening contingencies between the infringing supplies by Neo and the eventual overseas supplies made by Neo; (ii) the orders that were eventually placed for Neo's product were not made together with or subject to the same contract as any orders for infringing supplies, but were placed for delivery to JM's various production plants from time to time; and (iii) on the evidence before me, it appears that Neo and Rhodia were dual-qualified on the platforms for which Neo was known to have been approved, providing a choice between the two products. Taking all of those factors together, I do not consider that the infringing supplies of Neo's product can be regarded as the 'common sense' or proximate cause of the overseas sales that were ultimately made."

330. Rhodia appealed against this conclusion on four grounds including (1) that the judge had erred in her approach to causation because she wrongly asked herself whether the infringing supplies were the common sense or proximate cause rather than a cause of the relevant sales ("GA1"), (2) that she wrongly approached the question of remoteness on the basis that Johnson Matthey's decisions were not independent of the infringements, intended by Neo and procured by Neo knowing that there was a risk of infringement ("GA2") and (3) that she wrongly analysed the factors bearing on causation ("GA3"): see [36]. Neo filed a Respondent's Notice in which it contended that a proper analysis of the sequence of events supported the judge's conclusion on causation ("RN3"): see [38].
331. Arnold LJ began with a general discussion of the measure of damage in tort: see [41] to [45] before setting out the following principles which apply to damages for patent infringement:

"46. Although *Kuwait Airways* involved the tort of conversion, the other House of Lords and Supreme Court cases cited above all concerned the tort of negligence. The analytical framework articulated by the majority of the Supreme Court in *MBS v GT* and *Meadows v Khan* cannot be applied to the tort of patent infringement without modification. The second question requires some adaptation in this context, and one of the issues on this appeal is whether the fifth question is applicable at all. Subject to that, however, I consider that the framework is of utility here.

47. First, the answer to the actionability question is that the harm which

may be recovered in a claim for patent infringement is pure economic loss. Such economic loss usually takes the form of one or more of (i) lost profits on lost sales, (ii) losses due to price depression and (iii) lost royalties (including negotiating damages quantified on a reasonable royalty basis): see *Gerber v Lectra*.

48. Secondly, the duty not to infringe a patent is not a duty of care, but a statutory duty of strict liability. The Patents Act 1977 prescribes in section 60 what acts amount to infringing acts, which must be committed within the UK, and it provides in section 61(1) that the court may award damages “in respect of the infringement”. The purpose of the duty is to confer a monopoly of defined scope and limited duration upon the patentee (and, if applicable, its exclusive licensee), and thereby enable the patentee (and/or exclusive licensee) to reap the economic benefits of that monopoly. In that way inventors will be incentivised to make and patent their inventions.

49. Thirdly, the answer to the breach question depends on whether the defendant has committed an infringing act or not. In the present case that question has already been finally decided in favour of Rhodia.

50. Fourthly, in patent cases the test of factual causation which is applied is the ordinary “but for” test. As noted above, in the present case the judge found that the losses claimed by Rhodia would not have been sustained but for Neo’s infringing acts. There is no challenge by Neo to that finding.

51. Fifthly, RN1 raises the issue as to whether there is a form of duty nexus requirement in this context.

52. Sixthly, as can be seen from the summary in *Ultraframe v Eurocell* at [47(iii)], and as I shall discuss in more detail below, factual causation is not sufficient in a claim for patent infringement (or for infringement of other intellectual rights) any more than it is in other torts. There must also be legal causation (or legal responsibility). GA1, GA2, GA3 and RN3 are all directed to this issue.”

332. Arnold LJ then dealt with the issue of territoriality and certain subsidiary issues before turning back to causation. When he came to consider the three Grounds of Appeal and the Respondent’s Notice dealing with causation, he began with the following observations:

"93. As can be seen from the House of Lords, Supreme Court and Court of Appeal authorities discussed above, it is important to distinguish between factual causation and legal causation in tort, and this is just as true where the tort is an infringement of an intellectual property right as it is in other cases. Although I have not accepted Neo’s arguments in support of RN1 and RN2, those arguments do help to illustrate the importance of legal causation in this context.

94. Before turning to the central issues on legal causation, it is first necessary to clear two points out of the way. The first is straightforward: as counsel for Neo confirmed, it has never been any part of Neo’s case that

Rhodia's losses were irrecoverable due to the existence of a novus actus interveniens, that is to say, some intervening act or cause which interrupted the chain of causation.

95. The second point concerns remoteness. As counsel for Neo submitted, and I agree, it can be seen from the case law in the field of tort that the term "remoteness" is used in two different senses, a narrow one and a broad one. When used in a narrow sense, "remoteness" is an antonym for foreseeability. When used in a broad sense, it is an antonym for legal causation. In the present case we are not concerned with remoteness in the narrow sense. Neo have never disputed that the losses claimed by Rhodia were a foreseeable result of Neo's infringing acts. In that sense, therefore, the damages claimed are not too remote. But Neo maintain that the damages claimed are too remote in the broader sense that the losses were not legally caused by the infringing acts because those acts were not a sufficiently effective or substantial or proximate cause of the losses. Counsel for Rhodia equivocated as to whether legal causation was different from remoteness in the narrow sense, but accepted that, to the extent that it was, the burden lay upon Rhodia to establish legal causation."

333. In relation to GA1 Arnold LJ accepted that it was sufficient for the infringement to be a cause of the loss rather than the sole cause of the loss. But he rejected Rhodia's argument that the judge had applied the wrong test as purely semantic: see [97] to [101]. He then dealt with GA2 and GA3 and the argument that the judge had made a number of errors of principle. He rejected the argument that the judge had disregarded the fact that Johnson Matthey's purchasing decisions were intended by Neo and both foreseeable and expected and that Neo was aware of the risk of infringement: see [104] to [106]. He also rejected the argument that the judge treated those decisions as breaking the chain of causation: see [107] to [108]. He then turned to three factors which the judge identified at [193] (above):

"109. Fourthly, and to my mind most importantly, Rhodia contend that the three factors identified by the judge in [193] do not, whether individually or cumulatively, justify her conclusion that the infringing acts were not a proximate cause of the lost sales because the judge failed to take into account the infringing nature of Neo's product. It is convenient to take the factors in reverse order. Factor (iii) is that Neo and Rhodia were both qualified as suppliers with respect to the relevant car platforms. Rhodia say that this simply means that, by making the infringing supplies of C100N, Neo got themselves into the position of being able to supply JM with a product that was substitutable with Rhodia's patented HSA20 product, and thus to compete with Rhodia on capacity and price. Factor (ii) is that the orders in question were not placed with, or subject to, the same contract as the orders for the infringing supplies, but later and ad hoc. Rhodia say that this is immaterial: the orders were foreseeable, and it was



the infringing supplies that opened the door to Neo obtaining them because it was those supplies that led to the specification being agreed. Factor (i) is that there were multiple intervening contingencies. Rhodia say that there was really only one contingency, which was whether Neo's product satisfied JM's requirements, and that depended solely or mainly on whether the product infringed the Patent. At worst, say Rhodia, there was a second contingency, which was whether the JM's catalyst system satisfied the car makers' requirements, but that again depended solely or mainly on whether Neo's product infringed.

110. I acknowledge that this argument has force, but in the end I am not persuaded by it. The first point to note is that, as I read the judgment, it was the cumulative effect of factors (i), (ii) and (iii) that led the judge to conclude that the infringing supplies were not a proximate cause of the losses claimed by Rhodia. She did not say that any of these factors would have been decisive on its own.

111. Taking the factors in the same order as above, the significance of factor (iii) is that it meant that, as the judge found at [178]-[181] and [191]-[192], Neo were able to compete with Rhodia on capacity and price. It is quite true that Neo were only able to become qualified because of their infringing supplies. But this did not necessarily mean that Neo would get the orders from JM that they did. In 2016-2017 Rhodia did not have the capacity to supply JM, which is why the judge held that they would only be entitled to a reasonable royalty in any event. From 2018, Rhodia could, at least in theory, have competed with Neo on price. But Rhodia's claim is for lost sales, not price depression. This suggests that neither technical performance nor price was determinative so far as JM was concerned. Rather, JM wanted to have a second source in order to mitigate the risk of either Rhodia or Neo being unable to supply at some point.

112. Turning to factor (ii), the significance of this factor is that it goes back to the distinction between creating the opportunity for the loss to occur and being a proximate cause of the loss. I agree with the judge that the fact that the foreign supplies were both later in time and contractually distinct from the infringing supplies is relevant to this question, but not determinative.

113. The most important factor in my view is factor (i). It is fair to say that the judge's phrase "multiple intervening contingencies" is something of an overstatement. Read in context, however, it is clear what she meant by this. As the judge explained at [183]-[184], [186] and [188], Neo's sales depended not only on JM's decision as to whose cerium oxide to purchase, but also on the car makers' decisions as to which catalyst system to purchase. Thus it was not enough for Neo to satisfy JM's requirements, it was also necessary for JM to satisfy the car makers' requirements. As the judge found at [186], the car makers' decisions turned on the car makers' assessments of the performance of the catalyst system as a whole rather than their assessments of the specific individual components.

114. This finding is supported by two pieces of evidence which counsel for Rhodia himself took us to. First, Ms Brown said in her affidavit: "Cerium oxide is but one part of a highly complex catalyst system, which will need to function in combination with the other parts." Secondly, Dr

O’Sullivan said in his witness statement: “One of the reasons that OEMs were reluctant to change formulations was that it is not possible to fully define a catalyst by its specification. The performance characteristics of a catalyst are like a fingerprint and the fingerprint is unique to that catalyst formulation and process used to make it. All of the emissions calibration that takes place ends up with a system that is tuned around the catalyst combinations that are in the system. Catalyst manufacturers are quite secretive about their formulations and will not disclose the recipe to the OEMs.”

115. Conversely, the judge made no finding that the car makers’ decisions were driven by the performance of the cerium oxide component, and we were shown no evidence that that was the case. Counsel for Rhodia sought to meet this difficulty by submitting that (i) Neo had not pleaded a positive case as to the car makers’ decisions and (ii) the evidential burden in this respect was on Neo. I do not accept either of these submissions. The burden lay upon Rhodia to plead and prove all the factual elements necessary for their claim. Neo were not obliged to plead a positive case, nor were they under an evidential burden, as to the car makers’ decision-making.

116. It is probable, given the judge’s findings as to JM’s requirements and Neo’s inability to satisfy them with a non-infringing alternative, that the performance of the cerium oxide component was necessary for JM to obtain favourable decisions from the car makers, but it does not follow that it was sufficient. It is also probable that each of the other components had to satisfy performance requirements of their own. Moreover, it is clear that the whole catalyst system will have had to satisfy the overall performance requirements laid down by the car makers based upon the Euro 6 standard. This was the real driver of the sales in issue.

117. Counsel for Rhodia also argued that the error in the judge’s conclusion could be seen by considering the counterfactual in which Neo did not make the infringing supplies: in that event Neo would not have got any orders for HSA cerium oxide from JM. I do not think that this is the correct test in the present context. As Lords Hodge and Sales explained in *MBS v GT* at [23]-[27], counterfactual analysis has been used by the courts as a way to assist in identifying the extent of the loss suffered by the claimant which falls within the scope of the defendant’s duty of care in cases involving the provision of information by asking whether the same loss would have resulted if the information had been correct. It is a tool for distinguishing between loss flowing from the fact that, due to the defendant’s negligence, the information was wrong (loss which falls within the scope of the defendant’s duty) and loss flowing from the decision to enter into the transaction at all (loss which would not have been sustained but for the negligence). The counterfactual test may be a useful cross-check, but it can be problematic and has the potential to confuse. Accordingly, it should not replace the decision that needs to be made as to the scope of the duty. As discussed above, the issue in the present case is not as to the scope of the duty, but whether the infringing acts were a proximate cause of the losses claimed.

118. Taking the three factors identified by the judge together, I consider that the judge was at least entitled to reach the conclusion that the infringing supplies were not a proximate cause of the losses claimed by Rhodia. Indeed, I agree with her.”

334. This is an important passage and I derive a number of propositions or principles from it which are relevant to a claim for damages for infringement in a case involving a complex product. I consider below whether they are also applicable to an account of profits and, in particular, to the Account in the present case. Those propositions are as follows:

- (1) The burden is on the patentee to plead and prove all of the factual elements of the claim and, in particular, that the infringement was a proximate cause of the relevant losses: see [115].
- (2) It is necessary for the patentee to prove that the infringer was unable to develop, produce or supply a Non-Infringing Alternative but this is not sufficient by itself to establish that the infringement was a proximate cause: see [116].
- (3) Where the infringement relates to a single component of a complex product and the infringer has to meet performance standards not only in relation to that component but the other components or the product as a whole, the patentee must demonstrate that the performance of the infringing component was the real driver of the sales in issue: see [116].
- (4) In order to determine whether the infringement is a proximate cause of the relevant losses, it is not enough simply to consider the counterfactual in which the infringer did not make the infringing supplies although this may be a useful cross-check: see [117].
- (5) Ultimately, the question whether the infringement is a proximate cause of the losses involves an evaluative exercise which may depend on the cumulative effect of a number of different factors (of which the judge’s three factors provide useful examples): see [111] to [114] and [118].

335. Lufthansa did not contest the proposition that even if the “but for” causation test is satisfied there is a separate requirement of legal causation or that the Court must decide whether the infringement should be treated as a matter of law as the cause of the relevant profits. Indeed, in their Opening Trial Skeleton the Lufthansa team cited *Neo* and relied

on Arnold LJ's fourth and sixth propositions at [50] and [52] (above). They also accepted in their written Closing Submissions that *Neo* was directly applicable in the present case and, in particular, that the absence of an NIA was a necessary but not sufficient factor in legal causation:

“34. Remoteness in the broad sense has an important role to play in this case. It is well understood that any “but for” test, including the differential profits “but for” test, can be over-inclusive. By way of example, if a defendant with no non-infringing alternative successfully invested the profits from an infringing trade, the profits resulting from that investment would fall within the differential profits assessment. It would be an insensible system of law which allowed the patentee to recover such profits. The tool by which the law prevents this from happening is remoteness/legal causation.

35. Remoteness is a flexible tool. In *Neo*, the intention of the defendant to carry out a non-infringing commercial trade as a consequence of the approval of infringing samples was a relevant, but not sufficient, factor in legal causation. There are, however, limits to the flexibility. As we observed in opening, the chain of legal causation holds until it breaks, and it must be applied to the facts of Ds' trade accordingly. It can give a different outcome – legally caused, or too remote – in response to different facts. But it cannot give a different outcome to a single pool of profits in respect of which the same material facts apply. In particular, legal causation cannot apportion a single pool of profit with a common factual history. It cannot be said that 60% (or any other proportion) of such profits were legally caused by an infringement, with the remainder being too remote.”

336. I do not necessarily accept the last three sentences of this extract and I consider whether they are right as a matter of law in greater detail below. However, it is clear from this passage that Lufthansa accepted that there was a separate requirement of legal causation and that *Neo* provides guidance as to the principles which the Court should apply. But in case there is any doubt, I find as a matter of law that in any account of profits, the patentee must establish not only factual causation but also legal causation and that the Court should follow *Neo* in deciding whether the patentee has made out that requirement even though it is an authority on the application of legal causation to awards of damages.

(6) *When should the Court apportion profits?*

(i) *OOO Abbott v Design & Display Ltd*

337. In *OOO Abbott v Design & Display Ltd* [2016] EWCA Civ 95, [2016] FSR 27 (where

Mr Cuddigan also appeared for the patentee) the patent in suit concerned display panels for shopfitting which had slots for inserts to carry shelves and hangars for displaying goods. Birss J held that the patent was valid and had been infringed. He described the invention of the patent in his judgment in the Patents County Court ([2013] EWPC 27) at [4] to [8] as follows:

“4. The case concerns display panels used in shops. Shopfitters often use a wooden wall called a slatwall as a panel on which to construct displays. Today the slatwall is made of MDF and has horizontal slots. Back plates or other shelf fixings can be fitted into the slots in order to secure display accessories such as shelves, brackets and hangers. The merchandise is displayed from the display accessories. The fittings are inserted into the jaws of the mouth of the slot and hooked into the top of an internal chamber of the slot lying behind its mouth.

5. The slots are made by a computer controlled router moving across the width of the panel. A router makes a T shaped slot and leaves visible machined surfaces within the slot having machined away the decorative veneer that generally covers the face of the MDF. Also the edges of the veneer around the mouth of the slot are susceptible to damage as display accessories are hooked in and removed.

6. For these reasons it became standard practice to provide inserts for slots, as protection against damage and to hide the machined surfaces. To an extent the inserts also strengthen the panel. The accessories are then fitted into the inserts rather than being fitted directly into the bare slots.

7. The inserts are made by extrusion. By 2004 the standard inserts used were of two kinds: “slide-in” or “snap-in”. As the name suggests slide-in inserts were slid into place from the edge of the slat wall. They were made of aluminium. They could be T-shaped, corresponding to the T shaped cross-section of the slot or else they could be L-shaped, using only the top arm of the slot. A problem with slide-in inserts was that if the edge of the slatwall was not accessible, for example at a corner, there is no room to slide the insert into place. Snap-in inserts solve this problem by being inserted from the front with a spring action. Because they needed to be compressible, they were made of PVC instead of aluminium.

8. The invention in this case is a snap-in insert made from a resilient metal like aluminium.”

338. The Court of Appeal dismissed an appeal and the patentees elected for an account of profits which was taken by His Honour Judge Hacon who held that the patentees were entitled to recover all of the profits derived from panels in which the infringing inserts had been used: see [2014] EWHC 2924 (IPEC). The judge identified the inventive concept at [28] (original emphasis):

“In my view the inventive concept was not just the idea of an insert made of a resilient metal (which was known). It was the composite idea of an insert made of such a metal *and* its having a particular shape *and* its interacting with the slot of the panel in a particular way, such that the metal insert could engage with the panel by snap-in means.”

339. The judge held that the sale of the infringing inserts drove those sales where the customer specified the infringing inserts or were recommended to use them but not those sales where the customer was indifferent to the inserts used. Nevertheless, he held that the patentees were entitled to recover the profits made on all of them. He also rejected an argument that the infringer could have used an NIA:

“29. The questions which I have to consider in relation to the scope of the account are (a) whether the sale by Design & Display of articles embodying the inventive concept caused the profits which the company made on the panels as a whole (‘caused’ in the sense identified by Staughton LJ in *Gerber* ) and (b) whether it was foreseeable that such profits would be made as a consequence of the sale of the articles embodying the inventive concept.

30. I think that the answer to both questions is yes. I will consider first just the sales of the infringing inserts. It is likely that in at least some cases the customer either specified or was recommended the infringing inserts because of the advantages they offered for particular displays and for use of the panel in which they were incorporated. Mr Lloyd in cross-examination accepted that there were such advantages. I have no real doubt that in those circumstances the sale of infringing inserts drove the sale of the compatible panels in which they were incorporated.

31. However, I will assume that some sales of panels with incorporated infringing inserts went ahead with the customer indifferent to the type of inserts used. I will also assume that while the panels must have been machined to be compatible with the infringing inserts, they may also have been compatible with non-infringing inserts (although it was the evidence of Mr Chasmer, the Second Claimant, that there is little if any such cross-compatibility in the industry). In those circumstances the sales of the infringing inserts were not in the same way the driving force behind the sales of panels but in the end I think it makes no difference. The customer will have specified panels with incorporated inserts (and also possibly that the panels were incorporated into a display, it doesn't matter). Design & Display was thus either going to make a sale of inserts and panels both, or no sale at all. The sales necessarily went hand in hand. Design & Display chose to sell infringing inserts. Because the sales went together, the sale of the inserts caused (in the relevant sense) the sale of the panels in which they were incorporated. It was also foreseeable that the sale of the panels would be a consequence of the sale of the inserts.

32. It goes further. As I have said, part of the inventive concept was embodied in the shape of a section of the panel. The fact that it was a

modest section makes no difference. The sale of that section of the panel both caused the sale of the panel as whole and the latter sale was a foreseeable consequence of the former.

33. The argument raised by Design & Display in this regard was based on Mr Lloyd's evidence that the cessation of its sales of the infringing incorporated inserts had made no difference to sales of the panels, and Mr Lloyd's assertion that consequently if Design & Display had not sold infringing inserts this would have made no difference at all to its sales of panels. I find this surprising because Mr Lloyd had conceded that at least in some circumstances the infringing inserts had advantages over alternatives, which implies the likelihood for the potential of some lost sales if the infringing inserts had been unavailable. But I leave that to one side. The main point is that this argument amounts to an assertion that Design & Display could have traded just as profitably without infringing. No doubt that is true, but for the reasons discussed above it is irrelevant. Design & Display did infringe and in my view the scope of the profit derived from such infringement extends to the profit made from sales of panels in which the infringing inserts were incorporated.”

340. On appeal Lewison LJ (with whom Sir Terence Etherton C and Tomlinson LJ agreed) stated that the first step was to identify the invention and that it was common ground that the scope of the invention was not necessarily coterminous with the scope of the claims (citing *Celanese*): see [8]. However, he could see nothing wrong with the judge's identification of the inventive concept above: see [13]. But he held that the judge ought to have apportioned the profits of those sales which fell within [31] (above) and remitted the decision to the IPEC for re-hearing. In reaching this conclusion Lewison LJ considered *Celanese*, *Gerber* in the Court of Appeal and the decision of the High Court of Australia in *Dart Industries Inc v Decor Corp Pty Ltd* [1994] FSR 567. After citing Laddie J's discussion of *Dart* in *Celanese* he made the following observation at [28]:

“Thus he, too, concluded that an apportionment would be inappropriate where without the infringement the infringing articles would not have existed or where the invention was an essential ingredient in the creation of the infringer's whole product.”

341. Lewison LJ returned to the judge's analysis and after referring to an example in *Dart* he gave his reasons for remitting the decision to the IPEC for re-hearing. In particular, he held that in a case where the infringement did not drive the sale, it was wrong in principle to attribute the whole of the profit to the infringement:

“36. Let me revert to the example given by the Full Court in *Dart Industries v Decor Corp* [1994] F.S.R. 567. A manufacturer sells a car

which includes a patented brake. If the car did not have brakes, the manufacturer could not have sold it, but it did not have to have that particular brake. In those circumstances the Full Court clearly thought that it would be unjust to charge the manufacturer with the whole profit made on the car; and I agree with them. In my judgment the legal error that the judge made was to ask whether the sale of the panel plus insert would have happened separately rather than to ask himself how much of the profit on the sale was derived from the infringement. In a case in which the infringement does not “drive” the sale it seems to me that it is wrong in principle to attribute the whole of the profit to the infringement. In particular it does not follow from the fact that the customer wanted a slat wall that incorporated *an* insert that the customer wanted a slat wall that incorporated the *infringing* insert. Mr Cuddigan argued that the infringing inserts and the slot were the “very essence” of the incorporated and unincorporated panels. But the judge made no such finding, and his observations at [32] suggest the contrary. In addition I do not consider that the judge was correct at [31] in saying that “*because* the sales went together, the sale of inserts caused ... the sale of the panels...” The mere fact that the two went together is not, in my judgment, sufficient to establish that the whole of the profit earned on the composite item was derived from the invention. One might just as well say that the sale of the panel caused the sale of the insert. As the judge himself recognised the customer specifies *panels*, and on the hypothesis that he was considering at [31] the customer is indifferent about the inserts (provided that some form of insert is included). On the judge's approach, because the sale of the patented brake went with the sale of the car, the whole of the profit on the car would be included in the account. If the judge had found on the facts that the infringing insert was “the essential ingredient in the creation of the defendant's whole product” (i.e. the incorporated panel), then he would have been justified, on the facts, in declining to apportion the profit. But I cannot see that he made that finding.

37. In my judgment therefore in cases simply falling within the factual hypothesis discussed at [31] the judge should have apportioned the overall profit. The question of apportionment will therefore have to be returned to IPEC, although the judge would not be precluded from finding as a fact that the infringing insert was the “essential ingredient” of the incorporated panel.”

342. Finally, Lewison LJ dealt with the outcome of the appeal at [53]. One point which Mr Cuddigan raised with the Court was whether the parties would be permitted to adduce further evidence given that CPR Part 62.23 permitted a party to submit material which had not been ordered at the CMC only in exceptional circumstances. In that context Lewison LJ stated that: “The cases emphasise that mathematical precision is impossible, and that the evidential burden lies on the infringer. But those are, in my judgment, matters for another day.”



343. It was unnecessary for Lewison LJ to decide which (if any) part of the profit which the infringer had made on the sale of the panels should be attributed to the infringement because the account was remitted to the IPEC. Before HHJ Hacon for a second time, the parties made further arguments on causation based on Lewison LJ's judgment. The judge held that if either requirement of paragraph [28] (above) were satisfied, apportionment was not appropriate: see [21] to [23]. He then addressed the meaning of an "essential feature" of the patent in this context:

"25. The principle that an infringer must compensate a patentee in relation to lost sales of entire products where the embodiment of the invention is an 'essential feature' of those products seems to have had its origin in the judgment of Eve J in *Meters Ltd v Metropolitan Gas Meters Ltd* (1910) 27 RPC 721, approved by the Court of Appeal (1911) 28 RPC 157. This related to an inquiry as to damages. *Meters* was not referred to by the High Court of Australia in *Dart Industries Inc v Decor Corp Pty Ltd* [1994] F.S.R. 567, but either independently or by indirect influence the same idea was adopted by the High Court in the context of an account of profits.

26. Lewison LJ summarised the relevant facts in *Meters*:

"[19] *Meters v Metropolitan Gas Meters* was another case of the assessment of damages for patent infringement. The patented article was a mechanism for controlling the supply of gas in a pre-paid gas meter. The patentee was a manufacturer of gas meters, and claimed damages representing lost sales of gas meters. It did not claim an account of profits. The defendant had sold 19,500 gas meters incorporating the patented article. However, the patentee claimed the profit on sales which it claimed that it would have made if the defendant had not infringed. It did not claim the profit that the infringer had made. The number of lost sales on which damages were awarded was assessed by the Master at 5,000 meters, although on appeal Eve J reduced that number to 3,500. It was in that context that the judge had to decide whether the damages should be assessed as the whole of the profit that the patentee would have made on the lost sales, or only such part of that profit was attributable to the patented article, which represented approximately 1/44th of the whole profit. It was in that context that Eve J said:

'... the parts incorporating the invention, are, in my opinion, component and essential parts of the meter regulating and controlling – from the Gas Company's point of view – the most important functions of the meter, that is to say the supply of the exact amount of gas to which the consumer is entitled having regard to the amount he has paid and the current price of gas. In my opinion, the mechanism protected by these Patents is of the very essence of the meter; ... and ... it is no answer to the Plaintiffs whose invention has been infringed to say that similar results could have been achieved without infringing the Patent. In this case I think that the inclusion in the Defendants' meter of the

infringement results in the meter itself being an infringement ... and that the Master has rightly held that the profit on the meters is a proper factor to be taken into the calculation and not the profit only on those parts of the inventions.’ ”

27. As Lewison LJ explained, in *Dart* the judge at first instance found as a fact that what characterised the plastic kitchen canister was the patented press-button lid, without which the canisters would never have been produced. The Full Court endorsed this finding and the further finding that this qualified the lid as the essential feature of the canister.

28. I think that what unites these cases is that the protected feature of the product was functionally and/or commercially the most significant part of the whole. It was in that sense essential. I include the possibility of its being commercially the most significant part because in *Dart* it might well have been said that the most important function of a plastic kitchen container is to contain its contents and for the most part that is performed by the body of the container. However, it was presumably the lid which gave the canister in question its commercial advantage over competitors and was thus, commercially, the most important part.

29. Neither test for whether apportionment is appropriate is binary. It could be that from the point of view of some purchasers the relevant feature is essential but from the point of view of others it is not. Similarly, it is possible that if the protected feature had not been available for use, some of the entire goods would have come into existence, but fewer of them. In my view, in such cases the court should make a partial apportionment: the infringer must account for the profit on a proportion of the entire articles.”

344. It is clear from this passage that the judge considered that the question whether the Court should embark on an apportionment at all was answered by asking either (1) whether the infringing articles would have existed at all without the infringement or (2) whether the invention was an essential ingredient in the creation of the infringer’s whole product. By contrast, he considered that the question whether the infringement drove the profits was the right test to apply in deciding whether the patentee was entitled to recover the profits from “convoys” (i.e. non-infringing) goods and services:

“There is a third test identified by Lewison LJ. If satisfied, it requires an infringer to pay over profits on non-infringing goods or services, i.e. convoys goods or services. Lewison LJ approved the unchallenged proposition contained in the first account judgment that if sales of the products embodying the patent infringed ‘drove’ the sales of other goods, the latter qualified as sales of convoys goods and the defendant was accountable for profits on those sales, see [29]-[30] and [36].

31. I first used the criterion of one set of sales ‘driving’ another in *Alfrank Designs Ltd v Exclusive (UK) Ltd* [2015] EWHC 1372 (IPEC), at [29]-[34]. That was a judgment in an inquiry as to damages. There, I stated that I was using the term to mean that there was a causative link in the mind of

the purchaser between his decision to purchase the goods protected by the claimant's right and a consequential decision also to buy the conveyed goods.

32. The inquiry in *Alfrank* followed the admission by the first defendant, a furniture wholesaler, that it had infringed unregistered design rights in the design of two dining room tables. The rights were owned by the claimant, a competing furniture wholesaler. The evidence was that consumers in the market for new household furniture characteristically decide first on the dining room table they like. Having done so, they buy matching furniture. Once the sale of the dining room table had been secured via a furniture retailer, the wholesaler would make sales of other items in the same range via the retailer. In that sense the sales of infringing dining room tables by the first defendant in *Alfrank* 'drove' sales of other conveyed items.

33. Not any link between two sets of sales will do. In his review of the law on conveyed goods as it applies in an inquiry as to damages Staughton LJ observed in *Gerber* ([1997] RPC 443, at 456):

"There is no dispute as to causation or remoteness in the present case; nor can I see any ground of policy for restricting the patentees' right to recover. It does not follow that, if customers were in the habit of purchasing a patented article at the patentee's supermarket, for example, he could claim against an infringer in respect of loss of profits on all other items which the customers would buy in the supermarket but no longer bought. The limit would be one of causation, or remoteness, or both."

34. In *Gerber* the patented article was a machine for the automatic cutting of fabric. The Court of Appeal awarded damages in relation to the claimant's lost sales of such machines and, among other things, for loss of profits on what would have been conveyed sales by the claimant of (i) CAD systems which enabled efficient and quick production of cutting patterns and automatic sizing of patterns, (ii) a proportion of spare parts and (iii) servicing (at 448-456).

35. To my mind, Staughton LJ's distinction, illustrated by his supermarket example, applies equally in the context of an account of profits and is consistent with the reasoning of the Court of Appeal in the present case. For goods or services to qualify as conveyed, there must be a causative link between their sale and the consequential sale of infringing goods. This means, first, that there is a perceived compatibility, functional interaction, or some other connection of that nature between the infringing goods and the putative conveyed goods or services. Secondly, the sale of the putative conveyed goods or services must be consequential upon the sale of the infringing goods or services (see the Court of Appeal at [36]). The sale of the infringing goods or services must constitute the primary purchasing decision. For example, in *Gerber* the purchaser principally sought to buy fabric cutting machines. The CAD systems, spare parts and servicing followed on from that. Likewise, in *Alfrank* the first purchasing decisions concerned dining room tables and the other purchases followed on as a consequence."

345. The judge dealt next with the evidential burden and referred back to Lewison LJ's judgment at [53] (above) and this is a point to which I will return. He then set out a summary of the legal principles which he proposed to apply:

“(1) In an account of profits the claimant is entitled to the infringer's profit made from the exploitation of the right infringed.

(2) Where the right is a patent, the invention must be identified. Where the invention is a product, the claimant is entitled to the infringer's profit made from the sales of articles or part articles which embody the invention.

(3) Where the patent protects only part of an article sold by the infringer, the claimant is entitled to the profit made by the infringer from the sale of the entire article if either (a) the protected part is the essential feature of the entire article, or (b) the entire article would never have been made by the infringer if there had been no infringement of the claimant's right.

(4) Part of an article is its 'essential feature' if the part is functionally and/or commercially the most significant part of the whole.

(5) If the patent protects part of an article and neither 3(a) nor (b) apply, the court must assess how much of the total profit made by the infringer on the sale of the article is to be apportioned to the protected part of the article. The claimant is entitled to that part of the total profit.

(6) Where the sale of an article protected by the patent drives the sales of other, unprotected, goods or services, the claimant is in addition entitled to the profit made by the infringer on the sale of those other goods and services (convoys goods and services).

(7) The sale of an article 'drives' the sales of other goods or services if there is a causative link between the purchase of the article protected by the patent and a consequential purchase of the other goods or services.

(8) There will be a causative link where there is a perceived compatibility, functional interaction or other connection of that nature between the protected article and the other goods or services.

(9) The purchase of the putative convoys goods or services must be consequential in the sense that the purchase of the protected article is the principal purchasing decision in the mind of the buyer and the purchase of the other goods or services follows as a consequence.

(10) In relation to the foregoing issues the evidential burden rests on the infringer.”

(ii) Lufthansa's submissions

346. The Lufthansa team adopted HHJ Hacon's 10 propositions in their Opening Trial Skeleton and, as they observed, the critical proposition in the present case is proposition (3). In Mr Cuddigan's oral opening submissions I put the question whether the test for proximate cause in *Neo* applied where there was a single complex product involving a

number of components and, if so, whether it was appropriate to apportion the profits in such a case. Mr Cuddigan submitted that legal causation was still applicable “but it plays the conventional and very narrow role of what Lord Justice Arnold described in the *Neo* appeal as broad remoteness”. He also submitted that it was not possible to apportion a single pool of profits from a complex product although he accepted that *Neo* and the proximate cause test applied to convoyed goods:

“But the important point to note at present is that a chain of causation is a binary thing. It holds until it breaks, and in *Neo* it had broken. But it can't, as a matter of logic, lead to an apportionment of a single pot of profit. You can't say, "Well, 12% was proximately caused and 88% wasn't". It just isn't a tool that is fit for that purpose. MR JUSTICE LEECH: There is an intersection between that and the sort of *Abbott* apportionment, where you look for -- you have got a whole series of components which go into a particular product. MR CUDDIGAN: Right. MR JUSTICE LEECH: And the infringement causes -- MR CUDDIGAN: You are absolutely right. MR JUSTICE LEECH: -- causes the -- or it enables the infringer to make a larger profit. So you can see that it might be relevant in those circumstances if you couldn't actually isolate the profit purely made from the infringement or the -- and then -- MR CUDDIGAN: I think it needs to work on the facts. If you think of the way causation works. So my submission to you is that it could be used to distinguish between primary -- MR JUSTICE LEECH: Because that is the way they -- it is one of the ways in which they meet your argument in relation to causation. They say that it does get you into that kind of enquiry. MR CUDDIGAN: It is one of the ways they -- MR JUSTICE LEECH: It is one of the issues that you are going to have to debate. MR CUDDIGAN: Yes. MR JUSTICE LEECH: So I see the issue. MR CUDDIGAN: Right. MR JUSTICE LEECH: I am not necessarily convinced that you are right, but I understand your submission and your submission. MR CUDDIGAN: No, no, I understand that. I haven't quite finished explaining the distinction. It could be used to distinguish between the profits on primary components and secondary components, because by analogy with *Neo* you can see a court -- my Lord might say, "Well, primary components, those are actually governed by patents and that's obviously a direct causative link". But when you are looking at convoyed sales, I think that's too far. There is a causative distinction between the two. MR JUSTICE LEECH: But the whole test for convoyed sales seems to -- has a causation element built into it. MR CUDDIGAN: Absolutely. So I accept that what -- MR JUSTICE LEECH: I mean, it might be described in the sort of parallel universe I normally inhabit as sort of consequential, consequential profits as opposed to consequential damages, you know, using language that I understand anyway. MR CUDDIGAN: Right. So the better way to consider the reasoning in *Abbott* is that the discussions about one thing driving another are about legal causation, about sufficiently proximate cause. In other words, everything passes the but for test unless you have got a counterfactual, which you ought to do if the patent is not very compelling.

But then if you get too far from the invention, the whistle on the battleship, if you get too far from the invention then legal causation says, "Well, article A did not drive the sale of article B, so legal causation is not established. That is too remote that profit. Too broad" MR JUSTICE LEECH: Even if it was foreseeable. MR CUDDIGAN: Even if it was foreseeable, absolutely. But what it cannot enable you to do is to say, "Here is a pot of a million pounds of profit that was accrued in relation to sales of the primary components, the stuff that's in the claim of the patent. Well, we think 30% of that should go to the patentee, 70% to the infringer because of an agreement", or something. Legal causation cannot lead to that outcome because it is a binary sift, and unless you can say, "That 30%, well, the facts applicable to that are different", then there's no logical route to the destination that my learned friends urge."

347. In their written Closing Submissions the Lufthansa team repeated their submission that once the "but for" test was satisfied, it was not possible to apportion a single pool of profits. They also submitted that the correct test for causation was proposition (3) (above) and that it was satisfied where the Defendants were unable to prove a Non-Infringing Alternative:

"42. It is no surprise that, aside from the slightly nebulous "essence" and "characterising", this swiftly devolves to the same NIA question addressed in the context of differential profits: did the defendant have another route to market with a substitute product?"

43. In their opening skeleton, Ds suggest that these various dicta are examples from the case law of factual scenarios in which an apportionment may not be required ([356(d)]). We submit the better view is that Lewison LJ was approving the reasoning as a matter of principle. That is also clearly the view taken by HHJ Hacon when the case reverted to him {JA/45/6}:"

(iii) The Defendants' submissions

348. The Defendants challenged the accuracy of HHJ Hacon's 10 propositions in their Opening Trial Skeleton and, in particular, the limitation of the test in proposition (6) to conveyed goods and services:

"The problem with this analysis is that it too pays no attention to the problem we have identified above, namely where the profits on the EmPower Systems cannot all be ascribed to the infringement. The problem then becomes that one cannot simply identify the link between the EmPower System and any conveyed good. One needs to look at the infringing components. It is not good enough simply to equiparate the whole of the EmPower System with the infringing components and then seek to draw a link between that whole product and the conveyed good. The starting point must at least be to try to ask to what extent (if at all) the

supply of the infringing component, as opposed to any other non-infringing aspects of the EmPower System, actually drove the sales of any conveyed goods or services. Lufthansa's approach does not seek sufficiently to identify the nexus between the invention (and the infringing use of it) and the conveyed goods. Instead it relies (at least in part) on a nexus between non-infringing aspects of the EmPower System and conveyed goods (and services). This may be an issue of remoteness as well as causation."

349. In their written Closing Submissions the Defendants placed very considerable reliance upon the fact that Lufthansa had conceded in opening that it was appropriate to apportion Safran's profits and I set out the full passage which also incorporates the Lufthansa team's written and oral submissions (original emphasis):

"417. However, in Lufthansa's written opening there was, tellingly, an acknowledgement of a role for legal causation - in the context of Safran. Thus at paragraph 335 (S1/1/106) Lufthansa's opening stated:

"Lufthansa recognises that awarding profits on all that seat manufacturing activity would be excessive. However, we maintain that the root problem is Safran's failure to investigate and plead a more defensible counterfactual, and not in the underlying differential profits approach. In any event, Lufthansa's constraint on excessive profits is legal causation: Lufthansa accepts that Safran's revenue derived from manufacturing activities other than installing EmPower Systems was not caused by its infringing activity, because installing EmPower Systems was not "a sufficiently effective or substantial or proximate cause" of such revenue (*Neo v Rhodia*, paragraph 95 – see above)."

418. This concession was correctly made, for reasons we come on to. However, Lufthansa's issue is that the concession acknowledges precisely the problem with its "but for"/ "differential profits only" based approach, particularly when coupled with the implicit suggestion that it was for Safran to plead and prove an appropriate counterfactual. The problem is that without the overlay of a legal causation filter Lufthansa's approach leads to overcompensation of the claimant and produces manifestly unjust results.

419. Realising the significance of this concession, given that it opens the door to apportionment as an aspect of the legal causation inquiry, it was withdrawn in oral opening only to be replaced by the suggestion that in the case of Safran it was appropriate to make an apportionment on equitable grounds (D1/71-72) (emphasis added):

"Firstly, Safran, I need to update you on our position in relation to Safran. It is obviously the junior party in relation to these proceedings. On reflection we consider our analysis of the legal position in our skeleton needs amendment. It is wrong as a matter of principle. The problem is this: Safran makes lots of money from selling seats with EmPower Systems in them but they never own the

EmPower Systems, so they are performing a service. The only counterfactual they plead is the same as the other defendants, the 1171M. We think that's a serious error of judgment. It means that if the 1171M infringes, then all their seat profits are in play on a differential profit basis because they haven't said they would have sold their seats anyway. They haven't said they would have sold them with different power supplies or to different airlines who didn't want power supplies, all of which might have made excellent sense. **Now, we recognise that an account of profits is an equitable remedy and an award of all Safran's profits would be inequitable and in our skeleton we had suggested squaring this circle by reference to legal causation but for the reasons you and I have been through this morning we don't think that works. It is not a tool which is apt to do that and so instead we consider the least worst approach on the facts of this case is to apportion Safran's profits, and the different approaches to that apportionment taken by the valuation experts will be discussed in the oral evidence.**"

350. The Defendants made seven points about this concession which they described as significant. I will not set out each one in this judgment although I have them all fully in mind when deciding this issue. For present purposes, I set out the two points which I considered to be the most significant:

"421. First, the burden of factual causation is on the claimant and Lufthansa does not rely in support of its factual causation case on an allegation that, "but for" Safran's acts of making, it would not have made the profits it did. Instead, the basis for Lufthansa's factual (and indeed entire) causation case is the relationship it alleges at §14D of the RAPOC (B1/1/10), namely that the transactions on which profits were accrued were "driven by" the specific acts of infringement because it was the adoption of the patented technology which caused the Defendants to have access to the AC Power market and to achieve the profit bearing transactions. However, as we have repeatedly pointed out, the acts of infringement occurred a decade later, and Lufthansa has not sought to run any case of factual causation based on the necessity of those acts to the accrual of profits. In the case of Safran plainly Lufthansa's factual case does not work (it is not the incorporation of the invention which allowed Safran access to the market for seats), but the problem is with the nature of Lufthansa's case, not Safran's response to it."

"427. Sixth, the difficulty that Lufthansa get into in seeking to suggest that *OOO Abbott* is a case about convoyed goods is instructive and revealing of the flaws in its analysis. As noted in *OOO Abbott* the claim covered the panels and the inserts, albeit that the invention resided in the inserts. In its opening Lufthansa accepted that legal causation might be appropriate to limit recovery in relation to convoyed goods, including where the goods are covered by the claim but the invention does not reside in them (the whistle on the battleship example) (see D1/20<sub>14</sub>-21<sub>18</sub>) but suggested there



was a distinction when one considers the profits made in relation to the Primary Components “*the stuff that’s in the claim of the patent*” (D1/21<sub>21</sub>-22<sub>5</sub>). The battleship is also in the claim in Laddie’s example<sup>3</sup>. Accordingly, there is no logical distinction between, on the one hand, the battleship covered by the claim, where the invention is in the whistle, or the claimed panel and, on the other hand, a composite product such as the EmPower Primary Components in which the invention only resides in sub-components and where other sub-components carry out many important features. Note that the discussion in [7] of OOO Abbott about the need to identify what profit has been earned “in a legal sense by the infringer’s wrongful acts” is in relation to both convoyed goods and “products into which the subject matter of the patent is incorporated.”

(iv) Analysis

351. *Apportionment*. I accept the Defendants’ submissions on this issue and I reject Lufthansa’s submissions. In my judgment, the Court should apportion the relevant profits where the test for legal causation in *Neo* is not satisfied and Lufthansa is unable to establish that the infringement drove the sales of the EmPower Fusion system. I have reached this conclusion for the following reasons:

- (1) HHJ Hacon was persuaded that Lewison LJ intended to apply the alternative tests in proposition (3) to the question whether the patentee was entitled to recover the profit on the sale of the entire article. With respect, I do not agree. In the relevant paragraph of his judgment ([28] above) he was doing no more than recording the conclusion which Laddie J reached in *Celanese*. If he had intended to adopt and approve such a test, he would have said so.
- (2) The ratio of the Court of Appeal’s decision is to be found in [36] where Lewison LJ held that the judge had made an error of law and asked himself the wrong question. He also identified the general principle in that paragraph: “In a case in which the infringement does not “drive” the sale it seems to me that it is wrong in principle to attribute the whole of the profit to the infringement.” He did not limit the application of that principle to convoyed goods and services only and if he had intended to limit the principle in this way, he would have said so too.
- (3) Moreover, I can see no reason of logic or principle why a different test should apply to the question whether the profit on the entire article was derived from the

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<sup>3</sup> See *Celanese* at [43].

infringement and the question whether the profit on the convoyed goods was derived from the infringement. Both are questions of causation and it was common ground that Lufthansa had to prove both factual and legal causation.

- (4) This analysis of *OOO Abbott* is consistent with Arnold LJ's decision in *Neo* even though the former case was decided several years earlier. *Neo* supports the conclusion that the question whether an infringement is to be treated as the legal or proximate cause of the profits derived from a complex product, is to be determined by asking and answering the question whether the infringement drove the relevant sales of that product. HHJ Hacon did not have the guidance in *Neo* available when the account was remitted to him for re-hearing and, with the greatest of respect, he might well have reached a different conclusion if he had had the benefit of Arnold LJ's analysis.
- (5) This analysis is also consistent with Lufthansa's concession that apportionment is appropriate in the case of Safran. It was Mr Ryan's evidence that Safran generated revenues of £274,403,964 and profits of £21,995,669 on the sale of seats incorporating the EmPower System. But it did not purchase any of the Primary or Secondary Components or charge a mark-up on them or derive any direct profit from assembling them and fitting them into airline seats. If Lufthansa's legal analysis is correct, then Safran is liable to account for the entire profits. Safran was dependent upon Astronics to prove that it had an NIA and it could not demonstrate separately that the airlines would have agreed to accept airline seats which did not incorporate the EmPower Fusion system. This is because the choice of the EmPower Fusion system was either dictated by the airlines as BFE or dictated by Panasonic.
- (6) The Lufthansa team conceded in their Opening Trial Skeleton (at [335]) that installing EmPower Systems was not "a sufficiently effective or substantial or proximate cause" of Safran's revenue derived from its other manufacturing activities. I agree with the Defendants that this concession was a telling one. I also agree with them that Mr Cuddigan's attempt to row back from that concession was unconvincing. In my judgment, Lufthansa was right to make the concession and in the terms which it did because it would clearly be unjust to require Safran to disgorge its entire profit and inconsistent with the broad principle that the patentee

is only entitled to profits that have been earned by the use of their invention. An analysis of the claim against Safran and the concession rightly made by Lufthansa both support the application of the *Neo* test.

- (7) Finally, this is another issue which I would be reluctant to decide on a pleading point. But the Defendants were right to point out that Lufthansa's case in the Points of Claim against all three Defendants was that their acts or infringement "drove" the relevant transactions for the sale of the Primary and Secondary Components and the Ancillary Goods and Services: see ¶14D. In my judgment, this was a recognition that the *Neo* test applied not only to convoyed goods (the Secondary Components and the Ancillary Goods and Services) but also to the Primary Components themselves.

352. *Legal or proximate cause.* I also hold that in determining whether the test for causation is satisfied, the Court should apply the five propositions of law or principles which I have set out in [334] (above). It may well be that there is no real difference in practice between the *Neo* test and the tests which HHJ Hacon adopted in proposition (3). But in my judgment, the Court is not limited to testing whether the relevant component was functionally or commercially the most significant part of the whole (see HHJ Hacon's proposition (4)) although that will inevitably form part of the Court's evaluation. Equally, I am not satisfied that propositions (6) to (9) should limit the Court's evaluation of what drove the sale. Those propositions are principally directed at the perception of the purchaser and one of the critical issues in the present case was whether Astronics' infringement was fundamental or essential to certification of both the original and subsequent EmPower systems.

353. *Convoyed goods.* Mr Cuddigan conceded most clearly that the *Neo* test for legal causation applied to convoyed goods in the passage from his oral opening submissions (above). But in case there is any doubt in relation to this issue, I hold that this concession was correctly made and that the *Neo* test applies to the question whether the Defendants are liable to account to Lufthansa for the profits which they made on Secondary Components and Ancillary Goods and Services. I also hold that in determining whether this test is satisfied, the Court should apply the same principles as for the wider test for the legal or proximate cause of the profits.

354. *Burden of proof.* Finally, I turn to HHJ Hacon's proposition (10). I am not satisfied that Lewison LJ was intending to lay down an invariable rule that the evidential burden rests on the infringer in relation to all issues of causation on an account of profits. I accept that the existence of an NIA is more likely to be within the knowledge of the infringer rather than patentee. I also accept that, as in other areas of the law, the Court ought to give the patentee a "fair wind" in proving what profits were derived from the infringement. Finally, if the Court accepts that the profits from the sale of the product are derived from the infringement, then I accept that the burden passes to the infringer to prove that the infringement was not the proximate cause of any profits on conveyed goods.
355. In my judgment, therefore, the burden of proof was on Lufthansa to plead and prove that infringement was the proximate cause of the profits which it claimed (and Lufthansa accepted that burden in the Points of Claim). However, given that the Defendants relied on an NIA, there was an evidential burden on the Defendants to plead and prove that relevant alternative (and the Defendants accepted that burden by pleading the 1171M in their Statement of Case in relation to Alternative Products and later pleading the third - party products). Finally, I agree with HHJ Hacon that the evidential burden is on the Defendants to demonstrate that the infringement was not the proximate cause of the profits which they made on the Secondary Components and the Ancillary Goods and Services. However, I make it clear that the burden of proof was not decisive in relation to any of the findings which I have already made in this judgment or to which I make below.

## L. The Facts

### *(1) What was the scope of the invention and what is its relevance?*

356. The first task of the Court is to identify the invention of the Patent and I remind myself that the scope of the invention is not necessarily the same as the scope of Claim 1: see *OOO Abbott* at [8] (above). In relation to this issue, the dispute between the parties was not so much about the construction of Claim 1 or the way in which a skilled person would interpret the claim but whether the Court should treat the insertion feature as the inventive concept of the Patent or a combination of all three features of the Patent (although Mr Acland fairly accepted that the timing feature was really subsidiary to the insertion feature).

357. This dispute was primarily relevant to the certification issue (below) and whether the Court should find that the Patent was a “gateway” or “barrier” patent although I have also dealt with it in the context of the construction of Claim 1 (above). In their written Closing Submissions, the Defendants submitted that for the Patent to be treated as a “gateway” to regulatory approval, it could only do so by virtue of the combination of the features in Claim 1:

“123. In this Account, Lufthansa seeks to recover the entirety of the Defendants’ profits associated with the EmPower System by characterising the Patent as a “gatekeeper” – one which gave rise to a change in the regulatory guidance and opened up the market to sales of 110 V AC ISPS systems. There are numerous flaws in that analysis which we address in section x below. For present purposes, the key point is that Lufthansa’s evidence in relation to the Patent as a regulatory gateway eschews any reliance on the combination of features in claim 1. In particular it proceeds as if the remoteness feature as construed by Morgan J and the Court of Appeal (and which was essential for the finding of validity) can simply be ignored for the purposes of the Account. Lufthansa’s approach is plainly wrong. For the Patent to be a regulatory gateway to sales of 110 V AC ISPS systems, it can only do so by virtue of the combination of features specified in claim 1 – all of them.”

358. The Lufthansa team did not really dispute the submission that the inventive concept of the Patent included all of its features and they argued that there were references to the remoteness test in some of the documents. When he came to address this issue in his oral reply submissions Mr Cuddigan approached this issue as one of causation and submitted that the Defendants themselves would never have obtained certification without the Patent whether or not they relied on the remoteness feature. He also submitted that the remoteness feature was not mentioned in the regulatory material because it was always obvious that the ISPS would be located under the airline seats:

“MR CUDDIGAN: I was going to come on to my learned friend Mr Acland’s remoteness point, so we’re now in the patent, and Claim~1, right? Our regulatory case is like our infringement case -- subjective. What we say, it is focused on these defendants. Did these defendants need the patent, need Claim~1 to get certified? And there are two stages to the answer to that question. First, did EmPower systems, or did Astronics disclose remoteness and the insertion test, but that is not in issue here, did they disclose the remoteness feature to the FAA and to Boeing and Airbus? Was it part of their submission? Second, is it said that the EmPower system would have obtained certification without it? MR JUSTICE LEECH: That’s what I was trying to tease out of Mr Acland earlier. MR CUDDIGAN: Right. If the answer to both questions is yes, then it was

necessary to certification, and that is why my learned friend's clever point about, well, you didn't quote from the judgment in your cross-examination goes nowhere, because there is no counterfactual. There is no contrary proposition that we could have got by without it, so my learned friend quoted from Mr Repenning's oral evidence, Mr Repenning had referred to power not being present at the outlet. You were taken to the transcript where he said such that 110 volts AC power is not present at the outlet until a suitable plug is inserted in it." Now let's just probe that for a moment and see what it means. My learned friend's complaint was that, well, you haven't said where the power supply is, you haven't said it is underneath the seat, but what is the difference? My conversational remoteness was no power at the outlet unit until the insertion test has been passed, so all that is missing is -- where is it? As a matter of physical location, where does the power stop? If it is not being supplied to the outlet unit which is attached by wire, where does it terminate? Well, it terminates in the ISPS, right? If the ISPS was right next to the outlet unit, right where the passenger could get at it with their knitting needles, he would have a point. He could say we didn't need it, but it is not. It's under the seat. Nowhere is a different arrangement ever contemplated anywhere in the papers for this case. Was anyone ever under any misconception about where the ISPS was? No, because the FAA was told it was a separate unit and it as told it was told it was under the seat and the airlines knew that too. In other words, everyone knew that remoteness was satisfied at all times, so if you ask whether EmPower systems were described as having remoteness, as per Claim~1 in the documents submitted to the FAA, the only answer is yes, the whole safety document we looked at, if you look at {C4/67/7}, 1.1: "This document provides the results of a System Safety Assessment for the seat power module and the AC outlet unit". They are two different parts. So when the same document tells you where the seat power module is, and it is under the seat, you know the two are remote from each other, and, indeed, Airbus mandated it. Could we go, please, to {D3/57/31}. You will see there under "location" the electrical in-seat unit shall be installed under a seat."

359. In Wheeler 5, Professor Wheeler gave evidence that the inventive concept of the Patent was the insertion feature and I have accepted that evidence: see [285] (above). However, he was dealing exclusively with the insertion test and whether the scope of the invention of the Patent was limited to a casing to casing test or whether it extended more widely. He was not dealing with the separate question whether the scope of the invention extended to all of its features.
360. In my judgment, the inventive core of the Patent was safety and it had two features which were designed to achieve that objective, namely, the insertion feature and the remoteness feature. Morgan J included both features in the inventive concept of the Patent: see the Liability Judgment, [244] and [260] to [270]. Birss LJ also held that the purpose of the

invention was “to keep the supply device away from the socket and arrange things in such a way that there is no source of danger to the passenger”: see the Appeal Judgment, [70]. Moreover, I accept Mr Acland’s submission that if the Patent had not taught a combination of the two features, it would not have been inventive at all because *Sellati* already taught an insertion test. However, I do not regard the timing feature as part of the inventive core of the Patent and it was noticeable that throughout the proceedings the parties often referred to Claim 1 teaching two tests without any reference to the timing feature (or treating it as part and parcel of the insertion feature).

361. But whether the inventive core of the Patent was the insertion test or a combination of the insertion test and the remoteness test or, indeed, a combination of all three features, I am not satisfied that this answers the question whether the Patent was a “gateway” or “barrier” patent. If the Defendants could not obtain certification without infringing the Patent, it should make no difference that the regulatory authorities or the airlines focussed exclusively or predominantly on the insertion test. The Patent was still a barrier to entry into the market. On the other hand, if the Defendants only had to find a way round the insertion test and not the remoteness test, then this weakens the causative strength or effect of the infringement. In my judgment, therefore, the extent to which the regulatory authorities and the airlines required the Defendants to exploit both inventive concepts of the patent is one of the factors which forms part of the evaluative exercise which I must carry out to determine whether the infringement was the proximate cause of the relevant profits.

(2) *Was the Patent a “barrier” or “gateway” patent?*

(i) The 1999 Memorandum

362. The principal issue of fact between the parties was whether the condition in the 1999 Memorandum requiring that output power should not be present at the ISPS socket until the PED connector “is correctly mated with the ISPSS socket” was intended to be a reference to the Patent. Lufthansa submitted that this must have been a reference to the insertion test. The Defendants argued that it was a generic design feature and was intended to apply to both DC and AC power sockets and in support of this submission they argued that it was first introduced at the Study Group meeting in January 1999. Lufthansa disputed this contention and objected to the Defendants relying on the relevant

documents because of the late service of the Second CEA Notice.

363. I have set out the detailed history of the 1999 Memorandum. Mr Acland did not put his case to Mr Mosebach but put it to Mr Repenning instead. Indeed, it was obvious why Mr Acland put it to Mr Repenning and not to Mr Mosebach. This was because Mr Repenning gave evidence that the invention of the Patent was “fundamental” to the requirements of the 1999 Memorandum. He gave that evidence in his first report dated 5 July 2024 (“**Repenning 1**”):

“59. I am told by Jones Day that the invention in the Patent provides that the AC power is only supplied to the outlet once a plug is inserted into it, and the outlet effectively checks for a plug by checking that there are two pins present in the outlet (as opposed to, for example, one thin metal object). In a refinement, I understand that the system of the Patent checks that the two pins were inserted within a certain time of each other. This is also the system that I am told that Astronics' EmPower System used. It appears to me that this system design is fundamental to the system achieving the first of the FAA Memorandum requirements. Without those features, the unacceptable risks posed by the possible insertion of thin metal objects and the general danger of electric shocks would remain. That would not have been acceptable to the likes of the FAA, JAA and later EASA, as it would not have complied with the FAA Memorandum.”

364. Mr Acland took Mr Repenning very carefully through the development of the 1999 Memorandum. He began with the JAA Draft Policy, went through the documentary evidence relating to the Study Group Meetings and dealt with the various drafts of the 1999 Memorandum itself. At the end of this exercise Mr Repenning accepted that there was no change between January 1999 and October 1999:

“Q. And I think you were saying that the patented features came in at some later stage. A. Yes. Q. Yes. Okay. A. Yes. Q. When you say "came in at some later stage" do you have some idea of when that was? A. No. I'm not so oriented on the date, more on the content. Q. Yes. Okay. Well, let's just -- we do have some later versions of this, so let's just make sure we're not at crossed purposes. If you take {G/5/1} again -- sorry. {G/31/1}. Tell me when you've got G/31. So do you see this is draft JAA policy, and do you see at the bottom of the page on the left there's a date, 13 September 1999? A. Yes. Q. Yes? And I don't know, have you considered this document? A. I think I have seen this, yes. Q. Yes, and it looks to me to be essentially unchanged from the version of the policy that we just saw coming out of the July meeting. Is there anything that struck you as notable? A. I didn't do a word-by-word comparison, so -- you must put it side-by-side and identify each line, because there may be a different comma, there may be a different wording which you can't identify in the first look. Q. Okay. A.



But the basis, 80 per cent is at least same, maybe some more. Q. Certainly you can see the patented solution here. A. I think it goes to the direction that the PED -- outward power should not be present until the ISPS socket is fully connected. That could also be for the low voltage system, as mentioned. They identified the adapter and this -- yes -- it's -- Q. But we saw that language, "the output power shall not be present in the ISPS socket until the PED connector is correctly mated with the ISPC socket". We saw that in January -- the beginning of the year. A. Yes. Q. So there hasn't been any change, has there? Let's just make sure we cover off the other ones. If you go to {G/30/1}, the previous document, so we're now looking at 22 September 1999, and it is much the same, to my eye. I can't see any significant changes that have happened there. A. Yes. Q. And then finally, the previous tab, tab {G/29/1}, and tab 29 is now the agreed document. When I say "the agreed document", this is the settled policy, the settled -- it is settled as between the JAA and the FAA on 5 October 1999, and it is this document that is referred to in the October 1999 memorandum. Does that make sense? A. I strongly believe yes."

365. Mr Jouper was also cross-examined about the 1999 Memorandum. Mr Cuddigan suggested to him that the "mating" condition or guidance must have been introduced because of the KID SkyPower system:

"Q. Now what has happened, Mr Jouper, is that the features of the KID Système have made their way into the FAA memorandum? A. Yes. Q. And they are the two key features of claim 1 of the patent: remoteness, no power present at the ISPS socket when it is not in use, and the insertion test? A. Yes. Q. And this guidance has been added at the same time as the FAA have indicated that they are open to mains voltage systems? A. Yes. Q. And if we go back to the FAA memorandum at {D3/37/8} those are the additional criteria for the installation of 110-volt AC systems? A. I see that. Q. And those are additional to the general conditions that we have already looked at? A. The general conditions were for all systems, AC or DC. These are in addition to that for AC only. Q. Indeed. But, as we have seen, the general conditions were changed when the FAA for the first time permitted high voltage mains power? A. I would assume that they were at the same time but I didn't write that guidance, so ...Q. You have exhibited it to your statement. A. Yes. Q. And that was -- in fact you exhibited both the earlier guidance and the one that changed to the same -- at the same time? A. Yes. Q. So you accept that that change was made at the same time? A. Yes, roughly. Q. Can we go back to your statement, please, {D1/6/26}, paragraph 104. You have a section dealing with the certification of the classic AC system. Do you see that? A. Yes, I do. Q. And you say that Astronics completed certification and airframer approval in parallel using the same set of documents? A. Yes. Q. And that at 106, under paragraph 106 you list those documents, {D1/6/27}. A. Yes. Q. And at 107 you say that the first document was the response to the latest FAA memorandum issued in October 1999? A. Yes. Q. That is the memorandum we have just been looking at? A. Yes. Q. And then at 108

you say that this was largely based on the previous memorandum? A. Yes. Q. You say the majority of the qualification conditions were very similar to those listed previously? A. Yes. Q. And you say that the memorandum also described for the first time specific guidance on high voltage AC systems? A. That's correct. Q. And then those additional criteria are addressed at paragraphs 109-112 of your statement, {D1/6/28-29}. A. Yes. Q. Where do you address the changes under condition (a) in the FAA memorandum that we have just looked at? A. I'm not sure what you're meaning by the question. Are you looking for me to find it or you are telling me it's not there? Q. I don't think it's there. A. Okay. Q. So what we see is that right at the front of the memorandum there has been this change where the features of the Lufthansa patent are imported under the requirement that applies to the outlet that is intended to stop children accessing dangerous high voltage power with thin metal objects, that's now a requirement of the FAA. You worked through all the requirements that you say are applicable to the new -- your new AC system and you don't seem to address that one? A. That was inherent in our system from early on, even back to the DC systems, so it wasn't a new requirement for AC to address that. Q. Mr Jouper, we have seen that those features unlocked the regulator's refusal to accept AC power supplies. You've accepted that? A. No. Q. Right. The regulators accepted AC power supplies in the face of lobbying from Astronics about safety? A. Please can you repeat that? Q. The regulators accepted, they changed their position, they accepted AC power supplies for passengers in the face of lobbying from Astronics about safety? A. Yes. Q. You previously had a DC system which you have accepted was inherently safe because it was low voltage? A. Yes. Q. You have now moved to an AC system which is inherently unsafe because it is high voltage? A. Yes. Q. And you haven't addressed the requirement that the regulators imposed in relation to that AC system. You have just ignored it completely? A. I'm not sure what you're ... MR JUSTICE LEECH: Why don't you show him condition (a) again. MR CUDDIGAN: I can read it to you. You accepted that the condition (a) was the power should not be present at the outlet until a conventional mains plug was correctly mated with the outlet socket. That was what was required in relation to an AC system. A. It was in relation to all systems and we have always had that feature so we've never needed to readdress that. Q. Mr Jouper, that requirement took on a very different meaning in the context of mains voltage AC power. Your DC system was inherently safe. Your company resisted the change to AC because they said it was inherently unsafe. Lufthansa got a patent for a safety outlet for mains voltage and your evidence in relation to how you obtained certification for AC voltage utterly ignores the features of that patent? A. We're not ignoring it. Q. If you can show me where in your statement you address that feature of the AC -- of your AC system I would be grateful. A. The document which you're referring to, the D117203 document, if we can pull that one up. I'm not sure which tab that is. Q. Right, you are referring to one of the exhibits? A. Exhibit JJ32. Q. To be fair, I absolutely accept the feature is discussed or disclosed in your exhibits. What I was putting to you was that in the narrative evidence you give in your witness statement you have excluded it? A. My understanding of the FAA requirements was those three items at

the end were those that were in addition that you needed to do in order to certify a 110-volt system. That's my interpretation of that.”

366. The Defendants submitted that the “mating” guidance or condition was introduced in January 1999 and at a time when the Study Group was recommending that low voltage DC output should be used. Mr Cuddigan vehemently contested this in the course of oral argument and argued that the condition was introduced much later and, therefore, at a time when the Study Group had accepted that AC power was permissible. He made great play of the failure to serve the Second CEA Notice on time and suggested that there was a real doubt about the reliability of the documents.

367. I accept the Defendants’ submission on this issue and I find that the “mating” guidance or condition was introduced at a time when the Study Group was recommending the use of low voltage DC power only. Moreover, I am satisfied that the documents were clear and straightforward and that there was no mystery about the date on which the condition was introduced. I have reached these conclusions for the following reasons:

- (1) On 10 February 1999 Ms Fairbank circulated the draft minutes of the meetings on 6 and 7 January 1999. The contents of the minutes recorded in terms that the Draft JAA Policy had been amended at the meeting and enclosed a copy of the amended draft. Moreover, paragraph 2.1 stated in terms that condition a. had been amended and that Attachment 2b contained the text of those amendments. Finally, Attachment 2b was clearly labelled as such and stated in the top right and corner “6<sup>th</sup> and 7<sup>th</sup> Jan Mtg”.
- (2) Mr Cuddigan advanced no reason why the Court should not accept the documents at face value. Ms Fairbank circulated them only three weeks after the meeting and the contents of her fax suggest that careful notes of the meeting were kept. Moreover, Mr Acland put both the minutes and the attachment to Mr Repenning, Lufthansa’s expert on regulatory matters, and if he had any reason to doubt the accuracy of the minutes, he had an opportunity to give that evidence.
- (3) Moreover, Mr Mosebach was recorded as being present at the meetings on 6 and 7 January 1999. If the minutes were not accurate, I would have expected him to give evidence that effect. But he did not do so. Lufthansa complained that these documents should have been put to him (and opposed the extension of time for the

Second CEA Notice on that basis). I disagree. If Lufthansa wished to advance a positive case that the “mating” condition was introduced at a later stage, it could and should have adduced evidence from Mr Mosebach to that effect. I, therefore, accept that the minutes were accurate.

- (4) It is fair to say that Mr Jouper accepted that features of the SkyPower system had made their way into the 1999 Memorandum. But when the “mating” condition was put to him specifically, he stated that it was a condition applicable to both AC and DC power. I accept that evidence and place little or no reliance on his first answer. His first answer was consistent with the contemporaneous documents and I found Mr Jouper to be both a reliable and fair witness. In particular, I do not accept the criticism which Mr Cuddigan put to him that he was being selective or partial in his evidence.
- (5) The revised version of the JAA Draft Policy circulated by Ms Fairbank expressly stated that the use of DC output voltage was recommended for the purpose of protecting occupants of aircraft against the hazards of electric shock: see Attachment 2b, condition d. It is clear from the contemporaneous documents that the Study Group only approved the use of high voltage AC power at the meeting on 15 July 1999 and that a separate set of conditions were added to the JAA Draft Policy as Appendix A.

368. I find, therefore, that the “mating” condition 1999 Memorandum was not introduced to require compliance with the insertion test. I also find that the 1999 Memorandum did not require compliance with the remoteness test. The Lufthansa team did not draw my attention to any document which contained such a provision or submit otherwise. Having reached this conclusion, however, I accept that the “mating” condition took on a different significance once the Study Group had accepted that ISPSS systems could use high voltage AC power to supply PEDs (as Mr Cuddigan put to Mr Jouper). I return to this point immediately below in the context of the KID presentation.

(ii) Other conditions

369. Mr Jouper gave very detailed evidence in Jouper 4 about the other technical and safety requirements which GD and Astronics had to satisfy to obtain approval of the various EmPower systems. None of this evidence was challenged in cross-examination and in

their written Closing Submissions the Defendants included a table of twenty-four conditions (including the mating condition) which had to be approved before certification could be obtained. Again, Lufthansa did not challenge it in closing and I accept it. I find, therefore, that the Patent provided the answer to one single safety requirement and that Astronics had to satisfy a further twenty four conditions in order to obtain certification.

370. The Defendants also cited *IPC Media Ltd v Highbury-SPL Publishing Ltd* [2004] EWHC 2985 (Ch) as authority for the proposition that the Court should not lose sight of the other hurdles which any manufacturer would have to overcome to achieve certification. Again, Lufthansa did not challenge that submission and I accept it. I am satisfied, therefore, that compliance with the “mating” condition was only one of the factors which I must evaluate in deciding whether the infringement was the proximate cause of the relevant profits.

(iii) The KID presentation

371. On the other hand, I find that the presentation made by KID of the SkyPower System was instrumental in persuading the Study Group to accept that ISPSS systems could use high voltage AC power to supply PEDs. On 17 June 1999 the presentation took place and on 15 July 1999 the JAA Draft Policy was changed to permit high voltage AC power. In my judgment, this was not a coincidence. Moreover, in reaching this conclusion I attach significant weight to the internal emails dated 28 April 1999 and 4 May 1999 which I have set out above. GD clearly anticipated that this would be the effect of the KID presentation and lobbied against it (as Mr Jouper accepted).

372. Furthermore, I find that the only means by which GD (and later Astronics) was able to comply with the “mating” condition was by adopting the insertion feature of the Patent. The Defendants adduced no evidence to persuade me that there was an NIA available to GD or Astronics to comply with the mating condition at any time between 1999 and 25 August 2016 when Intellicabin was approved by the FAA for use in the Boeing 787-8. I have held that the 1171M, the IFPL 1225 and PowerBox would all have infringed the Patent and the Defendants could point to no other NIA apart from Intellicabin (which did not make use of the remoteness feature). Furthermore, Mr Barovsky was unable to point to any other product which might have enabled GD or Astronics to obtain certification:

“MR CUDDIGAN: I want to discuss with you the question whether

Astronics could have achieved certification and approval for an AC passenger power supply system without infringing the Lufthansa patents; okay? A. Okay. Q. In other words, could they have satisfied the FAA and Airbus without infringing? You have reviewed many of the materials in this case and you have reviewed the fourth witness statement of Mr Jouper, haven't you? A. Yes, I have. Q. Which is where you got your information about the theoretical product. First, can we consider this question on the basis that the scope of claim 1 is such that it covers almost completely inserted? Let's say up to 0.1 of an inch of gap. A. So ignore the ruling of the court? Q. Yes. Ignore your reading of the ruling of the court, exactly that. MR JUSTICE LEECH: That's a matter for me, Mr Barovsky. MR CUDDIGAN: Do you understand what I'm asking you? A. Yes. Q. Have you seen anything in the materials of this case which indicates that Astronics could itself have achieved certification and approval for an AC passenger power supply system without falling within claim 1 in those circumstances? A. I believe I have. Q. What have you seen? A. Well, I believe that if you follow and work through the guidance material you can still -- as long as you can show an equivalent level of safety to the requirements, I believe that the product can be certified. Q. I do understand that as a matter of generality you think that it can be done. A. Yes. Q. I was asking a slightly more specific question. Have you seen anything to indicate Astronics itself could do it? A. I guess I'm not sure, but yes, I believe Astronics can do it. Q. Are you able to point to anything that you would rely on as demonstrating that this was something that Astronics could have performed? A. They met the requirements; they met the requirements of plug detect; they provided levels of safety; they had safety features that complied with the FARs, the JARs; so as long as you can work your way through all of that, yes, you could certify a product. MR JUSTICE LEECH: Are you asking about a specific product? MR CUDDIGAN: I was asking the question in general."

373. I accept Mr Barovsky's evidence that it would have been theoretically possible to obtain certification without infringing the Patent because it was not a requirement of the 1999 Memorandum that a manufacturer had to adopt the insertion feature (or, indeed, the remoteness feature). But I attach significant weight to the fact that in expressing his expert opinion, he was unable to identify any other technical solution which would have enabled Astronics to avoid infringement. I also rely on D1191-207 which contained GD's Safety System Assessment of the EmPower Fusion system and, as the Defendants concede, that provision was intended to address the 1999 Memorandum.
374. I have set out paragraph 3.3 above and, in my judgment, it was referring to the insertion and timing features of the Patent. When Mr Acland put paragraph 3.3 to Mr Repenning, he did not suggest otherwise but only that the implementation of the plug-in detection device described in that paragraph involved two software features and therefore required

a lower degree of assurance than hardware features. Mr Repenning accepted this and when I come to evaluate the causative potency of the Patent I bear in mind that it was not a safety feature which required the highest degree of assurance.

(iv) Airframe manufacturer approval

375. *Boeing*. In their written Closing Submissions the Lufthansa team submitted that Boeing required the use of the features of the Patent and they relied on the evidence of Mr Jouper. By comparison, in their written Closing Submissions the Defendants pointed out that Mr Repenning had not relied upon any of the requirements in Boeing's specification D6-3440 introduced in September 2003 as being referable to high voltage systems. They also relied on the unchallenged evidence of Mr Brady that it was perfectly possible for companies to sell a product successfully to one airframe manufacturer and not to the other. They submitted that the "Patent cannot conceivably be said to represent a barrier to the market where it was not a requirement for installation on Boeing aircraft".
376. I accept Lufthansa's submission and I reject the Defendants' submission on this issue. Mr Repenning gave evidence in Repenning 2 that the invention of the Patent was relied upon to satisfy Boeing that its technical requirements for the AC ISPS systems had been met and in giving that evidence he relied upon Document D1248-247. The Defendants did not challenge that evidence although they made the point that 3.2.9 and 3.3.3 (above) were referring only to the insertion test and not the remoteness test.
377. When Mr Jouper was cross-examined about the 1171 Twist Lock and Document D1171-221 (Rev A) he accepted that GD (and Astronics) expected all three of the inventive features of the Patent to be necessary to obtain certification:

"Q. You also exhibit a safety assessment document which is at {D3/55/1}. And if we go forward to health and safety on page {D3/55/13} towards the bottom of the page there, the very first requirement is: "Cabin system equipment shall be designed to adequately protect flight crew, cabin attendants, maintenance crew and passengers from injury due to moving parts, electrical shock ..." And Astronics' submission as to why that is satisfied starts: "Passenger contact with [outlet unit] power contacts is prevented by a latching shutter and power switching that removes power from the [outlet unit] when a valid plug is not inserted." Do you see that? A. I do. Q. So passenger contact with outlet unit power contacts, that is children with thin metal objects, isn't it? A. Yes. Q. And you relied on all three of these features to address this concern: shutters, remoteness and the insertion test? A. That, yes. Q. Can we consider the shutters. The 1171

outlet had shutters which retracted when a plug was partially inserted and then twisted? A. Yes. Q. And that was a safety feature? A. It was a safety feature, yes. Q. And it was a safety feature which was intended to and did in part address what we have called the knitting needle problem? A. Yes. Q. And there were three other features which addressed that knitting needle problem. The first was remoteness: there was no power in the socket when it wasn't in use? A. Yes. Q. The second was the insertion test: you needed to put something in both of the live and the neutral pin receptacles before the power would be turned on? A. Yes. Q. And the third was the timing test? A. Yes. Q. And at the beginning of 1999, I have already put it to you, you don't have to respond again, it is our position that the view inside Astronics was that an AC ISPS would be too dangerous to get certified and approved but when these documents were lodged with the FAA in 2002 it was Astronics' expectation that all these features were necessary to obtain certification? A. These features and many others, yes. Q. And when these documents were sent to Boeing in 2002 it was Astronics' expectation that all these features were necessary to obtain their approval? A. Yes, among other things, yes. Q. But to be clear, you knew that if you didn't have these features you had no chance of getting approval? A. This was our approach to it. It doesn't necessarily mean there were not other ways of doing it."

378. Document D1248-247 related to the later stage of integration with IFE and the Defendants were right to point out that Mr Repenning was not able to refer to any earlier documents in which GD or Astronics relied on the features of the Patent to obtain approval under D6-3448. Moreover, Document D1171-221 (Rev A) was prepared to obtain certification of the 1171 Twist Lock from the FAA. Given the limited documentary evidence to support Lufthansa's case, I have considered whether I should give little weight to Mr Jouper's evidence that all three inventive features of the Patent were necessary to obtain Boeing's approval of the EmPower Classic system and put it down to a clever piece of cross-examination.
379. After some reflection, I accept Mr Jouper's evidence at face value and I attribute substantial weight to it. He was an honest and careful witness who answered questions directly and in a straightforward manner. I have no reason to believe that he did not understand the question which he was being asked or consider the answer before he gave it. I find as a fact, therefore, that it was necessary for GD to rely on all three inventive features of Claim 1 to obtain approval for the EmPower Classic system and that Astronics would not have obtained approval from Boeing for the EmPower Fusion system if it had not continued to use those inventive features in the 12xx series.
380. However, I also accept Mr Jouper's evidence that these features were among many others



which had to be satisfied before GD obtained Boeing's approval. Mr Brady identified 13 environmental tests and 23 electromagnetic tests which GD had to satisfy before it obtained approval. He stated that many of these were required because failure to comply with them could result in safety threats which included a threat to the aircraft. Lufthansa did not challenge this evidence and I accept it. Moreover, Lufthansa did not suggest that GD had to use the inventive features of the Patent to satisfy any of these 36 tests. I find, therefore, that although it was necessary for GD to rely on the inventive features of Claim 1 to obtain Boeing approval for the EmPower Fusion system, GD and then Astronics had to satisfy 36 additional safety tests which were unconnected with those features and that any failure to comply with those tests might result in a safety threat.

381. *Airbus*. The Lufthansa team also relied on the evidence of Mr Jouper in support of their submission that Astronics relied on the feature of Claim 1 to obtain the approval of Airbus. The Defendants challenged this submission on the basis that no mention was made of the Patent in TS0011 and that if compliance with the Patent had been a requirement of approval, this would have been expressly stated. They drew a comparison with TS0010 (above), which required the manufacturer to obtain a licence for the GD power management patents.
382. Again, I accept Lufthansa's submission and I reject the Defendants' submission on this issue. Mr Repenning gave evidence in Repenning 1 that TS0011, Appendix 2, section 10 (above) was referring to the technical solution of the Patent and when Mr Jouper was asked about this document he accepted that he understood Airbus to have adopted the insertion and timing features as requirements for approval:

"Q. And then it says this: "For 110VAC only. Outlet power shall be available only if both pins are inserted at the same time and if the matching plug is fully engaged in the outlet unit." Do you see that? A. I do. Q. So Airbus was distinguishing between requirements for DC system and requirements for AC systems? A. Correct. Q. And in respect of the DC system you could satisfy that with a hypertronics connector? A. Agreed. Q. But for an AC system Airbus had adopted the two key features of the Lufthansa patent and included them as requirements in its technical specification? A. Could you please repeat that? I'm just ...Q. Yes, absolutely. In respect of the AC system -- so I am asking you to look at the highlighted sentence. A. Yes. Q. Airbus had adopted the two key features of the Lufthansa patent and included them as requirements in its technical specification? A. It says that both pins must be inserted and -- yes, and then output powers supplied. Q. Inserted at the same time and the

matching plug is fully engaged in the outlet unit? A. Yes. Q. So I'll ask the question again. In respect of the AC, the Airbus's AC system Airbus had adopted the two key features of the Lufthansa patent and included them as requirements in its technical specification? A. It's hard for me to understand if that's coming from your patent or LHT's patent or if that's their requirement or -- Q. It is definitely their requirement. A. Yes. Q. Right. You don't have to -- I am not asking you where they got it from. I know you don't have an understanding of why Airbus put this in, but what I am putting to you is that the Airbus requirements equate to the two key features of the Lufthansa patent? A. Roughly, yes. I'm not -- to me, I'm feeling as though I'm trying to opine on whether these are exactly the same as how it's written in a patent and I'm not sure that I can necessarily answer that directly. In general, yes, but not -- if you are looking for a definitive -- Q. It is absolutely fair. I am not asking you a question as a lawyer, but as an engineer that is what you understood the position to be? A. Roughly the same, yes. Q. And so you maintained those features in your Airbus AC plus system, didn't you? A. We did, yes. Q. And those are the same features that have been introduced into the FAA guidance in October 1999? A. Yes, roughly the same."

383. Mr Cuddigan also put the exchange of emails dated 24 March 2004 and 30 March 2004 between Mr Dueser of Airbus and Mr Hettich of Astronics to Mr Jouper. He accepted that in that exchange Mr Dueser was challenging the 1235 xx series because they did not comply with the insertion test:

"Q. And then at the bottom of that page he sets out, under the heading "Requirements", he quotes firstly from the technical specification -- Airbus technical specification, which you quoted from in your witness statement: "... in-seat power supply system should be designed to provide circuit protection ..." Et cetera. I am sorry, that is the FAA, isn't it? And then if we keep going over the page, {C4/19/3}, those are the FAA requirements, including: "output power should not be present at the ISPSS socket until the PED connector is correctly mated ..." And then over the page, we have the Airbus requirement which includes: "Output power shall be available only if both pins are inserted at the same time and if the matching plug is fully engaged." Okay? A. I see that. Q. That was quite a serious challenge from Airbus. He is saying that the new Astronics' product is non-compliant with both the core FAA guidance and the Airbus specification? A. That's what he is saying here, yes. Q. And then if we turn forward and go to page 9 {C4/19/9}. MR ACLAND: I think the whole thing is fine. MR CUDDIGAN: I am grateful. If we go forward to page, {C4/19/9}, what has happened is that Mr Hettich of Astronics has added comments in bold to Mr Dueser's email, okay? A. Yes. Q. And response under number 1, he says: "Only when connected to the ISPS and specific operational/safety conditions have been met will power be provided to the Outlet." So that's saying there is a remoteness feature, that there is a test going on and only when that test is passed will power be supplied to the outlet. Do you see that? A. I'm just reading, just one moment. (Pause). I see that. Q. And then

over the page, {C4/19/10}, under -- also under number 1 -- sorry, excuse me, under number 2, Astronics relied on the timing feature of claim 2 of the Lufthansa patent. Do you see that? A. I see the timing feature. But it doesn't necessarily it is from the patent, but -- Q. But you are aware, aren't you, because you have redesigned -- you are involved in the redesign of this? A. Yes. Q. You are aware that that is the timing feature of claim 2 of the patent? A. Correct. Q. Yes. A. However, the only issue I have with that is whether that timing feature in the patent actually stated a particular period of time versus the period of time that we are using. So does that fall within the patent or not? I wouldn't say that it necessarily does. Q. Indeed, I am not asking you to make that concession, but thank you, Mr Jouper. Turn forward, please, to page {C4/19/12}, and Mr Hettich addresses the Airbus requirement about power only being supplied if both pins are inserted at the same time and if the matching plug is fully engaged in the outlet unit. And his response is: "Comply. Definition of fully [engaged] is within .1 [inch] of faceplate." You see that? A. Except it says "fully inserted". Q. Sorry, "fully inserted", yes. You're right. A. I see that, yes. Q. Fully inserted -- we can see fully inserted and fully engaged mean the same thing? A. Not always in everyone's context. That is why I would like to be clear. Q. I see. Well, let's take that statement in steps. Mr Hettich was equating fully engaged and fully inserted, wasn't he? A. Yes. Q. And do you accept that he was right to do so? A. I don't have an issue with what he said there, no."

384. The exchange between Mr Dueser and Mr Hettich shows that TS0011 was referring to the insertion and timing features of Claim 1 and Mr Jouper accepted this without qualification in his oral evidence. In the light of this evidence, I find as a fact that it was necessary for Astronics to rely on the insertion and timing features of Claim 1 to obtain approval for the EmPower Fusion system from Airbus and I attach no weight to the fact that Airbus did not refer to the Patent expressly in its technical specifications.
385. On the other hand, Mr Jouper did not accept that TS0011 required Astronics to satisfy the remoteness test and Mr Cuddigan did not pursue that point with him. Mr Brady also gave unchallenged evidence that Airbus's technical specification strongly recommended that the manufacturer should design safety critical features or functions in hardware and that the requirement in TS0011 that output power should be available only if both pins were inserted at the same time and fully engaged was categorised as a "Minor D" safety feature which "would not significantly reduce airplane safety". Mr Brady also referred to the table in TS0011 at 3.6.6.1 which identified seven "Major C" safety features and one other "Minor D" safety feature which Airbus required to be satisfied for 110V AC power supply systems.

386. I find, therefore, that it was not necessary for Astronics to rely on the remoteness feature of Claim 1 to obtain approval from Airbus for the EmPower Fusion system and that the requirement for use of the insertion and timing features was a not a safety critical feature or one which significantly reduced airplane safety. I also find that the EmPower Fusion system had to satisfy seven major safety critical requirements and one other minor requirement in order to obtain approval. Again, these are findings which I must take into account in assessing the causative potency of the Patent.

387. I have found that the 1999 Memorandum did not refer to the features of Claim 1 but that the KID presentation was instrumental in persuading the Study Group to accept that ISPSS systems could use high voltage AC power to supply PEDs. I have also found that GD and Astronics relied upon all three features of Claim 1 to obtain approval for the EmPower systems from Boeing and the insertion and timing features to obtain approval from Airbus. For these reasons, therefore, I am satisfied that the Patent was a “gateway” or “barrier” patent in the sense that Astronics could not have developed or manufactured or sold the EmPower Fusion system without infringement.

(3) *Were the Components an essential feature of the EmPower System?*

388. It was Lufthansa’s case that the Components were an essential feature of the EmPower System. By contrast, it was the Defendants’ case that the Components were not an essential feature of the EmPower systems either functionally or commercially and they pleaded a wide range of other factors which drove the sales of those products.

(i) The pleading point

389. In my earlier judgment I refused the Defendants permission to amend the Defence to rely on their power management systems and the GD AES Patents as a key technical barrier to entry into the market: see [2024] EWHC 1918 (Pat) at [32] and [84] to [87]. One of the reasons which I gave for refusing permission to amend was that the Defendants did not rely on “functional non-essentiality” as a defence on causation but only on “commercial non-essentiality”: see [84](1). In his oral opening submissions Mr Cuddigan submitted that the Defendants were not permitted to place any reliance upon power management.

390. I reject that submission. The Defendants have always pleaded that the Components were

not functionally essential to the EmPower Systems and that its power management systems were “independent of and unconnected with the inventive concept” of the Patent: see the Points of Defence, ¶23(a). Moreover, this was the first pleaded factor upon which the Defendants relied in support of their case for apportionment and, in my judgment, they were entitled to argue both that the Patent was not an essential feature of the EmPower System and that their own invention was of equal (if not greater) commercial significance as Lufthansa’s invention. What they were not entitled to do was to advance an argument or call evidence to prove that the GD AES Patents were “gateway” or “barrier” patents which would have operated in the same way as the Patent to prevent competitors entering the market.

(ii) Functional significance

391. There appeared to me to be no real dispute that the three Primary Components were functionally essential to the EmPower Fusion system itself or to power only sales by Astronics to the airlines. But in any event, Morgan J held that those Components were essential in the Liability Judgment: see [274]. There was, however, a dispute between the parties whether the Primary Components were functionally essential to IFE systems and, in particular, those supplied by Panasonic.
392. Mr Mosebach gave evidence in Mosebach E1 that the Primary Components were functionally essential to an IFE system and that airline customers would return the Secondary Components if the Defendants were unable to supply the Primary Components. Mr Brady gave evidence in Brady 2 that the Primary Components were functionally essential if the only thing to be installed was an AC power system but that this was not the case either for a Phase 1 or Phase 2 integrated IFE system or after full integration. Mr Brady maintained his evidence in cross-examination:

“Q. And you describe it in paragraph 37 of your first statement, which is {D2/4/11}. You remark at sub-paragraph (b): "Aircraft manufacturers wanted to reduce their design effort, manufacturing effort and the weight required to provide both IFE and PED power." A. That is correct. Q. And that they recognise that the MCU incorporated in the PED power systems -- into the PED power systems could also provide power for IFE and motorised premium seats. A. Yes, they recognise that a single power distribution for a cabin would have many advantages for the aircraft manufacturer and reduce the total weight of the systems being installed into the aeroplanes. Q. Yes, there was as a result an extension in the functionality of the PED power system? A. I would not agree with that

characterisation. Q. Okay, let's consider it. Before the integration there was PED power at the aircraft seats and there were ISPSs at the aircraft seats, and they were all connected to -- well, in a significant or large installation they were connected to MCUs. A. That is correct. Q. Then after integration, what happened is those MCUs were given additional functionality and, in particular, they were then providing power for IFE and motorised premium seats? A. I'm not sure I would characterise it as providing additional -- they were given additional responsibility, their programming parameters changed, but the device itself, I was unaware of any changes that had to be made. Q. Right. Let me rephrase the question: there was an extension in the responsibilities of the PED power system? A. I would again disagree. Installing the MCU had nothing to do with whether the aircraft had PED power or not; it was therefore not an extension of the PED power system. Q. I see. I don't want to get bogged down in semantics, but I think you've agreed with me that prior to phase 1 integration there were MCUs serving ISPSs? A. There were MCUs with separate -- MCUs attached to separate circuit breakers with separate wiring going into in-seat power control units, yes. Q. And the only purpose at that stage of those MCUs was in service of the in-seat power facilities? A. That is correct. Q. Right. And you would agree with me that after the first -- pursuant to the phase 1 integration there were MCUs providing that same functionality, they were serving power to ISPSs? A. Your statement indicates that that was their intent and purpose, which was not at all the case. Q. I was talking about their function. A. Their function was to distribute power. Q. Right. The question wasn't so limited, Mr Brady. They were distributing power to ISPSs? A. They were distributing power to the cabin, which could optionally have IFE, seat motors and actuators and nothing else. IFE and PED power, they were all optional end points at that stage. Q. But when you had AC power at the seat, in a first phase 1 integrated system, there would be MCUs providing power to the ISPSs? A. If you are asking if I was only installing PED power, would I have utilised those same MCUs, yes, of course."

393. I prefer Mr Brady's evidence on this issue and I find that the Primary Components were not functionally essential to the sale of IFE systems. In particular, I accept his evidence that the AMCU was distributing power to the cabin and could have distributed power to IFE, seat motors and actuators without supplying power to a PED. His evidence was clear and Lufthansa adduced no technical evidence from Professor Wheeler to suggest that he was wrong. In my judgment, Mr Mosebach's evidence was not directed to functional essentiality but to commercial essentiality which I consider further immediately below.
394. Accordingly, I hold that the Defendants' case is made out and that the ability to supply AC power to PEDs was incidental and not essential to the overall function of the EmPower systems in providing power to IFE systems and, in particular, during Phase 2 integration and then after the market was fully integrated. Moreover, I consider this

finding of fact to be consistent with the findings made by Morgan J in the Liability Judgment. The judge found that the essential Components were the ISPS, the socket and power and signal cables and that the MCU was an optional Component: see [274].

(iii) Trite or commonplace

395. Lufthansa also advanced the case that the functions of the GD AES Patents and Astronics' power management system were trite or commonplace: see the Reply, ¶6. In their written Closing Submissions the Lufthansa team also submitted that Professor Wheeler had given unchallenged evidence to that effect. This submission was somewhat ironic since they had vehemently (and successfully) objected to the Defendants' application for permission to rely on the strength of those patents. But in any event, I reject that submission. Mr Acland put to Professor Wheeler that he had only been considering "load-shedding" systems and not the "load-limiting" system embodied in the GD AES Patents. Moreover, Professor Wheeler could not identify any common general knowledge which referred to this kind of system.

(iv) Commercial significance

396. The real issue between the parties was whether the power management function or functions of the EmPower system was of equal or greater commercial significance than the features of Claim 1. The Defendants relied on TS0010 and the evidence of Mr Robert Gleason, Panasonic's Senior Director of Product Line Management, In-Flight Systems. He gave evidence that in 2011 Panasonic considered five selected potential suppliers for a new SPM for the Airbus A350 aircraft including Astronics and a competitor called TDI Power Inc ("**TDI**"). His evidence was that he was shown the text of TS0010 at the time and his understanding was that if a manufacturer wanted to sell IFE on an Airbus aircraft, it had to include this particular technology.

397. Mr Gleason also gave evidence that TDI's "rolling black out" technology was unproven at the time and required considerable work and expense to achieve qualification and offerability and that the competing bid from Astronics represented significantly less risk to Panasonic because it was the only supplier which met all the qualification and offerability requirements on both Airbus and Boeing aircraft, that Astronics had a high reputation from a technical perspective and that it was able to charge a premium price because Astronics had the intellectual property in the power management system and the

experience and expertise.

398. The Defendants also relied on three articles in a trade journal dated 9 September 2014, 4 November 2014 and 5 October 2015 as evidence that its power management patents were of equal or greater significance than the Patent. Moreover, Mr Muirhead accepted that there was no comparable evidence in relation to the Patent:

“Q. And if we could go to {D3/105/2}? This is a Runway Girl article from 4 November 2014, and you will see that it involves, among other things, an interview with Astronics' Executive Vice-President, Mark Peabody, and Mr Markert, and if you look at the paragraph, if we can blow it up in the middle of the page: "So how does ..." So they are talking about entry into the market, and if we look at the paragraph: "We know that BAE systems is preparing to roll out its new in-seat power system ..." Do you see that? Because we're approaching the end of the patent period for the Astronics patents. A. Yes. Q. "I sat down with Astronics' Executive Vice President Mark Peabody and Mr Markert to learn whether Astronics, which owns some clutch and tightly held patents for aircraft power systems -- is seeing anything that might tread on its IP". Then I'll ask you to read the next two lines to yourself: "So how does Astronics respond to this sort of thing? We start with a back room conversation, and say "let's figure out how to work it out", says Peabody. If that doesn't work, make no mistake about it, Astronics does not fear litigation. We will vehemently defend out [sic] IP and we have". If I could ask you to look at {D3/109/9}, this is a further article of 5 October 2015 in the Runway Girl publication, and at page -- Opus page 9 {D3/109/9}, blow it up, the last paragraph before the banners at the bottom of the page: "Airlines and seatmakers need to watch and work in this space carefully. Astronics' vast trove of in-seat power patents have kept its AC power dominance in play ..." Do you see that? A. I see that, yes. Q. Now, there's not a single article in this case that has been introduced into evidence of any similar or comparable discussion of the advent of your so-called "gatekeeper patent" in 2000 or thereafter? A. I can only assume that that is a policy of Astronics to talk a lot about their patent portfolio in the market because that's not something typically -- we talk about products and less about patent portfolio in the market. We wait until we have hard evidence before we litigate, so I can only assume that Astronics likes to spend a lot of time talking about their patent portfolio. Q. If LHT genuinely considered it had the benefit of a gatekeeper patent it would be something to commercialise, wouldn't it, and it would be a selling point of your product? A. I believe in the marketing material from KID that that is referenced, but as I say, I don't have it in front of me. Q. But you agree that that would be something -- a selling point that you would want to commercialise and you would want to make known? A. Yes, and on brochures that we produced I'm also pretty sure that we had that on there as well, but did we make big press announcements about it? I'm not sure. Q. You wouldn't have been averse to blowing your own trumpet a bit, not only as a senior executive responsible for commercialising the product, but also as one of the co-inventors of the patent? A. We have other products



where we have numerous patents on them. We generally talk about the products and less about the patents, to be very honest. I would say that's perhaps a different policy of the two companies.”

399. To meet this point, the Lufthansa team relied on a number of Astronics' internal marketing documents including a proposal to Babcock & Brown on behalf of SkyMark Airlines dated 13 January 2009, a proposal to [REDACTED] dated 15 January 2010 and a proposal to [REDACTED] dated 16 April 2012 all of which described the outlet unit as a “unique safety feature”. Mr Cuddigan put a number of these documents to Mr Markert:

“Q. So safety and reliability are very much emphasised there? A. Yes. Q. And you're emphasising those because they are priorities of the airlines? A. That is correct. Q. And then over the page, {CXX/2/5}, we have looked at those quotes already, page 5, and again, the quote at the bottom. And Astronics highlights, doesn't it, that nearly all AC plug types in use around the world are accepted? A. Almost all, yes. Q. And then moving forward to page 6, please, {CXX/2/6}, you see the list of features that are called out there? A. I do. Q. Left-hand column: high power, compatibility with plugs and safety features? A. Yes, I see that. Q. And then forward to page 8, please, {CXX/2/8}. We see the MCU being referenced as something that customers will need to purchase if they are going to supply their passengers with AC power? A. For this proposal, yes, we proposed this. The system has been installed without an MCU on specific installations but in this case we proposed this to jetBlue. Q. Yes, absolutely. The point is, what you are saying to them is, "If you want to provide your customers with AC power, we suggest you buy an MCU"? A. Yes. Q. And then two pages further, {CXX/2/10}, this is page 10 ...Sorry, page 9, {CXX/2/9}. There are more safety features referenced and then now at the bottom half of the page there is a reference, do you see, to a unique safety feature of the AC ISPS being the outlet unit? Do you see that? A. I do. Q. "The AC ISPS only supplies power to the user if both prongs of the user's AC plug are inserted simultaneously. This ensures that if foreign objects are inserted into the AC Outlet Unit, no power will be supplied at the outlet." That feature was present in the KID system, wasn't it? A. I believe it to be the case. Q. Yes, because it is the system of the patent, isn't it, Mr Markert? A. We've had plug -- we considered this plug detect. We've had plug detect all the way back to our first DC system. Q. Yes, but the DC system -- A. So the reference here was when we were speaking to customers to assure them that no power was at the outlet unit, the system was safe along with all of the other plethora of safety features. Q. Yes. I mean, these documents are typical of your pitches to the airlines? A. Typical, but they change over a period of time. As the market changes, as customer requirements change, they tend to change. Q. Very good. But it's, let say, typical in 2009? This was the sort of thing you were saying to the airlines? A. Yes, that's correct, yes. Q. And the document reflects Astronics' own understanding of the airline's priorities? A. Yes.”

400. Lufthansa also relied on the evidence of Mr Seager and Mr Gleason that passengers, airlines and even Panasonic itself expected AC power in the cabin of aircraft. It also relied on the evidence of Mr Markert and Mr Jouper that Astronics needed to develop an AC power system to be in the market at all. For example, Mr Markert accepted without qualification that the success which Astronics achieved was built on having an AC ISPS system which it could offer to its customers. Finally, Lufthansa relied on the fact that throughout the Relevant Period Astronics sold ISPS systems both to IFE suppliers but also made direct power only sales to the airlines. Again, Mr Brady accepted this in cross-examination:

“Q. Can we look at how you describe this in your first report, so paragraph 49. You talk about a big development stimulated by the development of the Boeing 787 aircraft; do you see that? A. Yes. Q. The development of that aircraft took place between 2005 and 2011? A. Correct. Q. The first commercial 787, that's the Dreamliner, isn't it? A. Yes, it is. Q. It entered service, I think, at the end of October 2011? A. Approximately, yes. Q. It would have been towards the end of that period that airline customers specified their IFE and PED power requirements? A. In reality, it was probably 5 years before that, if not more, because of the procurement cycle imposed by Boeing and the fact the aircraft was a number of years late. Q. Right. Then deliveries of the 787 aircraft increased from 2011 onwards; is that right? A. Yes, sir. Q. You then say in paragraph 50 that: “[The same] IFE responsible approach was adopted by Airbus for the A350 development...” A. That is correct. Q. And that aircraft didn't enter service until 2015? A. That is correct. Q. Then this approach, this IFE responsible approach, subsequently spread out across other new aircraft; is that right? A. That is correct. In fact, an IFE development such as that for the A350, while it was targeted at a specific aircraft, was designed and almost always sold on other aircraft first. Q. Is this right, if the period we are concerned with for Panasonic is May 2013 to May 2018, it will involve significant sales of both phase 1 and phase 2 products? A. I would anticipate it would, yes. Q. In summary what was happening in phase 2 was that the IFE companies were becoming suppliers of hybrid IFE and PED power systems? A. Phase 2 allowed one supply to serve both needs, yes. Q. That's what was happening, that before you had PED power suppliers who were selling their wares to the market, and IFE suppliers who were doing the same, and under integration they are both coming under the IFE supplier's wing? A. If I could provide a correction: phase 1 integration not only involved incorporating the MCUs but the IFE suppliers were responsible for procuring and delivering the ISPS equipment as well. Q. Yes, in some circumstances? A. In some circumstances. Q. Because we know that throughout this period Astronics were still selling directly and it wasn't all going through an IFE, it was selling directly to airlines, wasn't it? A. Direct sales were okay, except for the wide bodies in which the procurement rules by the aircraft manufacturers forced the other relationship. Q. Yes. Obviously, under phase 2 the IFE suppliers were very familiar with IFE

systems? A. Obviously, yes. Q. Indeed, but the PED power companies had more knowledge and experience of PED power? A. Certainly. Q. They also had MCU experience because, in particular design and manufacturing of MCU experience, because MCUs began life as an adjunct to PED power installations? A. Certainly they had great experience in producing MCUs, yes, sir. Q. Yes. So it was easier for the PED power companies to start doing IFE power than vice versa? If that's not clear, under the integration there are sort of two power options: the PED power people start doing power for PED and IFE, or the IFE people start doing power for IFE and PED? And it was the former was the route that the integration took? A. Certainly...(Pause). What I can say is that IFE suppliers chose to use experts in particular areas to incorporate into the integrated system that we were required to -- the approach we were required by the OEMs, yes. Q. And the experts in power supplies were the PED power people? A. I would not agree with that. The experts in PED power were the PED power people. Power supply expertise went in all of our products, many of them -- most of them actually internal within the IFE suppliers. Q. So let's wind back: before integration, when an IFE supplier supplied an IFE system, they supplied power boxes for that system as well? A. The power supplies for the products were integrated into the boxes and they were supplied by the IFE companies. Q. And the IFE company and manufactured that power supply box? A. Yes, sir. Q. So they had some power supply expertise? A. Yes, sir. Q. Indeed. But what happened post-integration the IFE companies didn't take over the whole power supply job and start sending power to AC outlets, instead they let the PED power companies take over the whole power supply job and the PED power companies were then providing power to the IFE systems? A. The PED power products that were built to IFE specifications in the seat were indeed provided by PED power companies. The other power supplies provided in the system continued to be part of the IFE system's design role. Q. Can we consider how Thales approached phase 2 integration? So if we look at your paragraph 52 on page 15, there was a seat electronics box which had previously provided power to the IFE. And a seat power box which had previously provided power to the AC outlets. Yes so far? A. Yes, sir. Q. And Thales got rid of the seat electronics box and instead the seat power box was redesigned so as to provide IFE power and AC outlet power? A. In essence, yes, sir. Q. So you're doing away with the seat electronics box and you are enlarging the seat power box? A. There's an aspect of the system design which is technical in that the seat electronics box or some of the functions of the seat electronics box continued to be in a separate unit, specifically in the Panasonic there was an Ethernet switch that they had remotely that remained in a remote unit powered by the seat power box. Q. Okay. Leaving aside the Ethernet switch -- that aside my summary is correct? A. The power function was consolidated into one unit. Q. And that one unit is now the seat power box? A. Yes. Q. And as against the previous seat power box, which only did AC power, it's got a bit bigger and it's got a bit heavier? A. Yes, it is. Q. And customers are going to pay a bit more for it? A. Yes, they did."

401. The evidence adduced by both parties attested to the commercial importance of both the

power management functions and the AC power functions of the EmPower system for direct power only sales which Astronics made to the airlines. But it is not possible, in my judgment, to decide which was the more significant commercially. I find, therefore, that the power management functions and the AC power functions were both equally essential to the commercial success of power only sales. I make this finding for the following reasons:

- (1) I place significant weight on TS0010 which expressly stated that a manufacturer of ISPS systems would need to obtain a licence for the GD AES patents before it could obtain the approval of Airbus. In my judgment, the express reference to those patents shows the commercial significance which Airbus attributed to Astronics' power management system.
- (2) I also accept the evidence of Mr Gleason that Astronics was the only supplier which met all the qualification and offerability requirements for both Airbus and Boeing aircraft, that Astronics had a high reputation from a technical perspective and that it was able to charge a premium price because Astronics had the intellectual property in the power management system and the experience and expertise. Mr Cuddigan did not challenge any of this evidence and I attribute significant weight to it.
- (3) However, I also give significant weight to the fact that the Defendants' witnesses without exception accepted that Panasonic, the airlines and passengers all expected manufacturers to provide AC power. Indeed, I attribute very significant weight to Mr Markert's candid answer that the success which Astronics achieved was built on having an AC ISPS system which it could offer to its customers.
- (4) I also place some weight on the trade articles to which Mr Howe took Mr Muirhead and on the marketing documents to which Mr Cuddigan took Mr Markert as a reflection of the perception in the market. In my judgment, the pitch documents to which Mr Cuddigan took Mr Markert placed just as much emphasis on the power management functions of the EmPower system as the safety features including the outlet. It is also important to recognise that those pitch documents were all for direct sales to airlines and not to Panasonic or Thales.
- (5) Finally, I also accept Mr Brady's evidence and I find that during Phase 2 integration

Astronics continued to sell the EmPower System directly to airlines except in relation to wide-bodied aircraft. I deal with the proportion of direct and power only sales which Astronics made during the Relevant Period in greater detail below.

(4) *Why did the EmPower systems outsell the SkyPower System?*

402. It was common ground that during the Relevant Period both Astronics and KID were using the inventive features of the Patent. It was also common ground that during the same period Astronics outsold KID although there was a dispute between the parties both as to the scale by which Astronics out-performed KID and the reasons why it did so. Before I consider the evidence, it is necessary for me to explain why these two issues matter.

(i) Framing the question

403. One conclusion which can be drawn from the relative performance of Astronics and KID during the Relevant Period is that they were the two major players in the ISPSS market and that without the features of the Patent neither could have competed at all. Lufthansa invited me to draw this conclusion. The alternative is that Astronics' greater success in the market can only be explained by other factors since there was a level playing field throughout the Relevant Period and both were able to make use of the inventive features of the Patent. In my judgment, the choice between these two conclusions can only be addressed by considering the evidence as a whole.

(ii) The Defendants' evidence

404. *Mr Markert.* Mr Markert gave evidence that Astronics charged a higher price for its EmPower systems than KID but that customers were not concerned wholly about price. His evidence was that the most important factors for Astronics' success in the market were as follows:

(1) *Trust/relationship:* Mr Markert's evidence was that a pivotal factor was the trust which the airlines placed in Astronics as a supplier and that it was a central focus of its sales strategy to build relationships and cultivate trust over a long period of time.

(2) *Weight:* It was also his evidence that product and component weight was a

significant factor for airlines and that Astronics focussed on weight reduction for this reason.

- (3) *Reliability*: Mr Markert gave evidence that the reliability of a Line Replaceable Unit (“**LRU**”) directly correlated with its repair frequency over its lifespan influencing its total cost and that the key metric was Mean Time Before Failure or “**MTBF**”. It was his evidence that Astronics was always competitive in relation to the MTBF of its LRUs and that their actual performance usually exceeded the MTBFs quoted to customers.
- (4) *Repairs and maintenance*: It was also his evidence that Astronics’ ability to provide repairs and its maintenance support was also an important factor because there were often very small windows of time during which any repairs could be completed (e.g. time between flights) and how quickly a particular LRU could be repaired or replaced was of great importance. He stated that EmPower system components could be replaced in a 15-minute timeframe and an Astronics’ outlet unit generally took 2 minutes to replace.
- (5) *Linefit offerability*: Mr Markert’s evidence was that Astronics worked directly with and maintained an excellent relationship with the airframe manufacturers to ensure that its products met their requirements and were linefit offerable. He described this as “hugely important” for the following reasons:

“This was hugely important, as going through the OEMs’ linefit offerability process was a very complex, expensive, and time-consuming process that required meeting rigorous standards. In short, there is a large barrier to entry in this market space. The AES's consistent success in achieving linefit offerability for its products eliminated the need for its airline customers to allocate time and resources for this process when considering the installation of AES's products on their aircraft. This conferred a significant advantage to AES over suppliers whose products were not yet offerable or lacked a proven track record of achieving offerability. This was a big advantage of AES’s products over suppliers whose products were not yet offerable or that did not have a track record of achieving offerability.”
- (6) *Power management technology*: I have dealt with the commercial significance of Astronics’ own technology (above). But Mr Markert also gave evidence that as far as he was aware no competing power management technology made its way onto

aircraft during the Relevant Period. He also stated that the fact that airline customers did not want to infringe these patents, played a significant part in some instances in their decision to purchase the EmPower System from AES as opposed to (potentially cheaper) new entrants to the market.

- (7) *IFE providers*: Finally, Mr Markert gave evidence that the procurement and contracting process with IFE providers was very different because they were seeking to have products designed for their unique IFE systems rather than buying a standard product. He gave evidence that during Phase 2 integration Astronics adapted to this process very successfully for a number of additional reasons: (a) customer relationships with the IFE providers, (b) location in the state of Washington, (c) power management technology again and (d) the ability to integrate the SPM and IFE. His evidence in relation to this final factor was as follows:

“AES’s development of integrated seat power modules/boxes (“SPM”/”SPB”) for IFE systems, with first PAC’s IFE system, and then subsequently with Thales, Zodiac (also known as IMS and Safran at various points) and some other IFE providers, was a significant factor behind sales of AES’s power supply equipment to IFE providers. An integrated system saved on power draw, weight and space, and also reduced cabling within an aircraft. It was also attractive to airlines, as it meant they did not have to separately procure an IFE system and ISPS, as they both came as part of the integrated system.”

405. Mr Cuddigan did not really challenge any of this evidence in cross-examination. The case which he put to Mr Markert was that Astronics’ success was built on infringement of the Patent and that Astronics was more successful in exploiting the Patent than KID had been in exploiting the 1998 Teaming Agreement:

“Q. So the factors you mention include relationship with the airlines, weight, price, power management and integration? A. Yes, those are strong features when we were pitching the system to an airline. Yes, correct. Q. As I understand your evidence, what you mean is that in the market for certified AC ISPS systems it was these factors which enabled you to succeed as against your competitors? A. That and many other features; the way we approach customers, customer centricity, our support, our engaging with them for years before they purchased the system all played into the actual acquisition of the system. Not just the physical attributes of the system itself. Q. Indeed. Now, the success which you achieved was of course contingent on having an AC ISPS system which you could offer to your customers? A. Yes. Q. KID was the first to market

with an AC system? A. Yes. Q. And initially the KID system sold well? A. I can't speak to how well it sold, but they were first to the market, yes. Q. You knew they had a significant business in relation to AC systems? A. They had the first AC system but I can't speak to the installed base or how successful they were in winning. Q. So even though you were in the marketing department, you didn't have a read on how your competitors were performing? A. We had a read on how they were performing, but in many cases it takes years to install a product so you don't know if they've won the programme or if they were installing yet. We could only see who they were installing on and that was a long time ago, I don't recall. Q. Very good. You know that KID was a licensee under the Lufthansa patent, don't you? A. I do now, yes. Q. Now, before the 1171 EmPower system was launched, your DC system was losing sales to KID's AC system? A. That was before me, honestly, so it is very difficult for me to say if it was an equivalency or if they were ahead or not. Q. But throughout the period with which we are concerned at this trial, Astronics' AC ISPS system was at all times an infringement of the Lufthansa patent. You can take that from me. So isn't it the position that the success of your AC ISPS system was built upon infringement? A. Absolutely not. Not in my opinion at all. Q. What you are really saying is that you infringed Lufthansa's patent more successfully than KID exploited Lufthansa's licence? A. Again, I can't speak to what their sales numbers were but I am surprised that, being part of Airbus, they weren't more successful.”

406. *Mr Brady*. He gave evidence that the following factors drove the selection of PED providers to IFE providers during the Relevant Period: (a) weight, (b) power conversion and consumption, (c) efficiency and thermal dissipation, (d) price, (e) reliability, (f) after sales support capability, (g) certification and linefit offerability, (h) reputation and longevity and (i) the relationship with the supplier. His evidence was that the EmPower systems had a weight advantage over the SkyPower System.

407. Mr Brady gave evidence that KID only won one bid from Thales for the single-beam Recaro economy seat to be fitted on the Qatar Airways A350 aircraft because of the particular design of these seats and that weight advantage was the dominant factor in Thales' selection of Astronics over KID for the i7000/8000 and AVANT systems, which made up the bulk of its procurement. He also drew attention to the fact that Astronics' power conversion technology was superior to KID's and that Astronics' power outlets were more compatible with a greater number of different plug types. Mr Brady accepted in cross-examination that there was not a lot to distinguish between the two products but Mr Cuddigan did not really challenge the decisive features:

“Q. I'm grateful. You say that Astronics' products were slightly lighter and accepted more international plugs. A. That is my recollection on the more



international plugs. The other is factual based upon drawings I provided as attachments to my -- Q. Yes. There wasn't a great deal to choose between them, was there? A. 0.1 weight was the difference, minimum difference, on the ISPSC. The MCU was, I believe, about 1.4 pounds. My testimony actually had the hard numbers in it. Q. Yes, I mean overall, not just about weight. There wasn't a lot to distinguish the two products? A. No, there was not a great deal to distinguish them. Q. Both systems were well engineered? A. Both systems were well engineered. Q. They were both certified? A. Yes, they were both certified. Q. They were, so far as you were aware, safe and reliable? A. Yes, sir."

408. *Mr Bedekar*. The Defendants called Mr Neil Bedekar, who was the Senior Manager of Product Management, to give first-hand evidence about the relationship between Panasonic and KID. In his witness statement dated 17 May 2024 he gave a detailed description of his experience and I was satisfied that he was an informed witness and able to give reliable evidence in relation to both the technical and commercial aspects of that relationship. He gave evidence that in December 2007 when Panasonic was trying to get the SkyPower SPM approved for linefit for the Airbus A380 and the Boeing 747-8i aircraft, the issue with heat dissipation and the touch temperature of the SkyPower SPM generated a significant workstream involving an unusually large number of Panasonic personnel and that it became "a nightmare project". He also gave evidence that KID failed to supply documents and test data in a timely fashion when Airbus asked for them and that the solutions which KID proposed were not attractive to either Airbus or Boeing.
409. Mr Bedekar also gave evidence that Panasonic experienced similar issues with the SkyPower SPM in relation to the Boeing 747-8i aircraft and that even DLH changed its mind about using the SkyPower System and chose to use the EmPower system instead. Lufthansa did not challenge any of this evidence. Mr Cuddigan put a number of points to Mr Bedekar to downplay the effect of the heat dissipation issue. But Mr Bedekar was emphatic that the SkyPower SPM failed all of the criteria for acceptance by Panasonic, Airbus and Boeing:

"Q. Fundamentally, this is a data-based consideration, isn't it, about whether, in practice, these units are going to get too hot too often. A. Yes, but also not only heat, will they perform. Will they give as much power to make the business class, first-class passengers comfortable enough to use their laptops and what it means. Q. And what you were trying to do in your tests was estimate a high power load and see whether the units performed adequately in relation to that load. A. My Lord, it was a long time ago and there were multiple tests conducted, not only by KID on our request, but also Panasonic testing, Airbus testing. I did my best to grab as much data

as I possibly could to give this court as much information as possible, but not all of the tests were covered, but yes, at different conditions, different conditions, just to see how the box behaves, to prove to us that box would be performant. Q. But you don't really have any concrete data to show that in use these were problems which really manifest. A. Which -- may I ask, my Lord, which problems specifically? Q. The heating issue with the KID product. A. May I ask for clarification of which heating issue -- Q. The SPM overheating issue that you discuss in your evidence. A. Okay. My Lord, there are a number of overheating issues that this box failed -- their Airbus criteria, their Boeing criteria, their Panasonic criteria -- and there's also subjective criteria. There are four sets of criteria which are all very detailed and the level of precision is pretty high. We're willing to get deviations to pass this box to be installed on Lufthansa's aircraft, so you are seeing a snapshot of -- snapshot in history -- of some of the criteria."

410. *Mr Gleason*. He confirmed that he was informed by Mr Bedekar and other members of his team about the heat dissipation issue with the SkyPower SPM and that the KID team were not very responsive in their dealings with Panasonic. He also gave evidence that as a consequence KID was not invited to submit a Request for Proposal or "RFP" for the power supply for Panasonic's IFE system. Lufthansa did not challenge this evidence.

(iii) Lufthansa's evidence

411. *Mr Mosebach*. In his factual evidence, Mosebach WS, Mr Mosebach gave evidence that in 2004 or 2005 Airbus [REDACTED] prevented KID from participating in the IFE market. In Mosebach E1 he also accepted that in the absence of KID, Astronics "took all of this part of the market and its share of 110V AC sales grew very significantly".

412. Mr Brady had challenged this explanation in his evidence [REDACTED]. Mr Timothy Howe KC cross-examined him on behalf of the Defendants and Mr Mosebach accepted that [REDACTED]. The following exchange then took place:

"Q. Let's see then how you dealt with Mr Brady's evidence. I should just say, Mr Brady exhibited to his first report, after noting the inconsistency of what you had said with what he knew from his personal involvement whilst he was at Thales, he even exhibited the KID winning proposal on the one exceptional bid that you did manage to secure with Thales, which was the [REDACTED] project in May 2011. He exhibited that to his first report and you must have seen that document when you came to review his report. A. Yes. Q. So in fact, KID did try to compete, albeit unsuccessfully, with Astronics in the integrated market in relation to Thales on Airbus aircraft 's programmes, didn't it? It tried through its sales team to compete? A. Yes, but -- Q. Yes. A. -- with the limitation that it was not possible to realise at the end. Q. So do you now accept, Mr

Mosebach, that what you had said in your first witness statement and confirmed categorically in your first expert report about [REDACTED], was incorrect? A. No. Q. It was, wasn't it, it was incorrect? A. No, no. Thales would have another view, also different from the KID sales team, clearly. [REDACTED]. We want to buy the existing projects, of course, as well and if there is a good opportunity, maybe that they ask some other company for exception.”

413. Mr Howe suggested to Mr Mosebach that this evidence was incorrect and misleading and when Mr Hall came to re-examine Mr Mosebach, he returned to the question of the Airbus policy:

“MR HALL: [REDACTED].”

414. Although he had been KID's head of engineering Mr Mosebach was unable to give first hand evidence in relation to the heat dissipation issue which had troubled the development of the SkyPower SPM. He accepted that he was aware of the problem but said that he was not personally involved in the negotiations with Boeing or Panasonic:

“Q. Were you aware that those thermal dissipation issues were not satisfactorily resolved, with the consequence that the KID SKYPower SPM was substituted — was rejected from the programme in favour of the Astronics, the AS SPM? Were you aware of that for the B747 programme? A. On this part I was not involved. Q. And you didn't know about the loss of that contract, that programme, to KID? A. I have seen this in the documents as preparation for this meeting, yes. Q. But you would have known that the heat dissipation issues had not been satisfactorily resolved in relation to the SPM — the KID SKYPower SPM for the Boeing 747 programme? A. My understanding in this topic is that the heat dissipation is normally a point for discussion, for power supplies it is in any case a problem, a challenge, and the heat will be more or less generated linear to the output power which will be used, and would be solved if you limit the output power or you deactivate outlet units in case of overheating. Q. Yes, but were you aware at the time that that limitation of output power or deactivation was not in fact acceptable to Boeing and Boeing decided formally to change from the KID SKYPower SPM to the Astronics SPM because that issue was not resolved to Boeing's satisfaction? Were you aware of that at the time? A. I have heard this but, of course, I was not involved in the meetings with Boeing and I know the topic from various power supplies, also a power supply which was developed in the last years, that there is a lot of room for discussions. The most topic is so-called touch temperature. So if you put your finger on the unit, the finger doesn't burn. Q. Right. To be clear, you weren't personally involved in the end period — the way in which the issue around the thermal dissipation came to a conclusion with regard to the B747 project or the A380 project; is that fair A. I was not — Q. You weren't personally involved in that? A. Not

involved in the Boeing project. Q. Right. So you only know what you've read since in the course of preparing for this case in papers that you may have seen? A. I'm aware on the A380 project, yes. Not more."

415. *Mr Muirhead*. He accepted in cross-examination that an airline's "prime interest" was the reduction of weight and complexity. But although he had made three witness statements, Mr Muirhead made no reference in any of them to the heat dissipation issue or to KID's replacement as the provider for the Boeing 747-8i. Mr Howe suggested to him that it was a "really serious negative issue" and Mr Muirhead accepted that it could be seen that way. Mr Howe then took him to the email correspondence which I have set out in section II (above) and asked him about the effect of losing that programme. Mr Muirhead played down its importance. He also expressed the view that the real reason why KID lost the programme was the existing commercial relationship between Astronics and Panasonic:

"Q. You must have been horrified that KID SPM was going to lose the Boeing 747 programme, a programme of that value and size. A. I wasn't happy about it. Q. Was — it was a commercial disaster, wasn't it. A. I wasn't go as far as to say it was a commercial disaster, but I was not happy about it. Q. It was a serious commercial set back? A. It was a set back. Q. Serious one? A. It was a set back. Q. You see, you are trying to downplay it, Mr Muirhead. A. I think you are trying to put words — sorry, with all due respect, I think you are trying to put words in my mouth. It was a set back. Q. We've seen how desperate you were from your email to say your colleagues to try to stop this happening at all costs, weren't you? A. Yes, and this was a set back. Q. So then this email was sent to you, we will see that at {F/20/1}, so the email was an attachment — the letter from Boeing is an attachment to the email at {F/20/3} from Boeing to Lufthansa. It says — and this is a comment from Boeing to Lufthansa: "Like your BFE seat suppliers we see that this change is the only way forward due to technical and schedule constraints with the KID SPM". The reference to your BFE seat suppliers, what is that a reference to, Mr Muirhead? A. I can only assume that they had a problem with schedules with their seats as well. Q. Sorry, I missed that answer? A. I can only assume from this email that there was also a schedule problem with seat suppliers as well, like "your BFE seat supplier", so I can only assume at the time that there was also a problem with seat supplier schedules too, which is not unusual. Q. So it sounds like the BFE seat suppliers were also of the view that there was a need to change from KID SPM to Astronics SPM at this time. You would agree with that? A. I don't know the context of the — you could read that into it. As I say, I don't know whether this means "like your BFE suppliers" meaning that there are schedule issues there, or that the seat suppliers also saw that this was the only way forward. I'm not sure how that sentence is to be read. Q. And then we can see on page {F/20/1} — A. And it is possible, sorry, that the seat suppliers were concerned, because again, they

have to deliver the seat that contains the power supply, but again, I don't remember the context. Q. So we can see on page 1 of F/20 that that email is then sent up to you with the notification — with the comment in the email from Mr Stefan to Mr Kahabka, and Mr Kahabka was then forwarding it on to you: "It looks like the die is cast (at least at Boeing)". Do you see that? A. It does look like that is the communication of the decision-making. Q. And there's no dispute that the upshot of this was that, as we've discussed, the B747-8I project was entirely removed — the KID SPM was entirely removed from that project and was substituted for the Astronics — sorry, the Astronics was substituted for the KID SPM; correct? A. That is correct. Q. And that would have been a very substantial loss of income to KID and therefore royalties to yourselves, LHT, wouldn't it. A. To be honest, with respect to the 748 not really, because that aircraft, as you probably are well aware, was only ever sold to Lufthansa, and I think to Korea Airlines, so the market for the 747-8 was not that significant, which is why it was careful with my statement before, the Boeing 747-8 passenger aircraft was not a particularly successful aircraft. Q. Why were you so desperate, then, to stop the loss? A. Sorry? Q. Why were you so desperate to stop the loss of the project if it really wasn't that material? A. Well, at the time we didn't know how the 747-8 was going to sell, so I felt that it was an important platform to be on. The reality shows that it was less significant. Q. That's with the benefit of hindsight, Mr Muirhead; yes? A. That came fairly quickly, the 747-8's lack of success in the market was evident fairly quickly. Q. And more to the point, apart from the loss of the 747-8 project in its entirety and the loss of the business class seat supply for the Airbus A380, you will have had drawn to your attention the evidence in this case from the Panasonic witnesses that that had a serious impact on the Panasonic relationship with KID. You are aware of that now, aren't you? A. As I stated before, I couldn't comment on the relationship between KID and Panasonic. I was not directly involved in that interface. Q. But now you've seen the evidence in this case about that, you would agree that that was a very serious negative impact on the Panasonic/KID relationship, wouldn't you? Now? A. I still believe that Panasonic had business arrangements with Astronics prior to that happening, so whether this impacted that further or, if you like, made their business problem go away, I wouldn't want to — I couldn't confirm that statement, to be honest, that you just made. Q. To the extent that Panasonic was not prepared to countenance offering the KID SPM on the A350 project which followed? A. Yes. Like I say though, I think my personal opinion on that topic is that they had a business interest with Astronics, and that was more prime than this technical issue."

(v) Findings

416. In the Valour Consultancy report exhibited by Mr Brady to Brady 1, the authors reported that between 2009 and 2018 Astronics generated revenue of US \$233 million from the various EmPower systems and that KID generated revenue of US \$23 million from the SkyPower System. Mr Mosebach was unable to provide any alternative figures and had

not even read the Valour Consultancy report. I therefore accept its accuracy and I find as a fact that Astronics generated revenue of approximately US \$233 million from ISPSS systems during the Relevant Period. I also find that this was 10 times more than the revenue of US \$23 million which KID generated from the sale of ISPSS systems during the same period.

417. I also accept Mr Brady's evidence in Brady 2 that the percentage of power only sales which Astronics made represented 22% of its overall sales and that the remaining 78% represented sales to the IFE providers or to the airlines themselves but to be incorporated into IFE. Mr Mosebach did not challenge this evidence and he had no relevant experience to give in relation to the IFE market. I, therefore, conclude that between 2009 and 2018 Astronics generated approximately 78% or approximately US \$180 million of its revenue from IFE sales rather than power only sales. I accept that this is not a precise figure but it illustrates the importance of the IFE market during the Relevant Period.
418. If Astronics had undercut KID in price and outsold it by a few thousand units, I might well have accepted Lufthansa's argument that Astronics was unable to compete in the market at all without infringing the Patent. In my judgment, however, the infringement of the Patent cannot explain why Astronics outsold KID by 10 times or a factor of 10 between 2009 and 2018 including the Relevant Period. Moreover, Mr Markert, Mr Bedekar, Mr Gleason and Mr Brady all provided credible explanations for Astronics' performance.
419. In relation to the quality of the Astronics product, I accept Mr Markert's evidence and I find that Astronics provided a superior product and a superior service both to the airlines and to the IFE providers during the Relevant Period for the seven reasons which Mr Markert gave in his evidence. Mr Brady fully supported Mr Markert's factual evidence with expert evidence of his own experience at Thales. I also reject the contention which Mr Cuddigan put to him, namely, that Astronics was just better at exploiting the Patent than KID. I find that the superior product and customer service which Astronics provided to the airlines and IFE providers was not dependent upon exploitation of the Patent but the wider commercial factors which Mr Markert explained.
420. I also accept Mr Brady's evidence that the dominant factor which gave the Astronics SPM or SPB superiority over the KID SkyPower System and other products in the market

was weight. I also accept his evidence that Astronics' power conversion technology was superior to KID's and that Astronics' power outlets were more compatible with a greater number of different plug types. Mr Brady fairly accepted that there was not a lot to choose between the two products but he did not withdraw or qualify his evidence that weight was a dominating factor or that there were other factors which gave Astronics an edge. I find that although the differences between the products were relatively small, the three factors which I have identified differentiated the Astronics' SPM or SPB from the equivalent KID products and gave them a decisive superiority in the market.

421. In relation to the quality of the KID product, I find that KID attempted to compete with Astronics for the supply of SPMs to Panasonic for the Airbus A380 and Boeing 747-8i aircraft but failed to do so successfully (except in the first-class cabin of DLH's A380 aircraft). I accept Mr Bedekar's evidence that the KID SPM failed to compete successfully with Astronics because it could not overcome the heat dissipation issues in a commercially acceptable way and failed to satisfy not only the Airbus approval criteria and the Boeing approval criteria but also the Panasonic approval criteria and any subjective criteria which an engineer might apply to it. I also accept Mr Bedekar's evidence that from Panasonic's perspective the integration of the KID SPM became a nightmare project, that it involved an unusually large number of Panasonic personnel and that KID failed to supply documents and test data in a timely fashion. His evidence was consistent with the contemporaneous documents to which Mr Howe took Mr Muirhead and which I have set out above.
422. Finally, I do not accept the evidence of Mr Mosebach and Mr Muirhead in relation to the failure of this project. Both attempted to play down its significance and it was understandable that they should see it in a different light ten years later and with the benefit of hindsight. However, I find as a fact that the failure of the Lufthansa project and KID's failure to find a satisfactory technical solution to the thermal dissipation issue with the KID SPM were significant commercial set-backs for KID and that their failure effectively shut KID out of the market for the supply of SPMs and SPBs during Phase 2 integration.
423. In making this finding, I place significant reliance on the contemporaneous email correspondence to which Mr Muirhead was taken in cross-examination. He understood that KID's replacement by Astronics had to be avoided if KID was to compete with

Astronics for IFE sales during Phase 2 integration but he was unable to prevent it taking place. Moreover, Mr Gleason gave unchallenged evidence that Panasonic did not use the KID SPM in any of its IFE products after Lufthansa had changed supplier to Astronics.

424. I also place significant reliance on the fact that following KID's replacement by Astronics on the Lufthansa project KID obtained no contracts for the supply of the KID SPM to either Panasonic or Thales with two limited exceptions. First, DLH purchased the SkyPower System for IFE during Phase 2 integration but only for the first-class cabin of the A380 aircraft. Secondly, KID won a contract to supply the ISPS for the [REDACTED] seat ordered by [REDACTED]. However, it was Mr Brady's unchallenged evidence that this required a custom supply different to the power supplies available on the market at the time.
425. By contrast, I place little or no weight on Mr Mosebach's evidence that the [REDACTED]. I place little or no weight on that evidence because even if such a policy existed, it was not known to the market or to KID's potential customers and had no effect on its ability to compete with Astronics. I make this finding for the following reasons:
- (1) Although Mr Howe raised serious doubts about the reliability of this evidence in cross-examination, I am prepared to accept that Airbus [REDACTED].
  - (2) However, I do not accept that this was a rigid policy or that it prevented KID either from pitching for contracts or from obtaining authority to fulfil them if those bids were successful. [REDACTED].
  - (3) [REDACTED].
  - (4) It is also clear from this evidence that KID was keen to prevent this policy from being known in the market. Moreover, this conclusion is consistent with the evidence of Mr Brady who gave unchallenged evidence that such a policy was inconsistent with Thales' regular interaction with KID, which bid not only for the [REDACTED] seat but another project for the SPB-2 in 2009.
  - (5) [REDACTED].
- (5) *What motivated airlines to purchase the EmPower Fusion during Phase 2 integration?*



426. I have found that the supply of AC power was essential to the commercial success of the Empower Fusion system during Phase 1 integration for power only sales. However, I have also held that Astronics' power management technology was essential to that success and that other factors were responsible for the success of the EmPower Fusion system during Phase 2 integration and not the exploitation of the Patent. The final question which I must address is what motivated the airlines, who were the ultimate customers, to purchase the EmPower Fusion system during Phase 2.
427. Mr Brady gave evidence in Brady 1 that by 2011 the inclusion of PED power in an IFE system was expected and that it was not a differentiating factor between different IFE providers. He also gave evidence that the features of an IFE system which motivated the airlines were the quality and variety of the entertainment system and its ability to deliver content:

“76. Generally, ‘top tier’, high budget airlines (such as Emirates, Qatar, Etihad, Singapore and Qantas) were focused on providing the highest quality and variety of entertainment experience to their passengers as possible. As a result, the most important thing for these customers was the passenger experience being provided by an IFE system. This included screen size, video quality and resolution, variety of video/audio content provided, and method of control (e.g. touch screen control or remote control), and power provided for passenger PEDs. The level of video/audio technology that you could provide as an IFE provider was the key battleground in winning business. If you could match the technology and screen size required and being provided by another IFE provider’s system, bids were then won on weight and cost.

77. Such airlines were always pushing for the latest and greatest video quality and the broadest range of potential content as part of their IFE offering. Content owners and distributors were very sensitive about how their content would be presented. This meant that any IFE provider had to comply with video and audio encoding standards approved and accepted by the content owners in order to be viable for selection by an airline. Airlines and IFE providers were ultimately small fish in the broader entertainment market (i.e. including non-avionics), and so compliance with the video and audio standards was mandatory. The amount of content a system could carry (storage capacity) became a major differentiator for IFE systems. For lower budget airlines, the focus was more on price and how they could offer an IFE system that would please their passengers and compete with other airlines but at the lowest total cost, particularly once providing IFE systems in economy class became the market standard, especially for long haul flights.”

428. Mr Seager also gave evidence that when he worked for Virgin Atlantic no regard was

given to any particular design or features of the PED power outlets and that its specifications were limited to confirmation that PED power was required, the preferred configuration (i.e. AC only or USB only or a combination), the compatible plug types and the number of outlets per seat or group of seats. When Mr Cuddigan asked him about this evidence, he described them as “loose requirements”:

“Q. -- but what you've done in these passages of your statement is to re-read the passenger power requirements from the 2008, 2009 and 2011 Virgin Atlantic requests for proposal. A. Yes. Q. And then you quote some parts of those requests for proposal. A. Yes, amongst many other things that make up that proposal. Q. Yes, of course, and in each case in relation to those RFPs there were clear and detailed requirements for AC power outlets. A. There was very -- I would call it very loose requirements for the AC outlets. There wasn't, you know, any technical or any detail, it was just we were saying that you required one per passenger in upper class, J class, one in premium economy and shared in economy. I think that's -- and that was detailed on the document there, and obviously to provide power to the passenger. Q. Yes. So there was a clear specification of the number of AC outlets that needed to be provided in each part of the cabin? A. The number, yes. I mean, I wouldn't call it a specification. To me, a specification is something much more detailed and technical. Q. I understand. Right, and Virgin wanted this facility, this AC power facility, to be installed in accordance with this specification? A. The outlets to be installed with regards to that -- the RFP, yes. Q. Yes, and this wasn't a nice to have option, this was a necessary requirement. A. I can't say that it was a necessary requirement. That would have been down to our passenger experience people that chose that it was absolutely necessary. Q. But that's what they had chosen? A. Yes. That is what they specified in the RFP document.”

429. The Defendants also relied on [REDACTED] compliance matrix (which Mr Seager had exhibited) and an example of one of Lufthansa's own compliance matrices sent to Panasonic in 2013. The [REDACTED] matrix contained approximately 260 requirements but only one referred to AC power. The Lufthansa matrix contained approximately 450 requirements but did not refer to 110V AC power or any of the features of the Patent. Mr Howe put it to Mr Muirhead that the features of the IFE system rather than AC power “drove” the sales of IFE to the airlines after the market for ISPSS and IFE were fully integrated:

“MR HOWE: I must have misspoken. I apologise. So focusing on the IFE ISPS integrated market, it was the sale of the IFE system which really drove, by PAC or Thales to the airline customer, which really drove the sale of the package which included the integrated ISPS. A. My Lord, that's the bit I would disagree with, because the airlines' demand for AC at the

seat for the passengers to be able to use their laptops drove the sale of it, because they had an option, did they want that or not. It was bundled with the IFE manufacturer, that's how the airline got it through the integrated offering, but what ultimately drove it is the airlines wanting AC at the seat in particular for their first and business class passengers. Q. Well, Mr Muirhead, I'll put that again. The IFE vendors bundled up, as we've agreed, with the IFE generation an ISPS system of their choice? A. That is correct. Q. And then they marketed this package to the airline customers. A. That is correct. Q. And the airline customers, if they purchased the package, the driver of the sale to the airline customer was their choice of IFE system with bundled ISPS incorporated. A. I'm just a little cautious with the use of the word "drove", because of the word that I used yesterday being taken a little bit out of context. You could also argue connectivity drives the sale of seat power sockets, because where there is connectivity -- I need to charge my device and I need to be able to use it with connectivity -- so I'm just a little cautious with the word "drove", because what ultimately drives the sale of a product is a customer demand, and so there was a customer demand for people to be able to charge their laptops. The IFE manufacturer was the means by which that functionality was provided to the airline, so I'm just a little cautious -- MR JUSTICE LEECH: As long as the airline got an AC outlet, it wouldn't really matter to the airline whether it was Astronics or -- outlet. It needed an AC outlet as part of the package. A. That is correct, my Lord. MR JUSTICE LEECH: So it's really the IFE manufacturer who chooses the particular outlet, because the airline will generally be looking at the overall package in deciding which one to buy. Is that right? A. Yes, that is correct, so the IFE manufacturer was providing the bundle, but I always think, when we talk about driving, it is customer demand that ultimately drives whether a product -- MR JUSTICE LEECH: And they would want both. A. Yes. MR JUSTICE LEECH: They probably wouldn't do without one rather than the other. A. That is correct."

430. I accept Mr Brady's evidence and I find that what motivated the airlines to purchase IFE systems was the quality and variety of the entertainment experience which it provided and that the provision of PED power was not a differentiating factor. I also accept Mr Seager's evidence and I find that no regard was given by the airlines to the design or features of the PED power outlet. Mr Muirhead did not really dispute this evidence and his point (which I also accept) was that it was standard for every IFE package to contain a number of AC power outlets and that the IFE providers would not have sold integrated IFE systems to the airlines unless they also included AC power outlets for PEDs.

431. The Lufthansa team did not seek to persuade me that the provision of AC power outlets for PEDs was commercially essential to the supply or sale of IFE systems during Phase 2 integration or after that integration had been completed in the sense used by HHJ Hacon in *OOO Abbott* (above). But in case there is any doubt, I find that the provision of AC

power to PEDs was not the most significant part of the whole IFE system. In making this finding I rely on the unchallenged evidence of Mr Brady that the quality and variety of the entertainment experience was the motivating factor in the choice of an IFE system by the airlines, who were the ultimate customers.

#### M. Application

432. I turn, therefore, to the application of the law to the facts. I have held that the *Neo* test applies to the Account in the same way that it applies to a claim for damages for infringement calculated by reference to lost profits. I also remind myself that the burden of proof was on Lufthansa to prove both legal and factual causation but that the evidential burden was on the Defendants to plead and prove a Non-Infringing Alternative. I begin, therefore, with a brief summary of the findings of fact which I have made to date before applying the relevant legal tests to those facts.

##### *(1) Summary of Findings*

##### (i) Non-Infringing Alternative

433. I have found that although Astronics could have developed and marketed the 1171M cheaply, it would have infringed the Patent. I have also found that the Defendants would not have developed or marketed any of the third-party products upon which they relied during the Relevant Period and that two of those products, namely, the IFPL 1225 and PowerBox, would also have infringed the Patent. The Defendants have not, therefore, discharged the evidential burden of establishing that there was a Non-Infringing Alternative to the Patent and I find in favour of Lufthansa on that issue.

##### (ii) The inventive core of the Patent

434. I have held that the inventive core of the Patent was safety and it had two features which were designed to achieve that objective, namely, the insertion feature and the remoteness feature.

##### (iii) Certification

435. I have found that the “mating” condition in the 1999 Memorandum was not introduced to require compliance with the insertion test and that the 1999 Memorandum did not

require compliance with the remoteness test. But I have also found that the presentation made by KID of the SkyPower System was instrumental in persuading the Study Group to accept that ISPSS systems could use high voltage AC power to supply PEDs and that the only means by which GD (and later Astronics) was able to comply with the “mating” condition was by adopting the insertion feature of the Patent. Finally, I have found that the Patent provided the answer to one single safety requirement which required a lower degree of assurance than hardware features and that Astronics had to satisfy a further twenty four conditions in order to obtain certification.

(iv) Airframe manufacturers’ approval

436. I have found that it was necessary for GD to rely on all three inventive features of Claim 1 to obtain Boeing’s approval for the EmPower Classic system and that Astronics would not have obtained approval from Boeing for the EmPower Fusion system if it had not continued to use those inventive features in the 12xx series. However, I have also found that these features were amongst many features which GD had to satisfy before it obtained approval for the EmPower Classic system and the EmPower Fusion system. In particular, I have accepted Mr Brady’s evidence and found that Astronics had to satisfy 36 additional safety tests which were unconnected with those features and that failure to comply with those tests could result in a safety threat.

437. I have also found that it was necessary for Astronics to rely on the insertion and timing features of Claim 1 to obtain approval for the EmPower Fusion system from Airbus and that it would not have obtained approval from Airbus for the 12xx series if it had not done so. But I have also found that the remoteness feature was not a requirement and that the requirement for use of the insertion and timing features was a not a safety critical feature or one which significantly reduced airplane safety. Finally, I have found that the EmPower Fusion system had to satisfy seven major safety critical requirements and one other minor requirement in order to obtain approval.

(v) Essentiality

438. *Functional essentiality.* Morgan J held that the Primary Components were functionally essential to the EmPower Fusion system and I have also held that they were functionally essential for direct power only sales to the airlines. However, I have also held that the Defendants’ case is made out and that the ability to supply AC power to PEDs was

incidental and not essential to the overall function of EmPower systems in providing power to IFE systems. I have also held that the power management functions of the EmPower systems were not trite or commonplace.

439. *Commercial essentiality.* I have held that both the AC power and the power management functions were equally essential to the commercial exploitation and success of the EmPower Fusion system for direct power only sales to airline customers. But I have held that the provision of AC power to PEDs was not essential to the commercial success of integrated IFE systems in the sense used by HHJ Hacon in *OOO Abbott* (above), namely, that it was the most significant reason for that success in commercial terms. I set out the most significant reasons for that success below.

(vi) Revenue

440. I have found that Astronics generated revenue of approximately US \$233 million from ISPSS systems during the Relevant Period and that this was 10 times more than the revenue of US \$23 million which KID generated from the sale of ISPSS systems during the same period. I have also found that the percentage of power only sales which Astronics made during the Relevant Period represented 22% of its overall sales and that the remaining 78% represented IFE sales.

(vii) Commercial Factors

441. I have found that Astronics provided a superior product and a superior service both to the airlines and to the IFE providers during the Relevant Period and that the dominant factor which gave the Astronics SPM or SPB superiority over the KID SkyPower System and other products in the market was weight. I have also found that the superior product and service which Astronics provided to the airlines and IFE providers was not dependent upon exploitation of the Patent but a number of wider commercial factors. I have also found that the failure of the Lufthansa project and KID's failure to find a satisfactory technical solution to the heat dissipation issue with the KID SPM were significant commercial set-backs for KID and that their failure shut KID out of the market for the supply of SPMs and SPBs during Phase 2 integration.

(viii) Customer motivation

442. Finally, I have found that what motivated the airlines to purchase IFE systems was the quality and variety of the entertainment experience which it provided and that the provision of PED power was not a differentiating factor. But I have also found that it was standard for every IFE package to contain a number of AC power outlets and that Panasonic and other IFE providers would not have sold integrated IFE systems to the airlines unless they included AC power.

(2) *But for causation*

(i) Astronics

443. I deal with the quantification of the profits derived by Astronics, Panasonic and Safran from the infringement of the Patent in section VI (below) and for convenience I will refer to those profits as the “**profits in issue**”. Subject to one point, I am satisfied that Astronics would not have made the profits in issue but for the infringement of the Patent for which Morgan J found Astronics liable in the Liability Judgment given the findings which I have made in the summary above and, in particular, findings (i) to (iv). Astronics did not establish that it could have supplied an NIA and I have found that the only means by which it was able to obtain certification was by adopting the insertion feature of the Patent. I have also held that it would not have obtained approval from Airbus for the EmPower Fusion system if it had not continued to use the insertion and timing features of the Patent in the 12xx series and would not have obtained approval from Boeing if it had not used all three features of Claim 1.

444. In their Opening Trial Skeleton, the Defendants advanced a separate argument in relation to the liability of Astronics and Panasonic based on factual causation which I will call the “**timing argument**”:

“Lufthansa’s claim covers components which were imported and supplied in the UK by Astronics. In some cases those acts of infringement took place after the contractual right to payment was triggered by a non-infringing act - shipment of the goods in the United States. Astronics accordingly says that its profits in relation to those components were not caused by the infringing act and are not to be accounted for. Hogan Lovells conducted an analysis of Astronics’ and Panasonic’s contracts for the purposes of instructing Mr Bezant – see Bezant 1, paragraph 2.36 [D2/5/33] and letter of instruction [D4/55]. He estimates that this reduces the value of Lufthansa’s claim by about 25% to 30% in relation to Astronics and 20% to 25% in relation to Panasonic. We return to this issue

in the context of the accountancy evidence below.”

445. The Defendants adduced no other factual evidence to support their case and it was not tested in cross-examination. Counsel did not take me to any of the relevant contracts which were the subject matter of the analysis referred to above. Nor did they refer me to any witness evidence in their written opening or closing submissions. The only evidence at all to support the timing argument was contained in the letter of instructions referred to in the extract above which was dated 17 July 2024 and sent to Mr Mark Bezant of FTI Consulting LLP (“**FTI**”), the Defendants’ accountancy expert. In it, Hogan Lovells stated as follows:

“In respect of paragraphs 17D and 17N of the RAPoD, which relate to the Defendants’ case that the profits earned by AES and PAC on certain sales were derived from acts that were non infringing due to the payment terms of AES’s and PAC’s contracts with customers sometimes being triggered by a specified event other than delivery to the UK, almost all of which are triggered on shipments in the USA, that for: (a) AES, 38 out of 156 relevant contracts that Hogan Lovells has reviewed have payment terms that are triggered by a specified event other than delivery to the UK. Hogan Lovells has estimated that approximately 31% of AES’s Relevant Sales covered by the 156 contracts that it has reviewed are triggered by a specified event other than delivery to the UK; and (b) PAC, 45 out of 217 relevant contracts that Hogan Lovells has reviewed have payment terms that are triggered by a specified event other than delivery to the UK. Hogan Lovells has estimated that 23% of PAC’s Relevant Sales covered by the 218 contracts that it has reviewed are triggered by a specified event other than delivery to the UK.”

446. The letter exhibited over 60 pages of original documents. They appeared to me to be extracts from purchase ledgers although no attempt was made to prove these documents or even to explain their source. More importantly, however, Hogan Lovells did not annex copies of any of the 374 contracts which they claimed to have analysed. However, they then used Mr Bezant as a mouthpiece to present their conclusions in his first report dated 17 July 2024 (“**Bezant 1**”). None of Panasonic’s witnesses of fact gave evidence to prove the assertions which Hogan Lovells made in their letter, and I was not taken to any of the relevant contracts by counsel either orally or in their written submissions.

447. I consider this approach to be unacceptable. The Defendants’ solicitors should not have used an expert witness as a vehicle to present their own untested analysis or conclusions. It was for the Defendants to prove their case that the contractual right to payment was



triggered by shipping in the USA. The obvious way to do so was to adduce expert evidence from a lawyer qualified in the proper law of the relevant contracts and for them to present their analysis together with the relevant contracts to the Court and to make themselves available for cross-examination. It should not be left to the Court to conduct an archaeological expedition through the trial bundle after a demanding trial raising numerous issues in order to determine whether the analysis stated in a letter of instructions to an expert witness was accurate and correct.

448. Moreover, it should have been obvious to the Defendants and their legal advisers that the critical issue was not the timing of payment (or the obligation to pay) but whether, in the real world, Astronics and Panasonic would have insisted on being paid or refused to return the price of their products if Lufthansa had obtained an injunction preventing Safran from connecting the Components together and incorporating the EmPower Fusion system into its seats, or an injunction against Astronics and Panasonic preventing them from supplying further Components for that purpose either to Safran or other seat manufacturers.
449. I am willing to accept that Panasonic and Astronics were entitled to be paid once they had shipped the goods to Safran and I have assumed in their favour that title would have passed to the airlines even before Safran committed the acts of infringement found by Morgan J. But in the absence of any of the relevant contracts, I consider it highly improbable that the individual contracts which Hogan Lovells had analysed would not have conferred a contractual right upon the airline customer to recover the price paid for IFE or ISPS systems if there was a total failure of consideration. Moreover, even if those contracts had contained valid exclusion or limitation clauses preventing the recovery of the price in those circumstances, I would have needed detailed persuasion that those clauses were valid if the proper law of each contract was not English law.
450. Finally, in the absence of any evidence of fact I consider it highly improbable that Astronics or Panasonic would have stood on their rights and enforced such clauses against their principal airline customers. If the Defendants were to persuade me that Astronics or Panasonic would not have been willing to return the price of each IFE system or ISPS to those customers because Lufthansa had obtained an injunction against them, I would have needed clear and unequivocal witness evidence from senior executives in both companies that they would have been willing to enforce such terms

against their principal customers come what may. Indeed, I am wholly unsurprised that the Defendants were unable to adduce such evidence because all of their witnesses stressed the importance of customer relationships to the success of their products.

451. I, therefore, reject the timing argument. The Defendants failed to adduce any admissible evidence of the contracts terms on which they relied or any factual evidence from which the Court could be satisfied that they would have enforced the terms of the relevant contracts rather than return the price of their products in the event that Lufthansa had obtained an injunction restraining infringement. I hold, therefore, that Lufthansa has proved its case on but for causation against Astronics.

(ii) Panasonic

452. I address the Unresolved Issues in relation to Panasonic's liability in section VII (below). In its Points of Defence and the Defendants' Opening Trial Skeleton, Panasonic also advanced a closely related argument in relation to but for causation which I will call the "**common design argument**". They summarised it as follows:

"As noted, Panasonic has been held to be jointly liable with its "customers" for their acts of making. Panasonic pleads (RRAPoD [B1/7/15] at [20]) that it derives no profits from those acts. Its profits were made on non-infringing activities, namely the conclusion of contracts for sale of its IFE Systems (where those systems included EmPower Components). The short point is that on an account of profits it should not be required to disgorge profits which were not derived from the making, by its "customers", of EmPower Systems."

453. The common design argument turns on the effect of Morgan J's findings and the orders which he made and, in particular, what he meant by "an account of the profits accruing to the Defendants and each of them, by reason of the Defendants' acts of infringement of the Patent": see the Liability Order, ¶8. In their Opening Trial Skeleton the Lufthansa team submitted that he ordered the Defendants to account for the profits which Panasonic had earned as a consequence of two kinds of act. The first category was the acts of its customers in connecting the Components which Panasonic had adopted by joining the common design. The second category were those acts which Panasonic had itself committed in furtherance of that common design.

454. Section 60 of the PA 1977 defines the term "infringement" and its meaning depends on

whether the patent protects a product or a process or the extent to which it makes use of the inventive concepts of each individual claim (see further below). The section provides as follows (so far as relevant):

“(1) Subject to the provisions of this section, a person infringes a patent for an invention if, but only if, while the patent is in force, he does any of the following things in the United Kingdom in relation to the invention without the consent of the proprietor of the patent, that is to say— (a) where the invention is a product, he makes, disposes of, offers to dispose of, uses or imports the product or keeps it whether for disposal or otherwise; (b) where the invention is a process, he uses the process or he offers it for use in the United Kingdom when he knows, or it is obvious to a reasonable person in the circumstances, that its use there without the consent of the proprietor would be an infringement of the patent; (c) where the invention is a process, he disposes of, offers to dispose of, uses or imports any product obtained directly by means of that process or keeps any such product whether for disposal or otherwise.

(2) Subject to the following provisions of this section, a person (other than the proprietor of the patent) also infringes a patent for an invention if, while the patent is in force and without the consent of the proprietor, he supplies or offers to supply in the United Kingdom a person other than a licensee or other person entitled to work the invention with any of the means, relating to an essential element of the invention, for putting the invention into effect when he knows, or it is obvious to a reasonable person in the circumstances, that those means are suitable for putting, and are intended to put, the invention into effect in the United Kingdom.”

455. Section 61 of the PA 1977 contains the statutory power to bring proceedings for infringement of a patent and that section also fixes the scope of the remedies available. It is headed “Proceedings for infringement of patent” and it provides as follows (again so far as relevant):

“(1) Subject to the following provisions of this Part of this Act, civil proceedings may be brought in the court by the proprietor of a patent in respect of any act alleged to infringe the patent and (without prejudice to any other jurisdiction of the court) in those proceedings a claim may be made— (a) for an injunction or interdict restraining the defendant or defender from any apprehended act of infringement; (b) for an order for him to deliver up or destroy any patented product in relation to which the patent is infringed or any article in which that product is inextricably comprised; (c) for damages in respect of the infringement; (d) for an account of the profits derived by him from the infringement; (e) for a declaration or declarator that the patent is valid and has been infringed by him. (2) The court shall not, in respect of the same infringement, both award the proprietor of a patent damages and order that he shall be given an account of the profits.”

456. The judge rejected an argument that Astronics or Panasonic had committed a direct infringement within the meaning of section 60(1)(a) by supplying the Components to Safran and other seat manufacturers. He did so because he held that on the true construction of Claim 1 the Components did not themselves amount to a product unless they were connected together: see the Liability Judgment, [95], [96] and [281](i). By contrast, however, he held that Safran and the other seat manufacturers committed a direct infringement within the meaning of section 60(1)(a) by connecting the Components together into the EmPower Fusion system and that Panasonic was a party to the common design to commit those acts of infringement: see [285] and [286].
457. Lufthansa submitted that although Panasonic did not carry out those acts of infringement it must be treated as having done so and it relied on the decision of the Court of Appeal in *Sabaf SPA v Meneghetti SPA* [2002] EWCA Civ 976, [2003] RPC 14 where Peter Gibson LJ (giving the judgment of the court) stated as follows at [59]:

“The underlying concept for joint tortfeasance must be that the joint tortfeasor has been so involved in the commission of the tort as to make himself liable for the tort. Unless he has made the infringing act his own, he has not himself committed the tort. That notion seems to us what underlies all the decisions to which we were referred. If there is a common design or concerted action or otherwise a combination to secure the doing of the infringing acts, then each of the combiners has made the act his own and will be liable. Like the judge, we do not think that what was done by Meneghetti was sufficient. It was merely acting as a supplier of goods to a purchaser which was free to do what it wanted with the goods. Meneghetti did not thereby make MFI’s infringing acts its own.”

458. I accept that submission. The Defendants did not challenge it in their written Closing Submissions or seek to argue that the acts of infringement of Safran and the seat manufacturers should not be attributed to them. I hold, therefore, that “the Defendants’ acts of infringement of the Patent” in the Liability Order, ¶8 includes the acts of infringement committed by Safran and other seat manufacturers to whom Astronics and Panasonic supplied the Components in the United Kingdom. Even though I am satisfied that this is correct as a matter of law, I would have reached this conclusion in any event. Although the judge made separate declarations in relation to each Defendant, he did not distinguish between the different acts of the Defendants in the Liability Order, ¶8.
459. The judge also set out the acts which Panasonic did in furtherance of the common design in the Liability Judgment at [279] and he cited the decision of the Supreme Court in *Fish*

& *Fish Ltd v Sea Shepherd UK* [2015] AC 1229 at [282] as authority for the proposition that Panasonic's liability depended upon proof of two elements: first, it must have acted in a way which furthered the commission of the common design and, secondly, it must have performed those acts in pursuance of the common design. He concluded at [285] that "there does not appear to be any dispute as to the facts, summarised above, as to what Panasonic did and what it said to its customers". In reaching this conclusion he was clearly referring to the facts set out in [279] and finding that they proved the first element of Panasonic's liability. But if there is any doubt, I hold that this is what he meant.

460. The obvious conclusion to draw from the judge's analysis is that "the Defendants' acts of infringement of the Patent" in the Liability Order, ¶8 included not only the acts of Safran and the other seat manufacturers but also the acts of Panasonic in furthering the common design. However, the Defendants contested this conclusion by relying on the judgment of Lord Leggatt in *Lifestyle Equities* (above) at [92] and [93]:

"92. Applying the same standard of knowledge to both parties would be a logical approach if procuring or inducing someone to commit a tort, or participating in a common design to do so, were simply another way of committing a tort. The characterisation of the parties as joint tortfeasors may encourage such a view. But it is not correct. The procurer or participant is not liable because all the elements of the tort are established in relation to them. They are liable even though they do not satisfy all the elements of the tort. Their liability is secondary or accessory in the sense that it arises from an act which is connected in some relevant way with the commission of a tort by someone else. There is no logical requirement that any mental element necessary to make them liable should be the same as any mental element which is a constituent of the tort.

93. The distinction is particularly clear in the case of statutory torts such as patent, copyright or trade mark infringement because the elements of those torts are specified in legislation. I have explained why, on the facts found, the Ahmeds did not infringe Lifestyle's trademarks. The acts amounting to infringement, specified in section 10 of the Trade Marks Act 1994, are confined to various ways of using an offending sign. These do not include procuring or authorising another person to use such a sign. If a party who procures another to use an offending sign is liable in tort, therefore, it is not because that party is an infringer. Such persons are exhaustively defined in the Act and a person who procures or authorises another to use an offending sign falls outside the relevant provisions."

461. The Defendants argued that because Panasonic's acts in furthering the common design were not themselves actionable as "acts of infringement" they must be ignored for the purposes of the Account. They made the following submission in their Written Closing

## Submissions:

“The acts of patent infringement are similarly constrained and do not include acts establishing accessory liability for participating in a common design. Accordingly such acts are not within the scope of an “account derived from the infringement”.

462. I have no hesitation in rejecting that argument. In the passage from *Lifestyle Equities* (above) Lord Leggatt was explaining why the mental element required for liability as an accessory does not mirror the mental element required for primary liability: see [90]. The mental element is different precisely because the acts committed by an accessory are not themselves actionable. But if the relevant mental element is proved, the accessory becomes liable. However, Lord Leggatt was not suggesting that once an accessory has been found liable for participation in a common design, the Court should ignore their own conduct altogether. In my judgment, the acts of infringement to which the judge was referring in the Liability Order, ¶8 included not only the acts of Safran and the other seat manufacturers but also the acts of Panasonic as set out in [279].
463. Given findings (i) and (iv) (above) and my conclusions in relation to both the timing argument and the common design argument, I am satisfied that but for the acts of infringement of both Safran and Panasonic as set out in the Liability Judgment at [278] and [279] Panasonic would not have sold integrated IFE systems to the airlines unless they included AC power. I am also satisfied that in the absence of an NIA, the only ISPS system available to Panasonic was the EmPower Fusion system. I hold, therefore, that but for the supply of the Components to Safran and Safran connecting them together and incorporating them into airline seats, Panasonic would not have made the profits in issue.
464. But even if this finding of fact is wrong, I am satisfied that the Court is entitled to take into account all of Panasonic’s activities in respect of the supply of the EmPower Fusion system to its airline customers in deciding whether the profits in issue were derived from the infringement. In *Spring Form Inc v Toy Brokers Ltd* [2002] FSR 17 Pumfrey J (as he then was) held that the word “infringement” in section 61(2) (above) is used in a colloquial rather than a technical sense. He stated this at [24]:

“The first question is the effect of subsection 61(2) on the election which may be made by a patentee: what is meant by “infringement” in the subsection. If it means “act of infringement” (as in make, dispose of, offer to dispose of use or import and so on) then the provision is nonsensical, as

in general it is the whole course of the infringer's dealing with a particular item which causes the patentee loss or gives the infringer profit. In this context it makes no sense to separate manufacture from sale. In my judgment, therefore, the word "infringement" in subsection 61(2) is used in a colloquial way to denote the defendant's activities in respect of a single infringing article or operation of a process."

465. The Defendants sought to distinguish *Spring Form* on the basis that the judge was addressing a different question and was careful to distinguish between infringing and non-infringing activities: see [19]. In my judgment, however, the passage above is of general application and I interpret the word "infringement" in section 61(1)(e) in the same way. I also agree with Pumfrey J that it would be nonsensical to limit the operation of that paragraph to profits derived from the individual acts of infringement upon which liability is based. If this is correct, a patentee can never elect for an account of profits unless the sale of the infringing articles is itself an act of infringement. As Mr Hall pointed out in his oral submissions, section 60 does not use the word "sale" in defining infringement and if Panasonic is correct, it would be easy for an infringer to avoid the effect of section 61 by arranging for the sale of the infringing articles to take place outside the jurisdiction.

(iii) Safran

466. I deal with the quantification and apportionment of Safran's profits in issue in sections VI and VIII (below). Given findings (i) to (iv) (above) I am also satisfied that Safran would not have made the profits in issue but for the infringement of the Patent for which Morgan J found Safran liable in the Liability Judgment. In particular, there was no suggestion that Safran would have manufactured and assembled any seats without AC power if Astronics and Panasonic had not manufactured and supplied it with any of the Components. Furthermore, the purpose of the exercise which I have undertaken in section VIII is to identify the small element of Safran's profits which were caused by the infringement.

(3) *Legal or proximate causation*

(i) Astronics

467. I have held that the Patent was a "barrier" or "gateway" patent in the sense that Astronics would not have been able to obtain certification of the EmPower systems or the approval

of the airframe manufacturers without using some or all of the features of the Patent. The critical issue is whether this is sufficient to establish that the infringement was the legal or proximate cause of the profits in issue given the range of other factors which were causative of those profits. In my judgment, this is not sufficient to establish legal causation and I hold that the infringement of the Patent by Astronics was not the legal or proximate cause of the profits in issue for the following reasons:

- (1) Although Astronics used the insertion and timing features of the Patent in order to satisfy the “mating” condition in the 1999 Memorandum, that condition was not introduced to ensure or require compliance with either the insertion test or the Patent. Moreover, the “mating” condition was only one of twenty-four conditions which GD had to satisfy to obtain certification of its EmPower systems. Finally, this safety feature required a lower degree of assurance than the hardware features of those systems.
- (2) Again, although Astronics used all three inventive features of Claim 1 to obtain Boeing approval and the insertion and timing features to obtain Airbus approval, Astronics had to satisfy many other safety requirements in order to obtain airframe manufacturer approval. In the case of Boeing these included 36 additional safety tests which were unconnected with the features of Claim 1. In the case of Airbus the relevant requirement was not a safety critical feature or one which significantly reduced aircraft safety and Astronics had to satisfy seven major safety critical requirements and one other minor requirement in order to obtain approval.
- (3) I accept that the insertion and remoteness features, which I have held to be the inventive core of the Patent, were necessary for GD and then Astronics to obtain certification and airframe manufacturer approval. But, in my judgment, they were not sufficient. Each EmPower Fusion system had to satisfy the other safety requirements contained in the 1999 and 2005 Memoranda and the detailed technical specifications of the airframe manufacturers before they could obtain certification and approval. In my judgment, it was Astronics’ ability to satisfy all of the requirements of those memoranda and technical specifications which was the real driver of the sales of the EmPower systems. In this respect there is a close analogy with *Neo*: see Arnold LJ’s judgment at [116].



- (4) I accept that the AC power function was functionally and commercially essential for Astronics' power only sales direct to the airlines. But I have also found that its power management functions of the system were equally essential to the commercial exploitation of that system. I am satisfied, therefore, that without both functions Astronics would not have made the direct and power only sales in issue and that its power management function systems drove the sales of the EmPower Fusion system just as much as the infringement of the Patent during the Relevant Period.
- (5) However, power only sales represented no more than 22% of the market during the Relevant Period and Astronics generated 78% of its revenue from IFE sales. The provision of AC power outlets to PEDs was not commercially essential to those sales. In my judgment, the most significant feature of the IFE systems was the quality and variety of the entertainment experience which the system provided. The insertion and remoteness features were not, therefore, commercially essential in the sense used by HHJ Hacon in *OOO Abbott* (above).
- (6) The market for ISPSS systems was a duopoly between Astronics and KID. But although they were the dominant players, Astronics had a market share of 87.9% and achieved sales of USD \$233 million compared with KID's market share of 9.8% and sales of USD \$23 million. Further, 78% of those sales in issue were IFE sales. I have found that Astronics achieved this dominance because of its superior product and services and, in particular, the weight of its SPM or SPB. I have also found that KID's failure to find a satisfactory solution to the heat dissipation issue with the KID SPM and the failure of the Lufthansa project effectively shut it out of the market. In my judgment, these factors and not the infringement of the Patent drove the sales of the EmPower Fusion system in the integrated market during the Relevant Period.
- (7) Moreover, the reasons why Astronics' product and services were superior to the SkyPower System were unrelated to the exploitation of the Patent and the reasons why the Lufthansa project failed and KID was unable to find a satisfactory solution to the heat dissipation issue were also unrelated to the inventive features of the Patent. Indeed, this proposition can be tested simply. During the Relevant Period, both Astronics and KID were able to use those inventive features in their ISPSS

systems and KID was able to compete with Astronics on price. But Astronics outsold KID by a factor of ten. In my judgment, the scale of Astronics' market dominance cannot be explained by the exploitation of the Patent.

(8) I have accepted Mr Mosebach's evidence that [REDACTED] but placed little or no weight on that evidence because [REDACTED] was not known to the market or KID's potential customers and had no effect on its ability to compete with Astronics. But even if that [REDACTED], this would not have affected my conclusion that the infringement of the Patent was not the proximate cause of Astronics' sales during the Relevant Period. This is because the [REDACTED] was also unrelated to the exploitation of the Patent.

(9) Arnold LJ made it clear in *Neo* that the absence of an NIA is not determinative of the question of legal causation and a counterfactual test may be problematic or have the potential to confuse: see [117]. He made those observations in the context of a claim for damages but they are particularly apt in the context of an account of profits where the function of the test is not to determine whether recovery should be excluded altogether but to determine whether the Court should apportion the profits. In my judgment, Lufthansa and its team fell into the trap of treating the question whether there was an NIA as determinative of the overall issue of legal causation.

468. I have held that Astronics' ability to satisfy all of the requirements of the regulatory authorities and the airframe manufacturers drove the sales of all of the EmPower systems by analogy with *Neo*. I have also held that the superior quality of its product and services and KID's failure to compete drove the sales of the EmPower Fusion system in the integrated market during the Relevant Period. In my judgment, either finding might have justified the conclusion that the infringement of the Patent was not the proximate cause of the profits in issue. But I make it clear that in reaching this conclusion I have carried out an evaluative exercise in which I assessed the cumulative effect of all of the factors which I have set out above. In doing so, I have adopted the same course as Bacon J in *Neo* and followed the guidance of Arnold LJ in the Court of Appeal.

469. Finally, I remind myself that I refused the Defendants' permission to amend to plead that the GD AES Patents were "gateway" or "barrier" Patents and that for this reason I should

not attribute too much weight to Astronics' own power management technology. I am satisfied that even if I had not found that this technology was commercially essential to Astronics' power only sales, I would have reached the same conclusion that the infringement of the Patent did not drive Astronics' sales during the Relevant Period. If Lufthansa had brought an alternative claim to that pool of profits, it is possible that I might have found in its favour. But it was not presented in that way. At all times, Lufthansa approached the Account on the basis that it was entitled to a single, indivisible pool of profits.

(ii) Panasonic

470. The parties drew no distinction between the position of Astronics and the position of Panasonic in relation to legal causation. For the reasons which I have set out immediately above in relation to Astronics, I hold that the infringement of the Patent by Panasonic was not the legal or proximate cause of the profits in issue. Again, in reaching this conclusion I have taken into account the cumulative effect of all of the relevant factors. However, given that Panasonic is only liable for infringement in relation to IFE sales, I attribute greater significance to the commercial factors set out in paragraphs (6) to (9) (above).

(iii) Safran

471. Lufthansa conceded that apportionment was appropriate in relation to Safran's profits and it is unnecessary for me to decide whether the infringement was the legal or proximate cause of the profits in issue. But in any event, I would have held that Safran's acts of infringement were not the legal or proximate cause of the profits in issue for the simple reason that Safran charged no mark up on the sale of ISPSS or IFE systems and the acts of infringement had only a marginal effect on its profits.

*(4) Convoyed goods*

472. Finally, if I am wrong and the infringement of the Patent was the proximate cause of the profits in issue of either Astronics or Panasonic, then I hold that it was not the proximate cause of the profits which either Astronics or Panasonic derived from the sales of the Secondary Components and Ancillary Goods and Services. In making this finding, I rely on all of the findings and reasons which I have set out above. But I place particular

reliance on the finding at [467](viii) (above). In my judgment, the purchase of the Secondary Components and Ancillary Goods and Services was not consequential upon the infringement because the purchase of AC power outlets was not the principal purchasing decision in the mind of the airlines and the purchase of the other goods or services followed as a consequence. The principal purchasing decision of the airlines was the IFE system and this was based on the quality and variety of the entertainment experience.

## **VI. Panasonic's Liability**

473. Given my conclusions in relation to both but for causation and legal causation it is unnecessary for me to decide any of the Unresolved Issues. It also seems to me unlikely that the determination of those issues could be relevant to an appeal whether it is my findings on factual causation which are wrong or my findings on legal causation which are wrong. Nevertheless, I go on to deal with two of those issues briefly since they were the subject of detailed argument. I do not deal with the third issue for reasons which I explain.

*(1) Unresolved Issue (a): Is Panasonic liable for indirect infringement under section 60(2) of the PA 1977?*

474. Morgan J found that the Components were the means for putting the invention of the Patent into effect within the meaning of section 60(2) of the PA 1977. He also held that Panasonic supplied the Components in the United Kingdom with the knowledge and intent that they would be assembled into the EmPower Fusion system, that there was only one way to assemble the Components and that they were colour coded to assist the installer who was provided with assembly instructions: see the Liability Judgment, [277] and [279].

475. Section 60(2) (above) requires the patentee to prove knowledge of two facts or matters. First, it requires the patentee to prove that the infringer either knew or should have known that the means of working the invention was suitable for putting the invention into effect. Secondly, it requires the patentee to prove that the infringer knew that it was intended to put the invention into effect. It was common ground that the section was referring to the intention of the ultimate user. It was also common ground that the airline customers who purchased integrated IFE systems intended Safran to connect the Components together

and instal them in airline seats and that Panasonic knew that this was their intention. But if there is any doubt, I find that this was the intention of the airlines and that Panasonic was aware of it.

476. The issue between the parties concerned “knowledge of suitability” and, in particular, whether it was necessary to prove that Panasonic had the technical knowledge and understanding about how the EmPower Fusion system worked. In their Opening Trial Skeleton the Lufthansa team submitted that it was enough to prove that Panasonic knew that the Components were suitable and intended by the ultimate user to be connected together to produce the EmPower Fusion system:

“The relevant knowledge is therefore that the means are suitable and intended for turning what is something less than the product into the product. The person supplying the means (or a reasonable person standing in their shoes) need not know that they have any particular technical features, only that they are suitable for and intended to be connected together in a manner which will, as it happens, fall within the claim. That makes sense because the supplier of inherently non-infringing means, which are later assembled by a third party into an infringing product, ought not to be fixed with liability if they are unaware that the means are capable of being assembled in such a way or that anyone will try to assemble them in that way.”

477. In the Defendants’ Opening Skeleton Argument, Panasonic submitted that knowledge of suitability required knowledge not only that the Components could be assembled into the EmPower Fusion system (and that it was the intention of airline customers to do so) but also a technical understanding of how the invention worked:

“Considering the ‘knowledge of suitability’ requirement confirms the point. Knowing that means are suitable for putting the invention into effect necessarily requires knowledge of how the means work, in order to determine suitability. It cannot be said that Panasonic knew that the components were suitable for putting the invention into effect simply because it knows they are suitable for being connected together: that being the limit of Panasonic’s knowledge it would still not know whether the components are suitable for putting the invention into effect or not. The concept of putting “the invention into effect” must have the same meaning in the ‘knowledge of intention’ requirement.”

478. On this issue I prefer the Defendants’ construction of section 60(2). They relied on the judgment of Lord Sumption JSC in *Warner-Lambert Company LLC v Generics (UK) Ltd* [2018] UKSC 56 at [59]:

“On the other hand, an allegation of infringement under section 60(1)(b) (at any rate by offering the process for use in the United Kingdom), or an allegation of indirect infringement under section 60(2), on the other hand, requires proof of knowledge. In both cases, the knowledge required is encapsulated in the phrase “when he knows, or it is obvious to a reasonable person in the circumstances ...”. Secondly, section 60 uses a consistent conceptual approach to the relationship between the words product, process and invention. Invention is a class with only two members, product and process, and the invention in question is the subject matter of one or more claims in the patent. Thus, for the purposes of section 60, phrases about using the process, product or invention, or working the invention or putting the invention into effect need to be understood and applied by reference to the claim (or claims) in the patent alleged to be infringed.”

479. In my judgment, therefore, knowledge of suitability requires Lufthansa to prove that Panasonic either knew or ought to have known that the Components were suitable for putting the invention of Claim 1 into effect. In practical terms, therefore, Lufthansa had to show that Panasonic was aware of the insertion feature, the remoteness feature and the timing feature. If Panasonic’s officers or employees were aware of those features or had that technical information available, then in my judgment Panasonic had the required knowledge of suitability.

480. Lufthansa accepted that it was not entitled to rely on any evidence or documents which were not available at the trial. It also accepted that it could not seek to go behind Panasonic’s PPD for the Liability Trial which stated as follows under the heading “The Defendant’s knowledge of the function of the components”:

“11. The Defendant does not design or manufacture any of the AES Components. The Defendant did provide specifications for the basic functionality it wanted the SPM to have but the SPM was designed by and is manufactured by AES. The Defendant knows that the SPM carries out power management but it does not know exactly how this function is carried out or the internal design of the SPM. This is also the case for the exclusive model described in paragraph 8 above.

12. The Defendant keeps a small stock of spare AES Components in the UK. If the Defendant has a maintenance contract in place with an airline then the Defendant may, on occasion, board an aircraft when it is on stand at a UK airport to remove AES components that the airline has reported to be faulty. The Defendant returns faulty components to AES in the USA for repair. Repaired components are then returned to the Defendant in the USA. Outlet Units are not repaired, they are just replaced. Depending on the terms of the relevant contract, the Defendant may itself fit repaired or replacement components onto the aircraft in the UK. The Defendant provides its customers with a Component Maintenance Manual (CMM)

which provides instructions to customers that if any of the AES Components are faulty, the customer should return the component directly to AES or to an AES approved repair facility. Panasonic is not an AES approved repair facility.

13. The Defendant is not legally allowed to dismantle, open or alter any of the components which are supplied to it by AES. The only information the Defendant has about the workings of the AES Components is limited to the information contained in the installation requirements manuals supplied by AES to the Defendant. These manuals do not give a detailed description of how the AES Components work.

14. Prior to reviewing the AES PPD, the Defendant was not aware of the detailed information provided in section 5 relating to the inner design and workings of the Outlet Unit. The Defendant was not aware of the content of section B of the AES PPD or that the Outlet Unit had been re-designed by AES. Nothing about the re-design of the Outlet Unit is included in the CMM provided by AES nor was the Defendant notified of any re-design.”

481. I accept, therefore, that Lufthansa has not proved that Panasonic had actual knowledge of the three features of the Patent far less that any individual officer or employee had that knowledge. However, I am satisfied that it was obvious to a reasonable person in the circumstances that the Components were suitable for putting Claims 1 and 2 into effect for the following reasons:

- (1) The PPD for the Liability Trial stated that Astronics had designed an exclusive model to Panasonic’s specification in or around 2004. It also stated that it “wanted these functions to be separated out into two separate boxes to make the placement and installation within the seat easier (as the single box is more bulky)”: see paragraph 8. I am satisfied that the configuration of the ISPS would have been obvious to the Panasonic team designing the specification and that the ISPS was remote from the outlet.
- (2) Panasonic admitted that it had knowledge about the workings of Astronics’ components from the installation requirement manuals supplied to it by Astronics: see paragraph 13 (above). Lufthansa identified two such manuals dated 10 March 2004 and 26 May 2016 which were annexed to Astronics’ PPD and explained the insertion feature. Paragraph 3.2.1 of the first manual stated as follows:

“The ACOU, part number 1235-X-X, is a single LRU of the ISPSS. The ACOU is connected to the outputs of the 1191 series ACISPS and provides a receptacle for users (i.e. passengers or cabin crew) to plug in and power their Portable Electronic Device (PED). The ACOU is

designed such that 110VAC power is not present at the ACOU until a suitable plug is fully inserted. Power will not be available to any device plugged in before the ACISPS is powered. Users must unplug and wait for the ACISPS output to reset.”

- (3) Lufthansa also identified a component maintenance manual dated 12 July 2012 for the Astronics SPM 1248-10, a training package which Astronics sent to Thales on 22 January 2007 and the Boeing safety assessment dated 4 October 2007 (see [84] above). All three were included in the trial bundle for the Liability Trial. All three described the timing feature and the Boeing safety assessment described both the insertion and the timing feature.
- (4) Lufthansa relied on all of these documents in its Opening Trial Skeleton. The Defendants did not address the facts in any detail in their Opening Trial Skeleton and were principally concerned to ensure that Lufthansa was unable to rely on any new material. Panasonic had fair warning, therefore, of the reliance which Lufthansa placed on these documents but did not address them at all in their written Closing Submissions. They did not suggest that these documents had not been supplied to them or were not available and they did not suggest that it was not obvious to a reasonable person from these documents that the Components were suitable for putting Claims 1 and 2 of the Patent into effect.

482. Accordingly, I answer Unresolved Issue (a) in favour of Lufthansa and I find that Panasonic is liable for indirect infringement under section 60(2) of the PA 1977 because (as the judge found) it supplied or offered to supply Components to Safran and other seat manufacturers in the United Kingdom when it was obvious to a reasonable person in the circumstances that the Components were suitable for putting, and were intended to put, the invention of Claims 1 and 2 into effect in the United Kingdom.

*(2) Unresolved Issue (b): Does the doctrine of equivalents apply and are the Primary Components equivalent to the connected EmPower Fusion system?*

*(i) Actavis I*

483. Mr Barovsky gave evidence for the Liability Trial in his third expert report dated 22 January 2020 that the unconnected Components did not achieve substantially the same result as the connected EmPower Fusion system. Lufthansa submitted that I should



dismiss this evidence because Mr Barovsky did not identify the inventive concept and because the Defendants did not identify connection as part of the inventive concept in their Points of Defence. I reject that submission. The difficulty for Lufthansa is that it did not challenge Mr Barovsky's evidence at the Liability Trial and it was not open to it do so at the trial of the Account. I, therefore, accept it. But in any event I agree with the Defendants that the variant of the invention embodied by the Components does not achieve substantially the same result as the invention, because until the Components are connected together they do not achieve any result at all.

(ii) *Actavis 3*

484. It follows that *Actavis 2* and *Actavis 3* do not arise. But even if I had answered both *Actavis 1* and *Actavis 2* in the positive, I would also have answered *Actavis 3* positively and in favour of the Defendants. Morgan J held that on the true construction of Claim 1 the individual components were not to be treated as equivalent to the assembled voltage supply apparatus or supply device and he contrasted the word "connected" with the word "connectable": see the Liability Judgment, [96]. Moreover, he reached this decision even though he found that there was only one way to assemble the Components, they were provided in almost finished form and they are connected the same way regardless of the type of seat into which they were installed: see [279]. I, therefore, answer the Unresolved Issue (b) in favour of the Defendants.

*(3) Unresolved Issue (c): Did Panasonic commit direct infringement by supplying the Primary Components in the United Kingdom as a complete "kit of parts"?*

485. In their Opening Trial Skeleton Lufthansa acknowledged that this was a "tricky" issue and they doubted that a determination of this issue was necessary if I found in their favour on the common design argument and any of the Unresolved Issues. The Defendants argued that there was no free-standing "kit of parts" doctrine and that, frequently, Panasonic does not supply the Primary Components as kits. Given that I have found in Lufthansa's favour on the common design argument and on Unresolved Issue (a) and given the difficult legal and factual issues which arise, I do not consider that it is necessary for me to decide Unresolved Issue (c) and I leave it for determination in a case where the decision is necessary to the result.

**VII. The profits in issue**

486. Lufthansa called Mr Daniel Ryan to give expert evidence in relation to the calculation of the profits in issue. He is a Managing Director at Berkeley Research Group and head of the London office and he made three reports dated 17 July 2024 (“**Ryan 1**”), 9 August 2024 (“**Ryan 2**”) and 1 October 2024 (“**Ryan 3**”). The Defendants called Mr Bezant to give expert evidence and he is a Senior Managing Director at FTI and leads its Economic and Financial Consulting practice in Europe, the Middle East and Africa, and Asia Pacific. In addition to Bezant 1, he made a second report dated 9 August 2024 (“**Bezant 2**”) and a third report dated 24 September 2024 (“**Bezant 3**”). On 5 September 2024 Mr Ryan and Mr Bezant met and on 9 October 2024 they made a joint statement (the “**Joint Statement**”).
487. Both experts are Fellows of the ICAEW and had extensive experience in the valuation of intellectual property rights. The Defendants made a sustained attack on Mr Ryan’s evidence in their written Closing Submissions. But I do not accept their criticisms of him. I found both experts to be reliable and conscientious witnesses doing their best to assist the Court. Given the number of variables which they had to consider and the challenging circumstances in which they were preparing their own evidence and responding to each other, they were bound to modify their opinions. Further, many of the differences between them were no more than a reflection of the instructions which they were given in relation to factual matters (and I have already given one example above). I, therefore, approached the evidence of both witnesses on the basis that the differences between them reflected the fact that an experienced accountant might arrive at a range of conclusions on each issue and I decided between them on the basis of the evidence which I found to be the more compelling.
488. The experts produced three tables in the Joint Statement (Table 4-1, Table 5-1 and Table 6-1) which helpfully set out the differences between them. In the left hand side they set out their calculations on the basis that 100% of the profits of each of Astronics, Panasonic and Safran were replaced by sales of the 1171M during the Relevant Period and in the right hand side of the table they set out their calculations on the assumption that none of those sales were replaced by sales of the 1171M. Given the findings which I have made in section IV (above) it is only necessary for the Court to consider the calculations in the right hand side of each table. Both experts presented their figures in US dollars and I do the same.

N. Astronics

489. In Table 4-1 Mr Ryan and Mr Bezant agreed that Astronics' gross profit from UK sales was [REDACTED] for the Relevant Period on the assumption that no sales were replaced by sales of the 1171M. There was a dispute between the parties about internal research and development costs ("IRAD costs") which does not arise because the Defendants did not establish that the 1171M was an NIA. Nevertheless, because I heard evidence and argument on that issue, I deal with it briefly below. The only other issues on which the parties disagreed were the profits from the sale of final assembly components which were shipped outside the UK ("FAL Components") and tax payable on UK sales. I deal with each in turn.

*(1) IRAD Costs*

490. Mr Ryan calculated that Astronics' IRAD costs were [REDACTED] million and Mr Bezant calculated that they were [REDACTED]. Mr Bezant gave evidence in Bezant 2 that he had allocated revenue using a revenue allocation approach but excluded projects which could not have contributed to Astronics' sales during the Relevant Period and which did not generate material revenue for its Cabin Electronics division. Mr Cuddigan did not challenge either his approach or the projects which he had excluded in cross-examination. When he came to give evidence, Mr Ryan accepted that he had not included costs incurred before the Relevant Period but which might have generated revenue during that period. He also accepted that he had excluded 21 projects on instructions and that he did not have a positive reason for doing so or for disagreeing with Mr Bezant in relation to their inclusion.

491. I prefer Mr Bezant's evidence on this issue. It was unchallenged and clearly based on reasonable assumptions. By contrast, Mr Ryan could not defend the assumptions which he had been instructed to make and he accepted that one of them at least might well be wrong. I find, therefore, that Astronics' IRAD costs during the Relevant Period were or would have been [REDACTED] if Astronics had been able to develop an NIA and, in particular, if the 1171M had been an NIA.

*(2) FAL Components*

492. The FAL Components which Astronics sold outside of the UK consisted of a seat-to-seat

cable, a grounding wire, an MCU and a configuration module. Mr Ryan calculated that the net profits from FAL Components was [REDACTED] and Mr Bezzant calculated that they were [REDACTED]. The only difference between them was based on the ratio of FAL Components to ISPS which each expert was instructed to assume. Mr Ryan gave evidence in Ryan 1, ¶6.10.4 that he had been given instructions by Jones Day to adopt certain ratios. He also gave evidence in footnote 37 that he had used Panasonic's global data to verify one of those figures:

“6.10.4 I have been instructed to estimate the number of FAL Components shipped by Astronics to locations outside the UK based on the ratio of components shown in Figure 3-1. Specifically, I have assumed that:

- Every ISPS requires a seat-to-seat cable;
- Every ISPS requires a grounding wire;
- Astronics sold one MCU for every 44.8 outlet units sold; 36F 37 and;
- For every MCU Astronics sells, it also sells a Configuration Module.

37. I understand that every aircraft fitted with an EmPower System requires at least one MCU, and in many cases will be fitted with multiple MCUs. I have no way of estimating the number of aircraft that Astronics supplied with EmPower Systems, but I have observed, using Panasonic's global data that, on average, one MCU is sold for every 44.8 outlet units sold.”

493. Mr Bezzant also adopted ratios in relation to FAL Components on the basis of his instructions from Hogan Lovells. He set out those ratios in Bezzant 2 and explained that he had been instructed that it was inappropriate to use Panasonic's data (although he did not explain why):

“To assess AES's profits from FAL Components sold outside the UK, I apply the same overall approach as that applied by Mr Ryan. However, I have been instructed to:

(1) assume that there is a ratio of 0.5 seat-to-seat cables and 0.6 grounding wires for every one ISPS sale in the UK (rather than a one-for-one ratio that Mr Ryan assumed). This is on the basis that Airbus aircraft do not require a seat-to-seat cable and grounding wire for fitted ISPSs (and a certain Boeing aircraft does not require a seat-to-seat cable);

(2) assume that there is a ratio of one MCU and configuration module (on the basis that there is one configuration module for each MCU) sold for every 60 outlet units (rather than a one to 44.8 outlet unit ratio that Mr Ryan assumed). This is on the basis that the Defendants consider that it is inappropriate to use PAC data to estimate the ratio given that MCUs sold by PAC do not solely support ISPS outlets, but also support IFEs; and

(3) rely on the part categorisation in column H of the UK sales data in the updated AES UK sales spreadsheet that has been provided to me, rather than the part categorisation provided to Mr Ryan by Jones Day. This is on the basis that the Defendants disagree with this parts categorisation.”

494. When Mr Howe put this passage from Bezant 2 to him, Mr Ryan accepted that his own figure was based on data which he had not seen and on assumptions which were outside his expertise:

“Q. He provides an explanation for the basis of the ratio? A. I mean I'm not a technical expert. That's why I've taken instruction on that point. Q. Do you have any explanation as to the basis of your ratio of 44.8 to 1? A. An explanation is not going to allow me to come up with a different number. Q. Do you have any idea of the basis of it? A. Well, I understand — I think there is data that shows for every MCU there is roughly 44 outlet units. I think it's look at total number of units, look how many outlet units, divide one by the other. You know, there is then this explanation. I have no idea whether that is appropriate or not. Q. But if it's correct that MCUs can often support up to 80 outlet units where there is no IFU to support it — assume that is correct — then that would suggest your ratio is too low? A. Well, I 'm not going to engage as to whether that's appropriate or not. Q. That's not a matter that as far as you're aware — A. It's a matter outside of my expertise. Q. It is not a matter as far as you are aware that has been taken into account in the ratio you have been instructed to assume? A. I do not know.”

495. Mr Howe also put a number of detailed questions to Mr Ryan about variations in the mix of products shipped to the UK which cast doubt on the ratio which he adopted and intended to support Mr Bezant's analysis. Mr Ryan's response was that he had observed negatives but: “Whether that makes sense, I am the numbers guy.” When Mr Hall cross-examined Mr Bezant on the same issues, it was also clear that he had no personal knowledge of the underlying data either or, indeed, how it had been analysed. He did accept, however, that Astronics ought to have been able to calculate those ratios:

“MR HALL: So just to be clear, the way you calculated, or the way that the ratios have been calculated were using Panasonic's global sales database, yes? A. I am looking for the reference to the source, yes. Q. So it's page 44 {D2/9/44}, footnote 96. A. Footnote 96, yes. MR HOWE: If you go back to 43, you will see the heading "to Astronics", my Lord. MR JUSTICE LEECH: I understand. A. So the point is one is using Panasonic's database for the purpose of this exercise? MR HALL: Yes, indeed, yes. A. Or somebody is. Q. Indeed, yes, yes. So I just want to consider the position for Astronics, because ideally what we would be able to do for Astronics is the same as what we've just done for Panasonic, which is to look at the global sales data and calculate a ratio. That would

be the ideal way of doing the exercise for Astronics? A. If the information is available for Astronics, yes. Q. Well, Astronics, in your view, as an expert financial accountant, you would expect Astronics to have that global sales data available, wouldn't you? A. Probably, yes. Q. And if the MCU ratio for Astronics were materially different to that for Panasonic, then you could readily identify those differences from the relatively straightforward exercise of analysing that global sales data? A. Subject to the issues as to how to interpret the ratios that come out of the calculation? Q. Yes. A. Yes.”

496. With some hesitation, I prefer Mr Ryan’s evidence on this issue. In my judgment, it ought to have been possible for Astronics to produce evidence of the number of FAL Components sold for each ISPSS and Mr Bezant confirmed this in his oral evidence. Furthermore, the Lufthansa team stated in their written Closing Submissions that Lufthansa had sought disclosure of this data but Astronics had resisted it successfully. The Defendants did not challenge this statement nor did they provide the Court with any of the underlying data which would have enabled the Court to evaluate the instructions given to both experts.
497. In the absence of that data, I consider that the assumptions made by Mr Ryan were reasonable. It does not seem unreasonable to assume that every ISPS would require a seat-to-seat cable and a grounding wire and the Lufthansa team were able to produce a diagram from Astronics’ website and a proposal for Air China which supported these assumptions. As for the ratio of MCUs to ISPSS Mr Ryan was able to verify this figure by reference to Panasonic’s global data whereas there was no evidence to support Mr Bezant’s competing ratio. He had been instructed that it was inappropriate to use Panasonic’s global data but if the Court was to accept this, it was incumbent upon Astronics to produce the correct data and to permit both Lufthansa and the Court to interrogate it. I find, therefore, that Astronics’ net profits from FAL Components during the Relevant Period were **[REDACTED]**.

(3) *Tax*

498. Mr Ryan calculated that Astronics’ tax on UK sales was **[REDACTED]** and Mr Bezant calculated that it was **[REDACTED]**. Mr Ryan used the statutory tax rate and Mr Bezant used the effective tax rate. I prefer Mr Bezant’s evidence on this issue for the reasons which he set out in the Joint Statement, ¶4.11. I place considerable reliance on the fact that Mr Ryan originally used the effective tax rates calculated by Astronics and

considered them to be reasonable: see Ryan 1, ¶6.7.1. I find, therefore, that the tax payable by Astronics on its UK sales during the Relevant Period was US \$10.8 million.

(4) *Total net profit*

499. Based on these findings, I hold that the total net profit earned by Astronics on its sales of EmPower Fusion systems containing the infringing outlets during the Relevant Period in the UK (but also including FAL Components shipped outside the UK) were US \$34.0 million (i.e. Mr Bezant's figure of US \$26.6 million for net profit from UK sales together with Mr Ryan's figure of US \$7.4 million for the net profit from ex-UK FAL Components).

O. Panasonic

500. In Table 5-1 Mr Ryan and Mr Bezant were agreed that Panasonic's gross revenue from UK sales was [REDACTED], that direct costs for UK sales were [REDACTED] and that a reduction of [REDACTED] should be made to that figure for overheads. They were also agreed that expenditure of [REDACTED] should be deducted for other Cost of Goods Sold ("COGS") and [REDACTED] for sales commission on UK sales. There were a number of issues between them:

- (1) *Sales credits*: Mr Bezant deducted [REDACTED] from gross revenue for sales credits. Mr Ryan did not accept that any sales credits should be deducted but that, if they were, the total figure should be [REDACTED].
- (2) *Fixed expenses*: Both experts were agreed that no fixed costs should be deducted if none of the infringing sales were replaced by sales of the 1171M. But they disagreed about the appropriate figure in the alternative hypothesis. Mr Ryan deducted fixed expenses for UK sales of [REDACTED] and Mr Bezant deducted fixed expenses of [REDACTED]. Again, the issue does not arise on the findings which I have made. But since I heard evidence and argument on the issue, I deal with it briefly.
- (3) *Variable expenses*: The experts were agreed that variable expenses of [REDACTED] should be deducted if 100% of the infringing sales were replaced by sales of the 1171M. Mr Bezant continued to deduct the same variable expenses

on the alternative hypothesis. But Mr Ryan made no such deduction.

(4) *FAL Components*: Mr Ryan added net profit of US \$8.4 million for the sale of FAL Components and Mr Bezant added US \$3.7 million.

(5) *Tax*: Mr Ryan calculated that Panasonic's tax on UK sales was [REDACTED] and Mr Bezant calculated that it was [REDACTED]. As before, Mr Ryan used the statutory tax rate and Mr Bezant used the effective tax rate.

(1) *Sales credits*

501. The question whether a deduction should be made from Panasonic's revenue to reflect sales credits given by Panasonic to its customers was the most contentious and significant of the accounting issues which I had to consider. There was no dispute between the experts that if Panasonic issued a credit to a customer for an ISPSS, then this discount or credit should be deducted from its revenue. There was no dispute either that if Panasonic issued a sales credit to a customer for an IFE system and that credit was issued in part against the price of the ISPSS, then this credit or discount should also be deducted from its revenue.

502. Lufthansa's case was that Panasonic had failed to prove by admissible evidence that it had granted any discounts in respect of the infringing EmPower Fusion systems and that the Court should disregard any sales credits altogether. The basis for this contention was that the underlying data had not been put before the Court and that the spreadsheet which contained the relevant information (or purported to contain it) had been manipulated for the purposes of the Account. Lufthansa also argued that if Panasonic had a policy for awarding or issuing sales credits, proper disclosure of the relevant documents should have been made. In both cases, Lufthansa argued, Panasonic should have called a witness or witnesses to prove the sales discounts by admissible evidence and to permit their evidence to be explored in cross-examination.

(i) Mr Ryan's evidence

503. *Ryan 1*. Mr Ryan originally took what I might describe as a constructive attitude to sales credits and had done his best to assess the amount of those credits on the assumption that this was not an unreasonable or unexpected commercial practice. He set out in Ryan 1



the basic information which he had used to arrive at his calculation of Panasonic's profits:

“7.2.1. Panasonic has set out its account of profits along with supporting data and calculations in a spreadsheet under the bates number ‘PAC0000528’. I refer to this spreadsheet as the **“PAC Cost Allocation Spreadsheet”**.”

7.2.2 Panasonic also provided two witness statements, the Confidential First Witness Statement of Michael Nguyen and the Confidential Second Witness Statement of Michael Nguyen. I understand that the information Mr Nguyen's witness statements supersedes information provided previously in the Confidential Witness Statement of Mr Steven Varner, dated 17 November 2020 and the Confidential Witness Statement of Mr Ryogen Takahashi, dated 1 December 2022.

7.2.3 I have also considered the following sources of information:

- Sales invoices; and
- Sales information disclosed in US proceedings.”

504. Mr Ryan gave evidence that in the PAC Cost Allocation Spreadsheet sales credits were deducted from the gross (undiscounted) sales to arrive at a net (discounted) sales figure: see Ryan 1, ¶7.3.4. But in interpreting that information, Mr Ryan also reviewed a number of the underlying contracts on which that information was based:

“7.4.11 To better understand the nature of Sales Credits, I have reviewed certain of the trade agreements between PAC and its customers. Based on that review, I note that:

- The grant of Sales Credits appears to be related to [REDACTED]. In particular, the Sales Credits are granted when a target [REDACTED] is reached;
- Sales Credits appear to generally be applicable to PAC's goods and services in general, rather than to individual products; and
- The duration over which the Sales Credits can be applied appears to vary considerably (for example, some of the PAC agreements provide that Sales Credits [REDACTED] from the date of issuance, whereas PAC's agreement with [REDACTED] appears to specify that Sales Credits can potentially be used over a period that is [REDACTED]. I have also observed some agreements (see for example, PAC0000360: Exhibit B) where it appears that a credit can be applied against the [REDACTED]). It is unclear to me how PAC accounts for such credits (for instance, whether it accounts for such credits as discounts or as Sales Credits).

7.4.12 Given that the Sales Credits appear to be granted on [REDACTED], it is unclear to me whether, or not, they constitute incremental costs. If it is the case that, absent the wrongdoing, PAC would have sold and delivered those [REDACTED] anyway, then it may also be the case that the Sales Credits would have been negotiated and granted on

the same or similar terms. I note that PAC's Disclosed Revenues only constitute around [REDACTED] of its IFS division's gross sales. In my view that supports the proposition that the absence of those sales would have had an immaterial effect on the terms of its customer trade agreements (including those relating to Credit Sales).

7.4.13 Ultimately, I consider that whether, or not, Sales Credits would have been granted absent the Relevant Revenues is a factual matter for the Court to determine."

505. Mr Ryan qualified this evidence with concerns about the availability of information and it is important that I should record the information which he considered to be lacking at that stage. He set it out in the following summary in Ryan 1 (although he did not suggest that there was any reason to doubt that Panasonic had granted sales credits to customers or that the data had been manipulated):

"7.4.31 To summarise the results of my analysis above:

- Information on the amount of Sales Credits that relate specifically to EmPower sales has not been provided (either on a customer by customer basis or in aggregate);
- Absent that information, in order to reflect Sales Credits in Panasonic's account of profits, it is necessary to come up with an estimate of the relevant Sales Credits;
- In my view, Mr Nguyen's approach to estimating Sales Credits (on the basis of the Sales Credits granted to total IFS customers) is not supported by the available data; and
- As set out above in 7.3.16, the data that has been disclosed in respect of Sales Credits is limited to the amount of Sales Credits that were granted to total IFS customers over the Relevant Period, and it is therefore not possible to determine from this data whether and to what extent Sales Credits ought to be included as a deduction from Panasonic's Relevant Revenues.

7.4.32 Notwithstanding the lack of available information, I have provided an alternative estimation of the amount of Sales Credits applicable to EmPower revenues using the following approach:

- First, as a starting point, I adopt the level of Sales Credits estimated by Panasonic using Mr Nguyen's approach;
- I then apportion those Sales Credits to EmPower customers based on those customers' respective shares of total Sales Credits. For example, [REDACTED] share of total Sales Credits is around [REDACTED] in 2015. I therefore assume that [REDACTED] of Panasonic's estimate of Sales Credits in that year apply to [REDACTED] EmPower revenues); and
- In instances where the apportioned customer's Sales Credits exceed its

EmPower sales, I assume that Sales Credits are equal to [REDACTED] of its EmPower sales. For example, in 2015, [REDACTED] share of Sales Credits of [REDACTED] exceeds its EmPower sales of [REDACTED]. Therefore, I assume that [REDACTED] Sales Credits related to EmPower revenues are [REDACTED]. As I set out in .4., the average ratio of IFS Sales Credits to IFS sales is [REDACTED]. Accordingly, I consider that my assumption (of a [REDACTED] discount on EmPower products) is conservative.”

506. *Ryan 3*. Mr Ryan did not take matters further in *Ryan 2* although he emphasised that the critical issue was whether the sales credits were actually offered against the sale of EmPower Fusion systems. However, in *Ryan 3* (which he prepared after the Joint Statement) he produced a calculation of sales credits totalling [REDACTED]. He stated that after the finalisation of *Ryan 2*, Panasonic had disclosed a revised version of the PAC Costs Allocation Spreadsheet, additional information about sales credits granted to [REDACTED], a detailed breakdown of the basis on which fixed costs were allocated for FY 2023 and a detailed parts classification list “that maps Panasonic’s EmPower components to parts categories”. In relation to the revised spreadsheet he gave the following evidence:

“3.2.1 In my first and second reports, I identified a number of issues with the PAC Cost Allocation Spreadsheet that indicated the information may have been incomplete. Panasonic’s finance team subsequently reviewed and updated the PAC Cost Allocation Spreadsheet to correct for shipments that had been incorrectly excluded. This updated information was provided to Mr Bezant for the purposes of preparing his second report but was only provided to me subsequent to the finalisation of my second report.

3.2.2 I have now updated my calculations to reflect the revised PAC Cost Allocation Spreadsheet. My updated calculations are set out in the Joint Model I have prepared with Mr Bezant.

3.2.3 I understand that additional financial disclosures have been made by Panasonic on the 18th, 27th and 30th of September 2024. At the time of finalising this report, Panasonic has not provided a further updated version of the PAC Cost Allocation Spreadsheet so these additional sales are not included in my account of profits. The additional financial disclosures will be incorporated into the Joint Model.”

507. He then stated that the information provided about [REDACTED] showed that the sales credit was [REDACTED] and that the PAC Costs Allocation Spreadsheet enabled him to reallocate the credits. He was also able to identify the top 10 customers by sales credit and the top 10 customers by EmPower sales. He pointed out that the correlation between sales credits and EmPower sales was weak but then set out the basis on which he had

made his calculation of sales credits:

“3.3.8 On 11 September, HL provided a spreadsheet called “2024.09.11 – Hogan Lovells to Jones Day RE PAC (Data enclosure)” that sets out Panasonic’s global IFE sales by customer. If the Court determines that it is appropriate to allocate a proportion of the Sales Credits that Panasonic grants to its customers to the Relevant Revenues, then I consider that the most appropriate way to do so, would be to apply the ratio of Sales Credits to IFS sales at the customer level, rather than applying a global average to all EmPower sales.

3.3.9 I have compared annual Sales Credits (as reported in the PAC Cost Allocation Spreadsheet) with total IFE sales as reported in “2024.09.11 – Hogan Lovells to Jones Day RE PAC (Data enclosure)” to calculate an annual Sales Credit percentage for each airline. I then applied these percentages to the EmPower customer represented in the PAC Cost Allocation Spreadsheet to derive an annual Sales Credit allocation for each airline.

3.3.10 I understand that the extent to which Sales Credits are generated by EmPower Sales is disputed by the parties and is a factual matter for the Court to determine. However, if it should be determined that EmPower sales generate Sales Credits on a pro rata basis, using the approach outlined above, I estimate that the Relevant Revenues generated Sales Credits of [REDACTED].”

508. *Cross-examination.* The figure of [REDACTED] which appears in Table 5-1 is derived from this evidence. In cross-examination Mr Howe asked Mr Ryan in terms whether he accepted that sales credits are a reduction in revenue rather than a cost and Mr Ryan accepted that they were:

“Q. Right. So would you agree that sales credits, turning to those in the context of PAC, sales credit represent a discount to the price the customer pays for the goods and services they are purchasing? A. As they are a discount against certain purchases. Q. Discount on the price? A. Yes. Q. Yes. So they are a reduction in the revenue generated from the transaction, not a cost incurred in producing goods or services. That is correct, isn't it? A. That is correct.”

509. Mr Howe then took Mr Ryan through his reports and suggested to him that his approach to sales credits had fundamentally changed and that both Mr Bezant and he had always proceeded on the basis that sales credits were deductible until the Joint Statement and Ryan 3. Mr Howe put it to him that he had changed his evidence to reflect the position adopted by the Lufthansa team in their Opening Trial Skeleton. When it came to the actual figures, an important exchange took place between Mr Howe and Mr Ryan and

because of its importance I set it out in full:

“Q. Can we go back to {B4/1/22}. This was the table we looked at a moment ago. The sales credits for UK sales entry line. The number that you have there -- I don't think these are confidential, are they? They are. Okay. Read the entry line for gross sales credits for UK sales, Mr Ryan. That number is substantially changed from your former numbers in relation to the appropriate entries for sales credits in your earlier reports, isn't it? A. Yes. Q. In your first report? A. It is. Q. Can you say what the approximate value was of the sales credits in per your first report? A. [REDACTED], I think. Q. Yes. And you've substantially changed and increased that number following Mr Bezant's reports in which he commented on the methodology you were then applying, and, it is fair to say, pointed out some flaws in that methodology? A. No, that is not appropriate to say that. The reason I have changed my methodology, my Lord, is because, as I have said all along in relation to sales credits, it shouldn't be done at a global basis, one needs to look at it on a customer-by-customer basis. It was only after receiving that information that I was able to do a more appropriate analysis. Q. So, to be clear, your original methodology, and tell me if this is a fair summary, a three-stage allocation process. First of all, allocation of revenue from the IFS sales credits to relevant sales? A. Yes. Q. Secondly, allocating that across the UK EmPower systems customers in proportion to each customer's receipt of total IFS business unit sales credits? A. Yes. Q. And thirdly, capping the sales credit for each individual customer at 50% of its UK EmPower system revenue? A. Yes. Q. You have jettisoned that methodology altogether and instead what you now adopt in relation to this item in the joint statement is what you refer to as the global customer ratios approach. Correct? A. Yes. Which is the approach that I would've adopted in my first report had the information that should have been available to me had been available. Q. It is a new and different approach from -- A. It is the approach that I would've adopted and made clear I thought was the appropriate approach. But because I did not have the data, I had to do the best that I could with the data that was available to me. Q. You didn't indicate that that was the preferred methodology in your first report, did you? A. I think I said one should not apply the average. One should look at it on a customer-by-customer basis. Q. If we could look at D2, tab 9. This is Mr Bezant's second report, commenting on your three-step approach. Let's just pick it up at page 65, paragraph 5.29. He summarises the three steps. If we go to page 67, paragraph 5.31, {D2/9/67} he does not consider your approach is robust with both steps 2 and 3 with the analysis being flawed. He explains then in some detail why he does not think your step 2 is reliable. Do you see that? A. Yes. Q. He gives an example of [REDACTED]: "... did not purchase any EmPower System products in the UK in 2013, 2014 or 2015. The revenue allocation that I apply will, in effect, exclude sales credits relating to this airline in these years (as this customer does not contribute to EmPower System revenue). "However, instead, Mr Ryan takes the results of this revenue allocation, and assumes that [REDACTED] of sales credits identified in these years relate to [REDACTED] EmPower System UK sales (despite there being no

EmPower System UK sales to this customer in these years)." He says: "This does not appear reasonable." Do you see that? A. Yes. I am not sure that that can be correct. Q. And in his second step, his next paragraph deals with your third step and explains the reason why that is not reliable. And he illustrates it, again, by reference to the [REDACTED] example at paragraph 5.37 {D2/9/68}: "...Mr Ryan capped sales credits attributable to [REDACTED] in 2013 through 2015 at zero (being 50% of its total EmPower System UK sales in these years, which are also zero). This change alone reduces sales credits attributed to EmPower System UK sales by [REDACTED]." Which he describes as a: "... one-sided approach of capping amounts of sales credits can only reduce the amount of sales credits allocated to the Relevant Sales as compared to the assumption made in the PAC spreadsheet, and there is no mechanism by which this allocation could be increased... [ie all your] adjustments serve to do is to reduce the allocation of sales credits." And it was in the light of those observations that you then changed your approach in your third report, isn't it? A. No, that's clearly not correct. The reason I changed, I was very clear in my first report that one should not use the average because there is a significant variation in the level of sales credits as between customers. In my first report, based on the limited data available to me, I sought to approximate what that might be per customer. Now, that was an imperfect approach. I asked for further information which I was told was not available. It was only two days before I finalised DR3, on the Saturday, that we discovered a spreadsheet that we had been given contained the relevant information even though we were told it wasn't available. It was available, my Lord, and we were able to do our updated calculation. Q. Now, your allocation of sales credits in the joint statement is very similar to Mr Bezant's allocations. It's knowledge a few million dollars apart. Correct? A. That's because Mr Bezant uses the average of his approach and my approach. Q. Yes. Which is a reasonable position to adopt, isn't it? A. Well, I think it says that Mr Bezant recognises that my approach is reasonable. My view is still that using the overall average is not the right approach, and if one looks at it, Mr Bezant's original approach compared to my updated approach which Mr Bezant obviously considers is reasonable, is more than 10% different. It's 15% different. Q. But I would suggest your movement from, as you say, [REDACTED] to your current figure and much closer to Mr Bezant's number is in fact confirmation that Mr Bezant's approach and allocation approach is a reliable one. A. No. I think two wrongs don't make a right. Mr Bezant adopted an average approach which is not appropriate, in my opinion. I adopted an approach based on the best information that was available to me. I requested additional information to allow me to do it properly, and having received that information I updated my approach. Q. Mr Bezant has not changed his approach, has he -- A. Well, he has changed his approach. Q. Sorry, let me finish the question. Until the joint statement where he has proposed an average of your position and his position, his methodology has remained unchanged, correct? A. That's right, but then he had the averages available to him from the start. Q. Your new global customer ratios approach, that tends to understate the potential values of relevant sales credits, doesn't it? A. I think there are a couple of instances where it understates it, but it is

quite insignificant. Q. It does not allocate all the relevant sales credits, and therefore, all else equal, it will tend to understate the appropriate allocation, won't it? A. I am not sure. What sales credits doesn't it allocate? Q. It does not allocate [REDACTED] of revenue associated with placeholder customer names. A. I think most of that relates to Panasonic and they shouldn't get sales credits. Q. To which sales credits could have been accrued, but to which no sales credits are allocated under your approach? A. They wouldn't have been accrued in relation to Panasonic. Have done some analysis on those amounts that we made. MR JUSTICE LEECH: These are the placeholder ones? A. The placeholder ones. There is also an issue in relation to [REDACTED], which we have now identified in the data is referred to as [REDACTED]. You know, I think there is possibly another [REDACTED] of sales credits, but it's -- Q. Another adjustment upwards of your number towards Mr Bezant's? A. As I said, my Lord, we only determined the data was available on the Sunday before DR3. So it is only subsequently that we have had more time to study it and looked to iron out these data issues. If that data had been made available to me from the start, these issues wouldn't have arisen at all. Q. I am not wanting to go into the history. I'm just trying to see where we are now, Mr Ryan. And sales credits in relation to what appear to be non-PAC internal sales would be appropriate to be allocated but, for example, from the [REDACTED], to the extent that that contains non-PAC, that is not allocated under your approach, correct? A. No, as I said, we have done an estimate of what that might be -- Q. When you say "no", you mean agree "but"? A. I agree but yes. With additional time we would be able to provide an updated -- Q. And a further adjustment, you recognise, is appropriate to your number to increase it in respect of the [REDACTED] -- A. Yes. 100,000 we have now estimated based on a detailed review of the data. Q. So given there are clearly a number of cons, by which I mean the opposite of pros, in relation to your global customer ratios approach, I would suggest to you that adopting an averaging approach between the two, which is what Mr Bezant has suggested in the joint statement, is a reasonable approach? A. The cons that exist are a function of the time available to do the analysis. Those cons can easily be ironed out and it would be by far the most appropriate way of doing that calculation. Q. Unfortunately, in a sense we have reached the trial, so you don't disagree, do you, that Mr Bezant's pragmatic suggestion of an average of the global customer ratios approach and his revenue allocation approach would be a pragmatic way to resolve this issue? A. No, I think it significantly overstates it."

(ii) Mr Bezant's evidence

510. *Nguyen 1*. The principal source of Mr Bezant's factual evidence in relation to sales credits was the first witness statement of Mr Michael Nguyen dated 21 March 2024 ("**Nguyen 1**"). Mr Nguyen made this and his second witness statement dated 10 April 2024 ("**Nguyen 2**") in support of Panasonic's disclosure and pursuant to the Orders of Bacon

J dated 20 December 2022 and 26 February 2024. He is the Manager of Financial Systems, Finance Global at Panasonic and although both witness statements were in the trial bundle for the Account, Mr Nguyen was not called to give evidence and I was not taken to a CEA notice in respect of his evidence (and his witness statements were not included in either of the Defendants' CEA Documents folders). Nevertheless, he gave the following evidence about sales credits in Nguyen 1:

“15. Sales Credit in the PAC Cost Allocation Spreadsheet relates to the discounts that PAC provided over the Relevant Period. It is deducted from Gross (undiscounted) Sales to calculate Net (discounted) Sales.

16. [REDACTED]. This means that an allocation of Sales Credit for the Relevant Revenues is required. Accordingly, in the PAC Cost Allocation Spreadsheet, I allocate the Sales Credit in each year for PAC's IFS business unit to the Relevant Revenues

sales over the Relevant Period by multiplying: (a) Sales Credit for the IFS business unit as a proportion of Gross Sales for the IFS business unit; by (b) total Gross Sales (including New Parts) of the Relevant Revenues.

17. In other words, I use a revenue allocation approach to apportion the IFS business unit's Sales Credit to the Relevant Revenues (as I typically do for cost categories that PAC does not directly track for the Relevant Revenues, as I describe below)...

18. Over the Relevant Period, I understand that the majority of the IFS business unit's customers that received Sales Credits purchased EmPower products, as shown by the data on Sales Credit included in the PAC Cost Allocation Spreadsheet. This supports the approach of apportioning Sales Credit using a revenue allocation basis because PAC's customers receiving Sales Credits are generally also purchasing EmPower products.”

511. *Bezant 1*. Mr Bezant relied on this evidence when explaining how Panasonic accounted for sales credits. In the following passage from *Bezant 1* I have excluded footnotes 91 to 99 for convenience. But in those footnotes Mr Bezant identified Nguyen 1 and a letter from Hogan Lovells as the source of his information and, in particular, the passage which I have set out above. He stated as follows:

“5.26 The spreadsheet that accompanies Mr Nguyen's witness statement (for which revised versions have subsequently been provided by PAC) (the “PAC Spreadsheet”) includes revenue and direct cost information for PAC's Relevant Sales, including Functionally Equivalent Sales. I understand from Mr Nguyen that PAC manufactures the majority of functionally equivalent products itself, rather than acquiring them from a third party. I rely on the latest version of the PAC Spreadsheet to calculate the gross profit for PAC over PAC's Relevant Period.



5.27 Sales Credits: PAC records its revenue for the Relevant Sales at the level of gross revenue (or gross sales), before the application of any credits provided to its customers. As explained by Mr Nguyen, it is necessary to adjust PAC's gross revenues for sales credits provided to customers.

5.28 PAC [REDACTED]. PAC recognises sales credits as they are accrued in the process of [REDACTED], rather than when the sales credits are issued to customers. This means that sales credits are recognised in the periods in which the sales are made that are expected to result in the issuance of sales credits.

5.29 As [REDACTED], I have allocated PAC's total sales credit accrual for its IFS business unit in each year across sales. I do this using the same approach described by Mr Nguyen, which is to allocate sales credits in proportion to gross revenues. That is, I allocate sales credits to PAC's Relevant Sales by multiplying the revenue earned on the Relevant Sales by the proportion of sales credits accrued by PAC's IFS business unit relative to revenue generated by the IFS business unit.

5.30 This revenue allocation approach appears reasonable given Mr Nguyen explains that "*the majority of the IFS business unit's customers that received Sales Credits purchased EmPower products*", which "*supports the approach of apportioning Sales Credit using a revenue allocation basis*".

512. *Bezant 2*. In his second report Mr Bezant relied on a letter dated 2 August 2024 which Hogan Lovells had sent to Jones Day. That letter was a very detailed response to a 12 page letter dated 30 April 2024 and a further 14 page letter dated 5 June 2024 from Jones Day in which they had asked for further explanations in relation to the PAC Cost Allocation Spreadsheet. Jones Day had not asked for this information to be supported by a witness statement or a further disclosure list. Indeed, Jones Day expressly stated that Lufthansa had been considering how the relevant information could be obtained in a way which minimised the burden on Astronics. At the end of their letter dated 30 April 2024 Jones Day stated as follows:

"You will appreciate that your clients' delays in providing their disclosure has put considerable time pressure on addressing the inadequacies of your clients' disclosure, and the needs for further disclosure. Please confirm that both PAC and AES will investigate the errors, omissions and requests identified above as a matter of urgency and provide the required supplemental disclosure as soon as possible. You should aim to provide the disclosure and information no later than Friday 10 May 2024. If you are unable to provide any aspect of the disclosure or information requested by then, you should nonetheless confirm the status in relation to that aspect by 10 May, including whether you intend to provide the information/disclosure and by when. Given the time pressure, our client puts you on notice that it will bring an application for disclosure in the absence of an

adequate response to this letter by then.”

513. The Defendants did not comply with that deadline, but they did attempt to provide the information in their letter dated 2 August 2024 and Mr Bezant did address the issues which they had raised in relation to sales credits in Bezant 2 (and again I have excluded the footnotes):

#### **“Sales Credits**

5.11 In my First Report, I adopted the approach applied in the PAC Spreadsheet to allocate PAC’s sales credits for its IFS business unit to its Relevant Sales, being to allocate the IFS business unit’s annual sales credits using a revenue allocation approach. On this basis, I assessed that sales credits in each financial year were equal to between [REDACTED] of Relevant Sales over PAC’s Relevant Period.

5.12 In his report, Mr Ryan commented on PAC’s approach to allocating sales credits in the PAC Spreadsheet. Specifically, he: (1) queried whether sales credits should be treated as specifically attributable to the Relevant Sales; (2) commented on apparent mismatches between the EmPower System UK revenue and sales credits recorded for certain PAC customers that purchase EmPower Systems; and (3) adopted an alternative approach to quantify sales credits associated with the Relevant Sales.

5.13 Since the date of my First Report, PAC has provided further information regarding sales credits. In this sub-section, I first respond to Mr Ryan’s comments set out above. I then explain why, following my review of Mr Ryan’s analysis and the further information provided by PAC, I do not consider it is necessary to revise my approach to sales credits (although I no longer allocate any sales credits to PAC’s internal sales for the reasons that I explain above).

#### *Attributing sales credits to the Relevant Sales*

5.14 Mr Ryan queried whether sales credits constitute incremental costs and therefore whether and to what extent they should be deducted from PAC’s Relevant Sales in the scenario where there is not a non-infringing alternative. Having reviewed certain trade agreements between PAC and its customers, he considered that: (1) sales credits appear to be granted according to the [REDACTED]; and (2) sales credits appear to be offered on [REDACTED].

5.15 Given the above, he considered that it is unclear whether sales credits are incremental to PAC’s Relevant Sales. Mr Ryan stated that whether sales credits would have been granted had the Relevant Sales not been made is a factual matter for the Court to determine. However, in all his scenarios, irrespective of whether there was a non-infringing alternative, he deducted sales credits in his assessment of PAC’s profits.

5.16 Since the date of Mr Ryan’s report, PAC has provided further information regarding sales credits. In particular, PAC explains that:

*“PAC employees negotiating sales credits will have regard for the anticipated margin (both in absolute value and percentage terms) of the associated contract. Consequently, the sales credit terms offered will be influenced by the anticipated sales under each contract.”*

5.17 This is consistent with how I would expect a business to assess the potential discount to offer to customers.”

514. Again, there was no mystery about the sources of Mr Bezant’s information and in his footnotes he gave Hogan Lovells’ letter dated 2 August 2024 as the source of the information in Bezant 2, ¶5.13 and ¶5.16. For clarity, I also make it clear that the query by Mr Ryan to which he was referring in Bezant 2, ¶5.14 was the query raised by Mr Ryan in Ryan 1, ¶7.4.11 (above). Mr Bezant also gave detailed evidence about [REDACTED] credits based on Hogan Lovells’ letter dated 2 August 2024:

“5.39 Since the date of my First Report, PAC has provided additional information on [REDACTED] credits, a sub-category of sales credits that account for between [REDACTED] of the IFS business unit’s sales credits over PAC’s Relevant Period.

5.40 PAC calculates [REDACTED] credit accrual percentages [REDACTED]. These [REDACTED] accrual percentages can be applied to the Relevant Sales associated with [REDACTED], providing an alternative approach to allocate sales credits to the Relevant Sales.

5.41 This analysis should address Mr Ryan’s concern that customers buying EmPower Systems delivered to the UK might have generally received a lower level of sales credits than customers in general. This is because the analysis considers separately the sales credits in respect of the [REDACTED] ordered by individual customers that include PAC’s sales of EmPower Systems in the UK. That is, unlike the analysis in the PAC Spreadsheet, it does not assume that all customers receive the same (percentage) level of sales credits.

5.42 Applying this approach identifies [REDACTED] credits associated with PAC’s Relevant Sales in the original PAC Spreadsheet totalling [REDACTED] over PAC’s Relevant Period, being [REDACTED] lower than the sales credit allocated in the original PAC Spreadsheet. This is consistent with my understanding that: (1) if the [REDACTED] credit value included all the relevant categories of sales credits, it would be between [REDACTED] higher; and (2) if the [REDACTED] credit assessment also included sales credits in respect of Functionally Equivalent Sales, it would be [REDACTED] higher.

5.43 Given this, I do not consider that it is necessary to update my approach to allocating sales credits to PAC’s Relevant Sales, except that I exclude sales credits allocated to PAC’s internal sales for the reasons that I explain above.”

515. *The Joint Statement.* Mr Bezant originally calculated that the appropriate deduction for sales credits was [REDACTED]: see Bezant 1, Table 5-3. He then adjusted that figure to [REDACTED]: see Bezant 2, Table 5-1. In the Joint Statement he reduced that figure to [REDACTED] which is the figure which appears in Table 5-1. He gave the following explanation for this in the Joint Statement, ¶5.13:

“In the present context (in particular, where he has had limited time to consider the analysis presented in DR3), Mr Bezant considers it is appropriate to rely on the average of: - the Revenue Allocation Approach; and - the Global Customer Ratios Approach (after adjusting as described in item 5.12). His conclusion is informed by his view that both approaches appear broadly reasonable, with strengths and weaknesses. In particular, the Global Customer Ratios Approach has the benefit of greater stratification, but the disadvantage of appearing not to allocate all relevant sales credits (and hence, all else equal, will understate the appropriate allocation). He accordingly applies an estimate of sales credits of [REDACTED], calculated as the average of these approaches (performed on an annual basis).”

516. *Cross-examination.* Mr Howe put Mr Bezant’s approach in the Joint Statement to Mr Ryan in the long passage from his cross-examination which I have set out above although Mr Ryan did not accept it. When Mr Bezant was cross-examined, Mr Cuddigan asked him a number of detailed questions about the PAC Costs Allocation Spreadsheet before putting to him the suggestion that the underlying data had been manipulated for the purposes of the Account. Mr Bezant did not immediately understand what was being put to him and I made it clear to him that I wanted him to address this issue. Again, because of the weight which I attribute to his evidence, I set out the relevant passage in full:

“Q. Right. I mean, what they might have done is pulled out the data and handed it over to the forensic accountants to do the right analysis based on that data. But instead of that, they pulled out the data, they -- and again, I really don't mean this pejoratively, they manipulated the data in a way that they thought was appropriate to the account, in a way that they thought was appropriate to Panasonic's case of the account, and then handed that resulting spreadsheet over as a disclosure document? A. Right. So the first exercise in column K takes the full year, if I've understood it. The second exercise takes the data for April. The third column is taking April out, because the account doesn't begin until May. MR JUSTICE LEECH: I know you think it's innocuous, but what's really being put to you is that the exercise that has been done here should really have been done by you or your team so that you could be satisfied that you were in fact given the full information. I think that's the point that Mr -- so although we can see that this is not a -- we can see what has been done, what you haven't done is had access to the underlying -- being able to interrogate the underlying

financial systems to satisfy yourself as an expert owing a duty to the court that the information is accurate. And Mr Cuddigan's point to you before the brief break was that, you know, there are reasons to believe it wasn't - - well, it wasn't accurate to start with, as you accepted. So that's the point that is being put to you. A. I understand. Would you like me to comment on it? MR JUSTICE LEECH: Yes, I think I would like you to comment on it. A. Thank you. So the extraction from a system requires people who understand how the system works and how the account works and how to interrogate it and query it and there will be aspects of that that I couldn't improve upon, that would be their system and their data and how they pull it. That would normally be the manner in which the information would come to me. The extent then becomes, can I test that at some levels? And Mr Ryan and I have selected invoices, and so on, of which these are the aggregate of all of them, and on a sampling basis tested information in the spreadsheet against underlying invoices. So rather than try to re-audit the whole thing, we've tested at a revenue level, and we haven't found any particular problems -- any at all, actually -- at that level. So there's nothing to suggest that the information is being pulled incorrectly, once it has been pulled. The information here flows up into the management accounts, into the statutory accounts, and because, depending on which business you're looking at, what we're looking at is a large part of a set of management accounts. So there's no suggestion, again, when you look at some of the regular accounting information that something has gone wrong. So I can look at that information produced in the ordinary course of events, test it at that level, didn't find anything wrong. When you run the analysis here and you look at the kind of margins that come out, again, you can compare them, depending on who you're looking at, to the overall margins that the business reported ordinarily. Done that, nothing unusual or untoward there. There are differences because the margins on EmPower are different to the margins on other aspects sold by AES and ditto at the PAC level which you can't really do, so you can test at that level, nothing to concern us. A lot of the costs are produced on what's called a standard costing basis, which essentially requires, for convenience purposes, an estimate of cost of things that you're buying in, labour you'll incur, and so rather than every month try to get the answer right, you make an informed estimate that it will be four hours of labour and \$100 of materials to make this particular component and it may be there's a \$100 an hour labour rate. So you can think about the expected costs of all of the components and they have very detailed analysis and the accounting convenience is to use an approximation and then true up periodically through time. MR JUSTICE LEECH: As you wouldn't need to -- for management accounting purposes, you wouldn't need absolute figures, you just need to know how the business-. A. Well, it's utterly onerous to keep fiddling around every month. MR JUSTICE LEECH: So you have a true-up periodically. A. You have a true-up periodically. So those true-ups tend to be accurate, there's very little distinction between the estimate and the out-turn, the actual out-turns in the accounts. So there is quite a dynamic here that you can see of them testing and checking the accounting costs at a very detailed level, at the direct costs level. So no, we didn't interrogate their systems, we didn't ask to go into their systems, but we did test in different

dimensions the outputs of the systems that we were given, and Mr Ryan did something similar.”

517. Mr Cuddigan addressed the specific issue of sales credits later on in his cross-examination. He took Mr Bezant through Mr Ryan’s evidence and approach before putting a particular example to him:

“Q. Right, indeed. I want to give you an example which hopefully we can agree about, but if we can't we may at least know a little bit more about where we're in disagreement. Consider I am a franchised car dealer, who is given a certain discretionary discount scheme by the vehicle manufacturer. So the cars I sell have a forecourt sticker price of £30,000 and that's for the basic model. And then there are various options available which can take the price up to £50,000, okay? And the manufacturer permits me to offer a discount of up to £10,000 off the basic car price, but says that no discount can be given against the options. Okay? So the total price paid by a purchaser will vary from £20,000, maximum discount, basic model, up to £50,000, fully loaded model, no discount. You're following me so far? A. I am. Q. If I sell more basic vehicles, I can grant more discounts. If I sell more optional extras, it doesn't affect the discounts that are given. Do you understand the example? A. In the example you've given, you have isolated discounts to one part of the offer. Q. I have. A. Right. Q. I have. A. So that is -- but if -- as I understand it you think about the discounts at the level of a contract with all of its parts in it. Q. Yes, I do, I'm just -- A. So for example if you say, yes, there's no discounts against product A, then you can't them from Product A, you can't establish them against product A. If that's not how things are done contractually, or commercially, then that logic doesn't carry across. You're trying to apportion an overall discount or credit in some way to all the things that are the parts of the contract to which the discount attaches. Q. Absolutely, I've realised you are now getting ahead of where we are and speculating where I'm going to go. But I'm just trying to find some common ground between us at this stage. You would accept that, in my example, the discount is always causally associated with the basic vehicle sale? A. In the example that you've given, in the way that you've constructed it, the discount is solely attached to the basic model and nothing else. Q. Yes. It reduces the profit I achieve on the basic vehicle by £10,000, but it doesn't affect the profit I achieve on the sale of options? A. In the way that you've constructed the example, yes. Q. So it's an incremental discount as against the sale of the basic vehicle, but it's -- it is fixed as against the sale of options. A. In the way that you've constructed the example, yes. Q. And those conclusions are not changed by the manner in which I choose to represent the discount to the purchaser. So I might tell a particular purchaser, who has already decided to pay full price for the car, that I could offer them £10,000 off the options, and they might think they were getting a £10,000 discount on the options, but in fact they weren't. A. Right. Q. So although my sales pitch might suggest that the discount is given against the options, the discount is in fact still incremental against the sale of the

basic vehicle? A. Um -- okay. You might, as a matter of accounting, spread it across the three things actually, but we'll come back to that. Q. You might want to do that as a matter of accounting, I accept that. But as a matter of -- well, it's a matter for my Lord, probably. A. Well, if your customers think something, the question is whether you are constrained by the contractual reality, or what it is that's engendering the sale. They think they're getting a discount. That's why I say you might, as a matter of accounting, treat it differently, but however. Q. But what I put to you is this: that what really matters in relation to the question of whether the discount is incremental against one thing or another is the policy which guides the decision to issue the discount? A. Um, yes. Q. Now consider, instead of granting discounts, I give the purchaser credits against future purchases, perhaps credits against servicing bills over the following years. Assume that those credits are all, in fact, subsequently redeemed. They could be accounted for as reduced revenue in relation to the servicing bills against which they are redeemed, but they're not contingent or incremental against the servicing activity; they remain incremental against the original transaction in respect of which the decision to issue the credit was made? A. So they derive from the original contract. Whether, when you get your credit, you knock it off your invoice within that contract, or you knock it off another contract, is in the customer's discretion, but overall, the discount will attach to the customer's business and the customer's set of contracts over time and you'll have a sense of the discounts over time that attach to that level of business. Q. As I read your evidence and Mr Ryan's evidence, this example reflects the threshold factual issue about whether sales credits are incremental as against EmPower sales or not. I think you are both agreed that, if they are incremental, they should be allocated. Are you not also in agreement that, if they're not incremental, they should not? A. If they're incremental in the sense of, you can allocate or direct a proportion of them, because if you hadn't made those sales your discount would be different and lower, then that's sense in which they're incremental. So that's the manner in which we're saying do they -- if we had a contract of 9 and we had a discount of half a million and we added some EmPower that got us to 10 and the discount didn't change, then that would be an example of it not being incremental. But we have a contract of 10 and we have a discount that attaches to that contract. You're allocating that discount across the components of the contract that are, in some ways, the basis on which the discount is assessed back to the size and the value of the contract. The discount isn't an absolute. It's informed by what it is that you're selling.”

518. Mr Cuddigan returned to the policy underlying the discounts again. He put it to Mr Bezant that it was a critical question whether Panasonic personnel granted sales credits to customers in response to EmPower sales and Mr Bezant accepted that it was an important question. He also accepted that his knowledge of that issue came solely from

Hogan Lovells' letter dated 2 August 2024:

“Q. Yes, absolutely. You accept it's a critical question whether personnel in the Panasonic sales team decide to grant credits only in response to IFE sales, or whether they grant them in response to EmPower sales as well? A. It is an important question, as I say, whether they hypothecate the discounts in some way. Q. Yes. Now, obviously, it is a question -- or it is something that Panasonic staff will, themselves, know about? A. Yes. Q. There will be a policy in place one way or the other? A. Um, yes, I imagine. Q. And given the sums involved, you would expect that policy to be recorded in documents? A. Probably, yes. Q. Yes. Now, it's our position - - you don't need to comment on this -- that any such documents were clearly covered by the order for disclosure. But what I am interested in is whether you have seen any documents relating to that policy? A. No. My understanding comes from 5.16. Q. Yes. A. It comes from some other information that was disclosed around about the time of my second report, another extract from the system, and obviously the various contracts that have been brought into play about how [REDACTED] credits are awarded. Q. Yes, but if we concentrate on the policy, as I understand it, your position on that policy -- and this is the point you made a number of times this morning about the trigger point and the size of the contract informing the sales credit -- that all comes from the Hogan Lovells letter of 2 August that you quote here? A. My knowledge comes from that letter. My expectation and understanding of commercial practice, although I agree that that might not be precisely what PAC does, is partly what's informing how I've thought about the problem.”

(iii) The sales contracts

519. In their written Closing Submissions the Defendants stated that in addition to Nguyen 1 and Nguyen 2 and the information contained in Hogan Lovells letter dated 2 August 2024, the experts also had available to them 346 sales contracts between Panasonic and its customers. I asked to see a sample of the contracts and under cover of a letter dated 12 November 2024 Hogan Lovells sent a schedule identifying 15 examples of sales contracts and setting out the relevant contractual provisions. They also stated as follows in the covering letter:

“In particular, we write to provide examples as requested of those Panasonic sales contracts (also referred to as “trade” or “supply” agreements in evidence), under which Sales Credits were granted during the Relevant Period. This is relevant to the question whether during the Relevant Period Panasonic granted sales credits [REDACTED].

Between 15 January 2024 and 5 March 2024 Panasonic disclosed to Lufthansa all “Supply agreement(s) between Panasonic and Astronics, Panasonic and Safran and Panasonic and any of its other customers in



relation to its dealings with the Primary Components, Secondary Components and Ancillary Goods and Services in the UK in the Relevant Period” pursuant to Issue 1.11 of the Disclosure Review Document under the Order of Mrs Justice Bacon dated 20 December 2023.

We enclose a schedule identifying, in relation to 15 examples of such Panasonic sales contracts, the relevant contractual provisions concerning the Sales Credits granted and the Astronics EmPower components included in [REDACTED] to which they relate. This schedule is accompanied by both hard and electronic copies of the sales contracts themselves. We will also upload the bundle to Opus as a new bundle - Bundle Y. This comprises agreements between Panasonic and its customers for which there has been a UK shipment during the Relevant Period, and includes contracts that were executed across the date range of the Relevant Period, for different customers and for different aircraft types so as to provide an overview of the sales contracts entered into and respective Sales Credits granted by Panasonic during this period.”

520. By letter dated 19 November 2024 Jones Day wrote to the Court commenting on this letter. They did not challenge the accuracy of the enclosed schedule or the contracts in Bundle Y. But they did not accept that the question which Hogan Lovells set out in the first paragraph (above) was the right question:

“That is not, we submit, the correct question. Rather, the issue is one of causation. In closing, we approached the issue by reference to a counterfactual: “would the same Sales Credits have been granted if Panasonic had sold IFE only systems, or IFE/USB systems, in place of the IFE/AC systems?”, and “whether the same Sales Credits would have been granted in the absence of UK EmPower Sales.” [Lufthansa closing, ¶¶123-125 & 137(i)(a)]. Those are questions which ought readily to be answerable by way of a full explanation of Panasonic’s sales credits policy. The mere observation that sales credits have been recorded in contracts [REDACTED] is not probative of the cause of those sales credits, and their amounts, and therefore does not assist in determining whether any of the credits are properly deductible from Panasonic’s Relevant Revenues. We therefore do not consider that the Defendants’ submissions take matters any further forward.”

521. I have read the contents of the enclosed schedule and looked at the provisions of the relevant contracts. All 15 of the sample contracts provide for a sales credit to the customer for [REDACTED] which was usually available to be used towards the purchase of Panasonic’s products in the future. For example, the first contract dated 26 February 2016 and made between Panasonic and [REDACTED] provides as follows:

[REDACTED]

522. [REDACTED].

523. [REDACTED].

(iv) Admissibility

524. *The pleading point.* Lufthansa's primary submission was that the Defendants ought to have pleaded their position on sales credits and that they had failed to do so. In particular, the Lufthansa team tried to suggest in their written Closing Submissions that Birss LJ had treated the sales credits as a cost rather than a reduction in revenue on the relief against sanctions application. I reject that submission. Mr Ryan accepted without qualification that a sales credit was a reduction in revenue and Birss LJ did the same: see [2023] EWCA Civ 1273 at [6] (above). It is also far too late to raise such an objection now. If Lufthansa had really considered that Panasonic was not entitled to rely on sales credits, it would have objected to Mr Bezant giving evidence about it in Bezant 1 and to Mr Ryan addressing it himself. Moreover, this would have given Panasonic an opportunity to amend.

525. *Disclosure.* Lufthansa's next submission was that Panasonic ought to have given disclosure of its policy or policies for giving sales credits. I agree that if Panasonic had had a written policy for the grant of sales credits and that policy had specified the basis on which sales credits were to be granted, then those documents would have been highly relevant and might well have provided a short cut for the experts in assessing what sales credits were relevant. However, there is no evidence that Panasonic ever had such a policy and the Defendants confirmed that there was no such policy in existence in their written Closing Submissions. In their letter dated 2 August 2024, which Mr Bezant quoted in Bezant 1, ¶5.16, Hogan Lovells did not state that there was such a policy. They did no more than make a generalisation about how Panasonic allocated sales credits.

526. However, Panasonic did disclose 346 contracts which contained the relevant terms on which Panasonic granted sales credits. Jones Day did not submit that those contracts were inadmissible or that the Court should not rely on them. Moreover, they did not suggest that the 15 sample contracts which Hogan Lovells provided to the Court under cover of their letter dated 12 November 2024 were not representative of the terms on which

Panasonic granted sales credits to their customers. Indeed, I am prepared to assume in Lufthansa's favour that Panasonic only granted sales credits [REDACTED] and that none of the 346 contracts expressly provided or specified that Panasonic was granting a sales credit for the sale of [REDACTED].

527. *Factual Evidence.* Lufthansa's next submission was that Panasonic ought to have served a witness statement from a witness of fact explaining and expanding on the disclosure which Panasonic had made and, in particular, dealing with any sales credit policy. I agree that it would have been better if the Defendants had called Mr Nguyen to give the evidence set out in Nguyen 1 upon which Mr Bezant relied. But I am not sure what useful evidence he could have given because the only evidence which he could have given was that Panasonic did not track sales credits for specific products but only for specific customers. He did give written evidence that during the Relevant Period the majority of customers who purchased EmPower products received sales credits. But given that he was not called to give evidence, I do not consider that evidence admissible and I ignore it.

528. *The PAC Costs Allocation Spreadsheet.* In my judgment, the critical issue is whether the versions of the PAC Cost Allocation Spreadsheet which Panasonic disclosed provided relevant and admissible evidence upon which the Court could rely in determining the sales credit issue. Lufthansa submitted that it was not relevant or admissible for the following reasons:

“127. In place of the above, we have no mention whatsoever of Sales Credits in Ds' pleadings, and the only 'disclosure' documents are the Cost Allocation Spreadsheets. As to these: i The Cost Allocation Spreadsheets are not genuine disclosure documents. They are not contemporaneous records which existed outside the requirements of this litigation. ii The Cost Allocation Spreadsheets are not even "Extract(s) from Panasonic's financial accounting system", which was what Panasonic was ordered to provide.

128. Instead, these spreadsheets are a hybrid of genuine extracted data (we are prepared to concede – although there is no evidence) and additional fields, rules and manipulations. We do not attribute any improper motive to whoever carried out all this work, but we do not need to. It is common ground that there were very significant errors in the identification of relevant transactions for the first two spreadsheets. It is therefore palpably inadequate for any work to have been done on genuine financial data without evidence at trial explaining what that work was.

129. Of course, Panasonic at all times knew about the state of its own

financial records. It also knew what was at stake in these proceedings, that is to say the key information which would be relevant to (i) Lufthansa's claims and (ii) Panasonic's intended defences and deductions against those claims. It was incumbent on Panasonic to engage with the disclosure process so that Lufthansa would receive the necessary information in a comprehensible and cost effective format. If the raw data from its financial systems would have been meaningless without associated explanation, then its disclosure proposals in advance of the DRD order should have involved provision of that data alongside an explanatory witness statement. Instead Panasonic took it upon itself to adopt a course which did not comply with the DRD order, and did not comply with the rules of evidence in UK courts."

529. I reject those submissions and I find that the PAC Cost Allocation Spreadsheets upon which both Mr Ryan and Mr Bezant relied in preparing their expert evidence were relevant and admissible and I consider that Lufthansa has considerably over-stated the position for the following reasons:

- (1) Mr Ryan described the contents of the PAC Costs Allocation Spreadsheet in Ryan 1, ¶7.3.3. It shows the gross, undiscounted sales, the sales credits and the net, discounted sales for each IFE customer. Moreover, Mr Ryan reviewed the underlying sales contracts and was able to reach certain conclusions based exclusively on the spreadsheet and the contracts: see Ryan 1, ¶7.4.11. Having reviewed the sample contracts myself, I am satisfied that Mr Ryan's analysis is correct.
- (2) Moreover, I accept Mr Bezant's evidence that there was nothing unusual or sinister about the way in which the relevant data was extracted from Panasonic's underlying financial system. I also accept his evidence that both Mr Ryan and he tested that information both by sampling the underlying data and also by comparing it with both the management and statutory accounts and that they did not find any particular problems with it or that something had gone wrong.
- (3) Mr Ryan's evidence was entirely consistent with this evidence. He did not suggest in any of his reports that he thought that the underlying data had been manipulated or doctored or that he was unable to rely on it. Indeed, there was an air of unreality about Lufthansa's submissions when I consider the detailed evidence which Mr Ryan was able to give me about the sales credits issue which I have set out above. Moreover, he was clearly able to conduct a detailed review of the information

relating to each customer using the individual contracts and the additional information provided on 2 August 2024.

- (4) For example, Mr Ryan accepted that there was an issue between himself and Mr Bezant in relation to sales credits worth [REDACTED]. He did not at any stage preface this evidence by stating that he did not believe any of the information upon which he had based these conclusions was inaccurate or that he had been unable to verify it. Moreover, given this granular detail, it is clear that the experts had reduced the issues between them to matters of detail.
- (5) The Defendants accepted that the original version contained two errors which were subsequently corrected. They gave a full explanation in their written Closing Submissions, ¶¶637 to ¶¶656 and I accept it. Given the length of this judgment, I will not rehearse those explanations here. In my judgment, those two errors did not demonstrate that Panasonic had manipulated the underlying data for the purposes of the Account but only that they had excluded certain profits by mistake.
- (6) I also accept that by a further oversight some of the relevant information was not flagged up or made available to Mr Ryan when it should have been. But once Mr Ryan had the relevant information, he was able to calculate the relevant sales credits. Indeed, his complaint in cross-examination was not that the material which was provided to him was unreliable but that it was given to him very late. Even then, he was able to analyse that material and to give evidence about it in Ryan 3.
- (7) Finally, after I had seen and analysed the contracts it became clear to me that there was little (if anything at all) between the experts in relation to the underlying data. Both accepted that Panasonic awarded sales credits to customers on the basis [REDACTED] and there was no dispute over the actual figures. The dispute between them was whether it was appropriate to treat sales credits as incremental and, if so, whether to calculate them by reference to the “Revenue Allocation Approach” or the “Global Customer Ratios Approach” or an average of both (as Mr Bezant had done in the Joint Statement).

530. I add one comment to this analysis by way of postscript. Lufthansa complained bitterly about the original errors which Panasonic had made in the PAC Cost Allocation Spreadsheet and the late disclosure of information. There was even a suggestion that

Hogan Lovells had served important information in a way which inevitably led to it being overlooked. These complaints may well have been justified and I would not wish the parties to gain the impression that I condone or bless this behaviour. It may well be that Lufthansa will wish to pursue these complaints in relation to costs. However, whether or not these complaints were justified they did not render the information inadmissible.

(v) Findings

531. I finally reach the real issue between the parties which is whether any deduction should be made for sales credits and, if so, how much. Lufthansa relied on the example of the car dealer which Mr Cuddigan put to Mr Bezant and submitted that the question was one of causation. The Lufthansa team formulated this question in their written Closing Submissions as follows:

“123. It is apparent that Sales Credits are a discount of some sort. There has been some confusion as to whether they should be treated as reduced revenue or costs, and it is notable that Birss LJ referred to them as “costs” in the relief from sanctions appeal: see {B1/53/1} at paras 6, 9, 13. It seems that the expert accountants are content to treat them as reduced revenue. On that basis, the threshold issue then comes down to the following factual question: were Sales Credits in fact granted against the EmPower Sales in issue? If, at the time they were issued, Sales Credits were in fact issued in part in respect of relevant EmPower Sales then it is proper to reflect them to that extent in a reduction in Relevant Revenue. If instead they were only issued against other equipment or services, then no such deduction is justified.

124 As with many issues of causation, this one can be interrogated by reference to a suitable counterfactual. Here, that question is: would the same Sales Credits have been granted if Panasonic had sold IFE only systems, or IFE/USB systems, in place of the IFE/AC systems? This question reflects the car dealership example discussed with Mr Bezant, where AC power is an “option”.”

532. *Causation.* The counterfactual which the Lufthansa team identified was carefully considered because Jones Day repeated it in virtually the same terms in their letter dated 19 November 2024 (above). I accept that this is the correct question to ask. However, the answer which I give to it is not the one which Lufthansa urged on me. I find that Panasonic would not have granted the sales credits identified in the PAC Cost Allocation Spreadsheet if Panasonic had sold IFE only systems (or IFE/USB systems) in place of the IFE/AC systems. I have reached this conclusion for the following reasons:

- (1) Mr Ryan and Mr Bezant agreed that it was not appropriate to deduct sales credits from Panasonic's revenue unless those sales credits were incremental in the sense that Panasonic would not have granted the sales credits if it had not made the infringing sales. Mr Ryan also accepted that this was a question of fact for the Court and not an expert question: see Ryan 1, ¶7.4.13. I agree.
- (2) Mr Ryan did not suggest that it was necessary for Panasonic to prove that it granted a discount or sales credit in respect of each EmPower Fusion system and, if he did go that far, I do not accept it. Mr Bezant did not accept this when Mr Cuddigan put the car dealership example to him. His evidence was that they had to be incremental "because if you hadn't made those sales your discount would be different and lower, then that's sense in which they're incremental". I accept his evidence. The issue, as Lufthansa recognised in framing the question, is purely one of causation.
- (3) Moreover, Mr Bezant also stated that where the amount of the discount depends on the total price, then it is permissible to allocate the discount across the individual components of the contract. Again, I agree. Indeed, with respect, this seems to me to be common sense. If the sales credit was only given for a specific component or attribute of the IFE system (e.g. the particular quality or quantity of content), that would be one thing. But if the sales credit was given for the [REDACTED], then there is a causal connection between each individual component and the total amount of the sales credit.
- (4) I have already found that it was standard for every IFE package to contain a number of AC power outlets and that Panasonic and other IFE providers would not have sold integrated IFE systems to the airlines unless they included AC power: see finding (viii) at [442] (above). Moreover, this was Mr Muirhead's evidence on behalf of Lufthansa and I have accepted it.
- (5) It follows, therefore, that if Panasonic had not sold integrated IFE systems with infringing EmPower Fusion system, then it would not have sold IFE systems at all or made any revenue from those sales or granted any sales credits in respect of that revenue to its customers during the Relevant Period. Indeed, this forms the basis for my finding of "but for" causation in favour of Lufthansa. The position might have been different if some of Panasonic's sales had involved the sale of IFE only

systems or IFE and USB only systems. But Lufthansa's position was very clear. It was only claiming in respect of IFE systems with AC power installations which involved an infringement of the Patent.

- (6) Again, the position might have been different if Lufthansa had been able to demonstrate that the sales credits were solely related to other components of the IFE system and not to all of them. But it did not seek to argue this case and Mr Ryan did not give evidence to support it. Indeed, I am satisfied from looking at the sample contracts that Panasonic only [REDACTED].
- (7) In my judgment, therefore, it is not open to Lufthansa to argue that Panasonic would not have made any of the sales agreed between Panasonic and its airline customers without incorporating EmPower Fusion systems into their products and infringing the Patent whilst at the same time arguing that Panasonic was not entitled to deduct the sales credits which it granted to the same customers in respect of the same sales.

533. *Quantum*. I prefer Mr Ryan's evidence on this issue. Mr Bezant accepted that his approach was a reasonable one and Mr Ryan pointed out that he could have ironed out any objections to his figures given more time. Given that he was not given that time as a result of the Defendants' conduct and he was not prepared to accept Mr Bezant's approach, it seems to me appropriate to adopt Mr Ryan's figure rather than the average of both figures which Mr Bezant adopted. I, therefore, hold that it is appropriate to deduct revenue of [REDACTED] from the gross revenue of Panasonic from UK sales.

(2) *Fixed expenses*

534. Mr Ryan deducted fixed expenses for UK sales of [REDACTED] and Mr Bezant deducted [REDACTED]. Although the figures changed as the numbers were updated, Mr Ryan's figures were based on Panasonic's own internal allocation of costs: see Ryan 1, ¶7.6.1 to ¶7.6.9. When Mr Ryan asked Panasonic to explain how they had allocated those costs internally, Hogan Lovells provided the following explanation in a letter dated 15 May 2024:

“The allocation conducted by PAC's managers is left to the discretion of the individual managers due to the idiosyncratic operations of each sub-team at PAC. The methodology adopted by each manager is not centrally recorded, and due to the large number of personnel involved (some of



whom are no longer at PAC) it would not now be proportionate for PAC to ask each manager to explain the approach taken.”<sup>4</sup>

535. When Mr Ryan was cross-examined, Mr Howe put a complex demonstrative to him to persuade him to accept that he should deduct a larger percentage of fixed costs because the revenue of the relevant business unit had declined. His answer was a simple one. He had relied on Panasonic’s own internal figures and he had no reason to believe that they were not reasonable:

“Q. So that the non-IFS business units receive a [REDACTED] share of costs, both when they for [REDACTED] of revenues in FY13 and when they account for [REDACTED] of revenues in FY21? A. That is correct. Q. Within the non-IFS units you suggest that the FY21 allocations can be applied in the relevant period. In other words, you consider it reasonable to assume that units such as services should receive the same allocations throughout. A. Panasonic's own accounting department considered that that was the reasonable thing to do and I haven't seen any evidence to suggest that it should be different. Q. But I would suggest to you, Mr Ryan, that it's obviously an anomalous position, an anomalous outcome if you are allocating the same fixed percentage of the fixed costs allocation to the IFS business unit regardless of the actual changing composition of the composition of those costs and the changing proportions that each of these business units accounts for? A. Well, Panasonic's management didn't consider that to be the case. I obviously, I ask for the cost allocation key to understand how costs were allocated in those subsequent years and a detailed reviewer of that and applying that to earlier years suggests that the percentages would be lower than the amounts identified by Panasonic management. In that very detailed spreadsheet, my Lord, which has 600 lines for the different cost categories, along, and I should say most of those costs are allocated on a direct basis to divisions. So only some of them are allocated on a different basis. [REDACTED] of costs are allocated on the basis of [REDACTED]. [REDACTED] of costs are allocated on some other basis.”

536. By contrast, Mr Bezant considered it appropriate to adjust Panasonic’s fixed expenses allocations to estimate the allocation of Panasonic’s total business expenses over the Relevant Period. This was a very complex exercise and the complexity of it can be gauged from the fact that it took four pages of dense text and three graphs of a table to explain it. On this issue, I also prefer Mr Ryan’s evidence and I find that the appropriate deduction from Panasonic’s net revenue for fixed expenses over the Relevant Period is

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<sup>4</sup> Mr Ryan quoted this letter in Ryan 1, ¶7.6.8. He stated that it was set out in a letter dated 15 May 2015 but I assume that this was a typo.

**[REDACTED]**. I have reached this conclusion for the following reasons:

- (1) Mr Ryan's calculation was based on Panasonic's own historic allocation of costs between individual business units and carried out by its own managers. Moreover, it is clear from his oral evidence that they carried out a detailed exercise and allocated heads of cost or individual items on an individual basis. In my judgment, Panasonic's managers were in the best position to judge how to allocate fixed costs between individual business units and, as Mr Ryan stated, Panasonic's accounting department clearly considered their allocation to be reasonable.
- (2) Panasonic faced with the same problem which it faced in relation to sales credits. It chose not to call Mr Nguyen to give evidence or any factual evidence in relation to fixed costs either. As it happened, it suited Lufthansa to accept what he said about fixed costs and it did not suit Panasonic or the Defendants. But if they wanted to persuade the Court to adopt a different approach, it was incumbent upon Panasonic to call Mr Nguyen to give evidence and for him to explain what fixed costs were incurred by the IFS business unit, whether those fixed costs declined as its revenue declined and, if so, what his best estimates of the relevant costs were for each year. This was, after all, a question of fact.
- (3) But above all Mr Ryan's approach had the merit of simplicity. Mr Bezant's approach was very complicated and, at the end of the day, no more than an estimate based on an assumption that as its revenues declined, its fixed costs must have declined a similar way.

(3) *Variable expenses*

537. The issue between the experts was whether certain variable expenses of **[REDACTED]** were incremental. Mr Ryan's evidence was that they were not: see Ryan 2, ¶6.6.1 to ¶6.6.4. He pointed out that Mr Bezant had assumed that these costs were incremental because they were labelled as "variable" whereas an analysis of the PAC Costs Allocation Spreadsheet showed that they were not linked to revenue. Mr Ryan was not cross-examined on this evidence and beyond identifying the issues in their Opening Skeleton Argument the Defendants did not address this issue at all in submissions.

538. I accept Mr Ryan's evidence. Mr Howe did not challenge it and, again, it would have

been relatively simple for Panasonic to call Mr Nguyen or another witness to explain briefly what the relevant costs were and why they were either directly related to the production of the infringing products or correlated to revenue more generally. Mr Ryan and Mr Bezant agreed that sales commissions were incremental and this represented approximately 70% of the total. Proper identification of the remaining costs ought to have made it easy for experienced expert witnesses to agree the balance. I, therefore, decline to make any deduction from net profit for variable expenses.

(4) *FAL Components*

539. Mr Ryan calculated that the net profit on FAL Components was [REDACTED] assuming that Panasonic had been unable to replace any of the infringing sales with sales of the 1171M. Mr Bezant calculated that the net profit on FAL Components was [REDACTED] on the same assumption. Again, the only difference between the experts was based on the ratio of FAL Components to ISPSS which each expert was instructed to assume. Indeed, both experts adopted the same ratios as they had done to calculate Astronics' net profit on FAL Components.

540. I prefer the evidence of Mr Ryan on this issue for similar reasons to those which I gave for preferring his evidence in relation to that issue. It ought to have been possible for Panasonic to produce the information required to calculate how many FAL Components Panasonic sold for each ISPSS and I was given no reason why it had not done so. Indeed, in their Opening Trial Skeleton the Lufthansa team pointed out that Panasonic's financial accounting system recorded all transactions taking place worldwide but that Panasonic had strenuously resisted including this information in the PAC Cost Allocation Spreadsheet and continued to resist disclosure of this information.

541. Furthermore, Mr Bezant was instructed not to use the information which Panasonic had actually disclosed and which was contained in the PAC Cost Allocation Spreadsheet. He did not fully explain why he had been instructed to adopt this stance but Mr Hall explored this issue in cross-examination:

“Q. You give a basis there for your instruction, again. You say: "This is on the basis that the Defendants consider that it's inappropriate to use [Panasonic] data to estimate the ratio given that MCUs sold by [Panasonic] do not solely support ISPS outlets, but also support IFEs." A. That's my understanding. Q. So what you are doing there, as I understand it, is you're

taking into account the fact that a given MCU has two functions that supports ISPS and in-flight entertainment systems at the same time? A. Yes. Q. So that's an apportionment point, isn't it? A. No, in the sense of you want to be careful not to double-count or misunderstand that the MCU can have two roles simultaneously when you're thinking about the ratio. I think that's the point that it goes to, so that the actual ratio should be higher than the mathematically calculated number that Mr Ryan has presented. Q. So you're trying to make sure that the ratio reflects the -- or focuses on only the component that supports ISPS, rather than the part that is supporting IFE? A. Um... I just thought it was a slightly different point that you needed to understand how to interpret these ratios, given the way the equipment was used and therefore the relationships between different pieces of the equipment. I don't know if you're asking me a legal proposition as to -- that's all I'm saying. I just think it was an explanation of how to understand counting the relationship between one unit and another and therefore you can calculate a ratio, but that may not actually reflect what's going on in the aircraft, I think is the point that my instruction goes to.”

542. In their written Closing Submissions the Lufthansa team submitted that his explanation involved an attempt to apportion the profits between the two different functions of each MCU rather than to establish the actual profits which Panasonic made from the sale of FAL Components as a consequence of the infringing sales during the Relevant Period. The question of apportionment is an entirely separate one and, in my judgment, it was not appropriate to give Mr Bezant instructions on this basis or, indeed, to do so without making it very clear that he had not been instructed to reflect “what’s going on in the aircraft”. Indeed, if Mr Hall had not exposed this point in cross-examination, it would have remained entirely opaque.
543. I, therefore, reject Mr Bezant’s evidence on the basis that his instructions were not directed to the factual question in issue, namely, what sales of FAL Components were consequential upon the infringing sales in the UK. In the absence of disclosure by Panasonic of the financial information necessary to establish this fact, I consider that the assumptions made by Mr Ryan were reasonable for the reasons which I have already given. I find, therefore, that the Panasonic’s net profit on FAL Components was [REDACTED] assuming that it had been unable to replace any of the infringing sales with sales of the 1171M.

(5) *Tax*

544. Mr Ryan calculated that the tax payable on UK sales of the infringing products was

[REDACTED] million based on statutory tax rates. Mr Bezant calculated that it was [REDACTED] based on effective tax rates. Although the difference between the two of them was [REDACTED], the tax calculations were based on different figures and reflected a different rate of [REDACTED] (Mr Ryan) compared with [REDACTED] (Mr Bezant). The difference between them was, therefore, no more than [REDACTED].

545. Mr Ryan's evidence was that it was appropriate to apply the marginal rate of tax which was implied by the incremental tax attributable to the increase in profits due to the infringing sales. But in the absence of that information, he applied the statutory rate. Mr Bezant's evidence was that it was more appropriate to apply the effective rate and, in principle, I accept that evidence. However, it is clear from his evidence that he was unable to identify the effective rate simply and had to make a series of adjustments. His evidence in Bezant 2 was as follows:

“5.67 In my First Report, for FY 2013 to FY 2018, I applied PAC's effective tax rates to my estimate of PAC's profit before tax for the Relevant Sales, which I calculated as: (i) PAC's income tax provision; divided by (ii) PAC's profit before tax, both as stated in PAC's statutory accounts for each respective year.

5.68 For FY 2016 and FY 2017, PAC's effective tax rate was [REDACTED] due to [REDACTED] that PAC had to pay. Therefore: (1) in FY 2016, I applied PAC's average effective rate from FY 2013 to FY 2015 (rounded to the nearest percentage point) given that PAC's effective tax rate in these prior years had been relatively stable; and (2) in FY 2017, I applied a tax rate of [REDACTED], being the weighted average of: (i) [REDACTED] for nine months of the 2017 calendar year, which was the effective tax rate that I applied for FY 2016; and (ii) [REDACTED] for three months of the 2018 calendar year, which was PAC's effective tax rate in FY 2018 following a reduced statutory tax rate which applied from 1 January 2018.”

546. In my judgment, it is impossible for me to assess whether the calculations which Mr Bezant has undertaken demonstrate how much tax Panasonic actually paid on the infringing sales of the relevant IFE systems. Panasonic did not adduce any evidence to prove why the US Department of Justice imposed penalties on Panasonic or why it was not possible to identify the effective tax rate for FY 2016 and FY 2017 if those penalties were ignored. Moreover, the fact that Panasonic was required to pay penalties to the US Department of Justice suggests that its tax affairs were far from straightforward.
547. Given that it was not possible for Mr Bezant to identify and apply the effective tax rate

for two years of the Relevant Period, I prefer to adopt Mr Ryan's approach of applying the statutory tax rates. Again, this has the merit of being simple. Moreover, Lufthansa can hardly complain because I have accepted the evidence of its expert and Panasonic can hardly complain because this results in a higher deduction for tax. I, therefore, find that the appropriate deduction for the tax on the net profit from UK sales is **[REDACTED]**.

(5) *Total net profit*

548. Based on these findings, I hold that the total net profits earned by Panasonic on its sales of IFE systems incorporating the infringing EmPower Fusion systems during the Relevant Period in the UK (but also including FAL Components shipped outside the UK) were US \$56.8 million as calculated by Mr Ryan. I have also accepted Mr Ryan's evidence in relation to fixed expenses (should that issue become relevant).

P. Safran

549. Mr Ryan and Mr Bezant agreed that Safran's gross profit from UK sales of seats which included the EmPower Fusion system during the Relevant Period was US \$212.5 million. There was a disagreement between them about the total overheads deductible for UK sales. Mr Ryan considered that US \$169.8 million was properly deductible whereas Mr Bezant considered that US \$165.1 million was deductible. The difference between them related to the methodology for general and administration expenses. Mr Bezant chose to allocate expenses to the relevant Safran business division by reference to revenue allocation rather than using a headcount allocation.

550. Because of this difference of opinion Mr Ryan calculated that Safran's profit before tax for UK sales was US \$42.7 million whereas Mr Bezant calculated that it was US \$47.4 million. Mr Bezant also excluded all of the relevant overheads from his calculation of net profits (assuming no NIA) because they were not incremental costs. The experts also differed on the appropriate tax rates and Mr Ryan applied the statutory tax rate to Safran's UK sales whereas Mr Bezant applied the effective rate. Because of these differences, Mr Ryan calculated that Safran made a net profit after tax from UK infringing sales during the Relevant Period of US \$33.7 million and Mr Bezant calculated that it made a net profit after tax of US \$38.7 million after stripping out overheads altogether or US \$168.7 million after stripping out incremental overheads only.

551. The real difference between the experts was how to identify that share of Safran's profits which were derived from the infringement. Mr Ryan's opinion was that it was appropriate to attribute 5.9% of those profits to the infringement whereas Mr Bezant's view was that it was only appropriate to attribute 0.02% to the infringement. Mr Ryan summarised his reasons for his percentage in the Joint Statement:

“Mr Ryan considers that, in circumstances where the Court determines that the EmPower system made a significant contribution to the attractiveness of Safran's seats, the attribution percentage put forward by Safran does not reflect the economic reality of the contribution that the EmPower System made to Safran's seats. (DR1: ¶8.6.1; DR2: ¶7.2.7)

Mr Ryan considers that, in such circumstances, a reasonable approach to assessing the relative contribution EmPower makes to Safran's overall profits is to examine the hypothetical situation in which, rather than receiving EmPower components as BFE, Safran purchased the components and added them to the cost of its seats, without any further mark-up over costs. (DR1: ¶8.6.2)

Mr Ryan considers that the importance of the EmPower system to Safran's seat sales is a matter of fact for the Court to determine. (DR2: ¶7.2.7)”

552. Mr Bezant was critical of this evidence for a number of reasons which he largely captured in the reasons which he advanced for adopting his own, much lower percentage. He stated as follows:

“Safran does not charge for the installation of EmPower Systems in isolation. This is because EmPower Systems are BFE, being equipment that is purchased by the end-customer and installed by Safran (rather than purchased, installed and then sold on by Safran). The charge for installing EmPower Systems is therefore included within its overall price for the seats that contain EmPower Systems, but not separately reported. This means that it is necessary to quantify the value of Safran's effort relating to the EmPower Systems, being to install them.

Mr Bezant's approach, being the same as Safran's proposed approach, compares the installation cost to Safran's total direct costs in respect of seats into which EmPower Systems are installed. Mr Bezant considers that his approach is reasonable because it reflects:

1. the structure of Safran's commercial relationships. That is, Safran only installs the EmPower System (as is the case for other BFE), but is involved in sourcing, buying and installing other materials; and
2. where Safran buys materials for its seats, it will likely incur additional efforts selecting and ordering these products, and then incorporating them into its product design. This is not the case for BFE which Safran does not select, and which is incorporated into seats as a routine activity, rather than necessarily being an integral part of the seat itself. (MB2: ¶¶6.21-6.22)

Using this approach, Mr Bezant concludes that 0.02% of Safran's seat-related costs derive from its installation of EmPower Systems, which represents his assessment of the appropriate attribution percentage. (MB2: Table 6-2) He considers that this conclusion is consistent with Safran's position that it:

1. does not incur any design costs to ensure that its seats are compatible with EmPower System components, meaning that the only costs that it incurs relating to EmPower System components are when it fits these systems to its seats; and
2. expends very little effort when installing EmPower Systems, and the activity required to do so is highly routine, unlike some of the other activities required to produce a seat. (MB2: ¶6.22)"

553. Based on their calculations of net profit and their attribution percentages Mr Ryan calculated that Safran derived net profits of US \$1,811,000 from the sales of infringing seats and Mr Bezant calculated that Safran derived US \$36,000 from the sales of infringing seats. Mr Bezant adopted an alternative approach in Bezant 2 which I consider in section VIII (below). None of these differences were explored in cross-examination and given that the real issues between them were whether to deduct overheads at all and how to calculate the profits from infringement, their differences over overheads for UK sales and tax were largely immaterial.

554. For the sake of simplicity, I adopt Mr Bezant's figures. The Defendants can hardly complain since he was their expert and Lufthansa can hardly complain either since his evidence favoured them. I find, therefore, that Safran's profits for the Relevant Period were US \$38.7 million after deduction of overheads of US \$165.1 million and US \$168.5 million if no overheads are deducted: see Table 6-1. I deal with the apportionment percentage and whether it is appropriate to deduct overheads in section VIII (below).

### **VIII. Apportionment**

555. As I have indicated, the principal issue between the parties was whether it was appropriate to apportion the profits of the individual Defendants as a matter of law. I have determined that issue in their favour because infringement did not drive the sales or profits of any of the Defendants even though Lufthansa has proved but for causation and that the Patent was, in that sense, a "barrier" or "gateway" patent. I must, therefore, go on to consider how to apportion the profits. Unfortunately, the way in which both parties approached apportionment gave rise to legal, pleading and evidential issues which I have



to resolve before I can address the merits of the case.

Q. Approach

(1) *The authorities*

(i) *Celanese*

556. I did not follow *Celanese International Corporation v BP Chemicals Ltd* [1999] RPC 203 in deciding the principal question whether it is appropriate to apportion the Defendants' profits. But for very different reasons I have arrived at the same result. In my judgment, therefore, it remains instructive to consider how Laddie J decided to apportion the profits on the facts of that case. The patentee put forward a number of percentages all of which he rejected. In doing so, the judge made the following comment about its position which has some resonance in the present case:

“80. Some logical basis for an apportionment must be found. The fact that an account can be an imprecise exercise does not mean that the judge is entitled to pick a winner on the basis of little more than hunches. In any event, even if I accepted Mr Watson's invitation, I would not have picked a figure within the range he suggested. During the process of litigation, the fact of the defendant's infringement and the validity of the patent take centre stage. It is very easy to lose sight of the whole picture. But it is the whole picture which must be considered in an apportionment. The invention here is a small but useful cleaning step added to the end of two complex and highly refined chemical synthesis processes. I have no doubt that attributing to it even 20 per cent of the total profits of the two plants greatly overstates its significance and value and would result in profits which have nothing to do with its exploitation being paid to HC. The reality is that HC were so single-minded in their pursuit of 100 per cent of BP's profits that their evidence did not pay regard to the proper scale of an apportionment. As Mr Mainz accepted under cross examination, he did not undertake an apportionment exercise.”

557. In the event, Laddie J chose to follow the decision of Millett J in *Potton v Yorkclose Ltd* [1990] FSR 11 (a copyright case, where the defendant was held to have erected certain houses in infringement of the plaintiff's copyright in architect's drawings) and apportion by reference to cost:

“81. This does not mean that no relevant material has been produced on this account. It will be recalled that in *Potton*, Millett J. said a useful guide is likely to be provided by ordinary accounting principles whereby, in the absence of some special reason to the contrary, the profits of a single

project are attributed to different parts or aspects of the project in the same proportions as the costs and expenses are attributed to them. This seems to me to be very similar to the evidence given by Mr Boulton which I have quoted above in paragraph 18. He said that one rule of thumb or general way of allocating the total pool of profits is by reference to relative costs. He said that such an approach is quite often applied where it is very difficult to disentangle the contribution of lots of different elements to a final product. This evidence was not challenged. In my view this is a case where it is very difficult to disentangle the contributions.”

558. The judge accepted that it might be appropriate to add a “weighting” to account for the overall significance of the product or process but held that BP could have continued to supply all of its customers with no or additional cost and that the apportionment would be 0.6% for one plant and 0.3% for the other: see [82] and [83]. However, he also accepted that in principle a patentee might be able to recover differential profits in addition to the apportioned sum where the effect of the infringement was to reduce the infringer’s costs significantly (although he held that no additional sum was recoverable in the instant case):

“140. In paragraphs 58 et seq. above, I suggested that it may be possible in some cases to compare the profits actually made with and without infringement. Any increase during the period of infringement could be regarded as differential profits attributable wholly or partly to the infringement. This differential profit can then be added to the base allocated profit. This can have no bearing on A5 because the acid produced on it made a substantial loss. If that is so nothing can be due to HC. As far as A4 is concerned, Mr Boulton came to the conclusion that, due to the collapse of the price of rhodium, no differential profit was made. Although it was suggested that he had not taken into account some other savings, such as the savings on possible additional tank storage requirements, no attempt was made to show that any significant differential profit was made on this plant as a result of the use of the beds. In my view the picture presented by Mr Boulton is accurate. The use of the guard bed process on A4 did not disproportionately improve the profitability of A4. I do not think any upwards weighting is justified.”

559. *Celanese* is useful in the present case because it demonstrates that there is no special method of apportionment in patent cases and that it is appropriate to follow copyright or trademark infringement cases. It also provides authority for the proposition that the Court may adopt the distribution of costs approach either with or without a weighting to account for any special contribution which the infringement made to the profits. On the other hand, I take the view that the Court must be cautious in applying *Celanese* given that I have departed from the decision on the issue of principle.

(ii) OOO Abbott

560. When the account of profits was remitted to His Honour Judge Hacon, the judge held that the infringing insert was the essential feature of 10% of the panels because the customers who bought those panels wanted the insert and no substitute. He also held that 10% of the sales of panels with separate inserts were driven by the sales of the inserts: see [43] to [47]. In relation to the remaining 90% of the sales in each category, he apportioned profits by reference to the profit made on the inserts rather than on the panels as a whole: see [51]. He dealt with a number of discrete issues which included overheads (the second issue which had gone to the Court of Appeal and been remitted to him for further decision) but in deciding to apportion by reference to sales revenue the judge followed the decision of His Honour Judge Pelling QC in *Jack Wills Ltd v House of Fraser (Stores) Ltd* [2016] EWHC 626 (Ch) (below).

(iii) Cipriani

561. In *Hotel Cipriani SRL v Cipriani (Grosvenor Street) Ltd* [2010] EWHC 628 (Ch) the defendants were found liable for trademark infringement and passing off and the claimants elected for an account of profits. The defendants served an expert report prepared by Mr Bezant and made him available to give evidence but chose not to be represented at the final hearing. Briggs J (as he then was) decided not to call him to give oral evidence given: see the judgment at [6]. He also followed *Potton* in setting out the following general principles:

“8. The principles are well settled and summarised by Millett J in *Potton v Yorkclose* [1990] FSR 11 at pages 14 to 16. First, the purpose is to deprive the defendants of the profits which they have improperly made by the wrongful acts committed in breach of the claimants’ rights and to transfer those profits to the claimants. Secondly, it is no answer to such a claim to say that similar profits could have been made in a non-infringing way – see *Celanese v BP* [1999] RPC 203 at 219 to 220. Thirdly, profits include accrued profits, for example a legal right arises to receive payment, even if payment is yet to be made. Fourthly, where a single head of profit is attributable to a number of causes, some of them infringing and some not, it is necessary and appropriate for the court to conduct an apportionment so as to work out on a broad-brush basis what proportion of the profit was due to the act of infringement.”

562. Both experts adopted the distribution of costs approach but also agreed that it was necessary to apply a measure of weighting. After deciding a number of specific issues on

the facts, Briggs J distinguished between those profits attributable to the functional activities of the infringing business and those profits attributable to the “intangibles” derived from infringement. He stated this at [18]:

“18. In the present case, the experts are agreed that it is necessary to apply a measure of weighting, and they both adopt the same mechanism for this approach. The only question is as to the figures inputted to the mechanism for the purpose of producing the ultimate result. The experts start by distinguishing the profit margin associated with the basic activities of a restaurant, i.e. buying food, rent, paying chefs and waiters and so forth, which they refer to as “functional activities”, as opposed to intangible elements of a restaurant business which gives its special value such as branding, marketing, etc. This is because a free market will only permit a marginal profit to be made from the provision of any service per se. Therefore, profits made over and above that level are likely to be as a result of something other than the service. By definition, the extra profit is caused by whatever intangibles are giving the service provider an edge over others in the same market.”

563. The judge held that 5% was the appropriate uplift for the element of profit based on the infringer’s functional activities and he applied what I will call the “royalty approach” or “licensing approach” to the profits on the second element of profit:

“21. Having thus identified and set on one side that part of the first defendant’s profits not attributable to intangibles, the question remains how to identify that part of the remainder, i.e. the part attributable to intangibles, derived from the infringing use of the name. Mr Bolton’s solution, which I accept, was to use as the best guide the ratio between (a) the royalty payable to the third defendant under the London licence for the use of the name and logo at a rate of 11.5% of gross sales, and (b) the third defendant’s entitlement to payment under a management agreement with the first defendant, also dated 1st January 2004. That agreement provided for the third defendant to make restaurant consultancy and management services available to the first defendant for 3% of gross receipts. The ratio is therefore 3 against 11.5, so that the contribution of the infringing use of the name to the first defendant’s profits derived from intangibles is, on that analysis, 79%.

22. While it is possible that the 3% versus 11.5% split adopted by the defendants themselves as between the management agreement and the London licence was not their true evaluation of the relative contribution from each to the restaurant’s profitability, the defendants have made no effort to say so or otherwise to explain why those figures were chosen. Mr Bolton was, therefore, in my judgment, entitled to assume that the two agreements, although of course between connected parties, were made on arm’s length terms.”

564. *Cipriani* is authority for the proposition that where a single head of profit is attributable to a number of causes, some of them infringing and some not, it is necessary and appropriate for the court to apportion on a broad-brush basis. *OOO Abbott* is an example of that broad-brush approach where the Court had to estimate the proportion of sales which were driven by the infringement without any figures with which to work. *Cipriani* also provides a clear example of a case in which the Court used the royalty or licensing approach to the apportionment of a single pool of profits. Finally, I accept that the Court must approach the decision with a little caution because Briggs J accepted without argument that the *United Horseshoe* rule applied to an account of profits although the existence or otherwise of an NIA does not appear to have had any effect on his decision.

(iv) *Jack Wills*

565. *Jack Wills Ltd v House of Fraser (Stores) Ltd* [2016] EWHC 626 (Ch) was also a case of trademark infringement and passing off. In that case His Honour Judge Pelling QC applied *Cipriani* and *OOO Abbott* in the Court of Appeal and he stated in terms that there was no justification in law for approaching the profit taking exercise differently simply because it was a trademark infringement case: see [62]. The judge also adopted a royalty approach accepting the evidence of Mr Bezant who also gave evidence in that case. The judge stated at [64]:

“In those circumstances, I must attempt some form of apportionment in the manner identified by Briggs J in *Cipriani* (ante) that is to “... work out on a broad brush basis what proportion of the profit is due to the act of infringement ...” Mr Bezant has approached the task by examining first the royalties paid by HoF to licence the use of third party brands. That work suggests a rate of about 3% of revenues applied during the period of the infringement. Mr Bezant says at paragraph 5.15 of his report and I accept that 3% would be a wrong comparator because the correct comparator would be much nearer to a bare trademark licence. That being so he has adjusted downwards the rate that HoF paid to licensees for the use of third party brands to 1.5%. I accept that approach as being in principle correct. That would result in an apportionment of about 41% of the net profits to JWL. Mr Geale was not instructed to consider this issue. I accept Mr Bezant’s evidence on this issue. I conclude therefore that JWL should recover 41% of the profits made from the sale of the infringing items calculated as set out above.”

566. *Jack Wills* also provides authority for the propositions that there is no difference in principle between an account of profits for patent infringement and an account of profits

for the infringement of other intellectual property rights and also that the Court should take a broad-brush approach to the apportionment of a single pool of profits generated by multiple causes. It also provides another example of the application of the royalty or licensing approach and of a case in which the relevant comparables were the royalties paid by the infringer to third parties.

(v) Lifestyle Equities

567. The final issue which I have to consider is whether the decision of the Supreme Court in *Lifestyle Equities* casts any doubt on any of these authorities. Mr Cuddigan submitted that the royalty or licensing approach was inconsistent with that decision because it is authority for the proposition that the aim of an account of profits is to deprive the infringer of all the profits of their infringement and he relied on Lord Leggatt's judgment at [156]: see [315] (above). He also put this point to Mr Bezant in cross-examination by reference to Seaman, Patent Remedies and Complex Products (2019), Chapter 2, pp.82-84. I suggested to Mr Cuddigan that he was putting a question of law to Mr Bezant but I also permitted him to ask his questions:

“MR CUDDIGAN: Yes. The authors continue: "The difference between the two is only that the differential profit represents the profit attributable to the patented technology in the hands of the infringer, which may be less than its true social value (if, for example, the infringer is particularly inefficient at implementing the invention). In many cases, however, the two concepts will coincide." The authors are clearly of the view that the differential profit method accomplishes a fair valuation of the contribution of the patent to the infringer's profits. A. That's what the authors are advocating. Q. In other words, they consider it's an approach which takes account of the economic value of the patent. A. Yes, that's what they say. Q. They are saying that differential profits is not an all-or-nothing approach and they're right about that, aren't they? A. I think you have to be careful at that point, because if you can isolate the value -- this is an article that isn't necessarily engaging with the complexities and realities, sometimes, of positions you meet. If you can neatly and satisfactorily isolate the contribution of something, then that might be a way forward, if that's the right approach in law. But it would certainly be an approach in economics. Sometimes, you have a situation where you -- the measure that you have, the differential measure that you have, isn't a perfect or a complete isolation, it's something else. You still have to bear in mind there may be other things you have to give credit for, and I think we might have come into that with Safran, for example. I don't think it has been said you think about the profits made by Safran on selling seats, because you couldn't make an alternative seat without the patent. Depending on what you are looking at, it's not necessarily perfectly isolating the value of the

patent because there are other things alongside it; in reality what your comparators are. So you may still have to, in a differential exercise, remind yourself, "I'm only part-way through the process of apportionment." If you can isolate it perfectly, then you may not need to look outside. But in reality you sometimes do need to remind yourself that you haven't neatly isolated the value of the invention in the information available to you. Q. "Differential profits" is nuanced in this way: it allows the infringer's profits to be reduced in accordance with the ability of the infringer to compete with the patented product. A. That's the principle on which -- on which this comparison is proceeding, as I understand it. Q. Yes. Then the authors consider the relationship between differential profits and incremental profits for the purposes of royalty calculations. This is towards the bottom of page 34 {JA/93/24}: "The differential profit approach to an accounting of profits is also closely related to the incremental profit approach we recommend as the appropriate approach to reasonable royalty damages. The hypothetical negotiation approach to a reasonable royalty considers a negotiation between the patentee and the infringer in which the infringer's maximum willingness to pay is determined by its profits if it had used the best non-infringing alternative." Do you see that? A. Yes, that's what it says. Q. Now, as a matter of economic principle, it is right that a notional licensee would not be -- A. Sorry, can you slow down, sorry? You're asking long questions. Q. As a matter of economic principle, it is right that a notional licensee would not be prepared to pay more than the profits which could be accrued through the use of the best non-infringing alternative? A. That would be the licensing paradigm. Q. Yes. A. Yes. Q. Yes. And then, carrying on: "The only difference between this and the differential profits approach to an accounting of profits is that an accounting awards all the value of the invention to the patentee, while reasonable royalty damages splits that value between the parties." Now, the authors are explaining the conceptual difference there between an account and a reasonable royalty, do you see that? A. They're talking about the differential approach to an account. Q. Yes. that's the approach you've taken with the teaming agreement, isn't it? A. I've done a number of things with the teaming agreement, what do you mean? Q. You've taken a differential approach -- the incremental profits that are made available through the use of the invention and you split those profits by reference to the teaming agreement, notionally, between Lufthansa and KID, and then you've applied that to the defendants. A. Right, so in the context of an apportionment, an account where one is apportioning and one is having to do an apportionment between the patent and other parts of the AES or PAC businesses that contribute to overall profits, when one is in that exercise, one is essentially trying to find a way of sharing profits between the patent and the rest of the business that made the overall goods, which include the infringing patent, as well as all the other contributors to profits. An exercise of sharing value between the owner of a right and the user of a right is a licensing analysis and the outcome of a licensing analysis, a royalty, \$10, 3% of turnover, tells you how the parties agreed to isolate the value of that patent in the hands of the user. And so as a similar paradigm you're trying to think about the relative contribution of the IP to someone's use of the IP under a licence and what the share of the profits will be that

will take the form of royalty. It won't be all of it, because the licensee is bringing other things to the party, doing other things, it will be a share of it. The outcome of that process tells you how two commercial parties decided to split profits upfront. It may have turned out differently. An account is saying, well, it's not a licensing negotiation, but it's the same concept: can I use the outcome of that negotiation, that actual commercial arrangement, where I agreed to take, in my example, \$10 a unit or 5% of turnover or whatever example I gave you, and that will tell me how I should think about the relative contribution in this equivalent context? Somebody has used the right, albeit without permission, and they've used their other resources and they have made some profit. So it's not a licensing negotiation, it's using the learnings and the outcome of a licensing negotiation and an actual contract to inform an apportionment in an account."

568. Mr Cuddigan also put it to Mr Bezant that as a matter of economics the patentee ought to be entitled to 100% of the profits and not a proportion if no Non-Infringing Alternative were available. Mr Bezant considered this issue to be one of law and not economics in the following exchange:

"If Component 5 were both irreplaceable and both necessary to the functioning of gizmos, however, then absent the infringement Firm B would have sold no gizmos and rightly should disgorge the entire \$10,000 profit; there should be no apportionment." That is a sound economic conclusion if the objective is to award the profits caused by the use of the invention. A. There's some predicates and factual predicates there. If those factual predicates apply and subject to whatever legal predicates apply, then that might be a case in which you disgorge the entirety of the profits because of the way it has been described. So I wouldn't disagree with that. Whether that is right here as a matter of fact or law is not for me. Q. Yes, but -- don't worry about the law. A. Well, you are asking me an awful lot about legal textbooks. Q. Well, I am, but I'm only interested in your view on the economics, which is repeatedly and expressly called out here. So leaving aside the question of the law -- A. And it is a point I made earlier. These examples -- you know, legally I could -- I can posit a way I can isolate, in a bright-line way, the differential profits. That may not be what is possible in reality. You've still got to ask yourself, have I fully isolated all of the profits? And it may be having done that, you're still left, as I say, with an economically uncomfortable answer, because it's only in situations -- I won't say extreme, but situations where something else wasn't possible at all that you push all the profits to one end of the scale. Something else -- even though other things are contributing to those profits, you push all of the profits to one particular piece. Q. Could we -- A. So that is a particular subset of the problem, if I can put it like that, where, either legally or factually, that's where you find yourself."

569. When Mr Ryan came to give evidence, Mr Howe took him to *Cipriani* and pointed out



that his partner, Mr Boulton, had given evidence in that case in support of a licensing or royalty approach. Mr Howe then asked him whether he was familiar with the *Jack Wills* case and he conceded that in principle a licensing or royalty approach was possible:

“Q. We'll come back to that possibly, Mr Ryan. Now, are you aware of the case of Jack Wills and House of Fraser, which is another case concerned with trademarks where apportionment arose? A. I'm aware of it. Q. Are you aware that in that case the apportionment of profits in respect of the trademark infringement and passing off was assessed by reference to the rate of royalties payable by the House of Fraser to the licensee for the use of the relevant articles, the brands? A. I'm aware that there was some analysis of that, but, again, I'm not very familiar with the case. I can't really comment on whether it's analogous. Q. Again, having regard to the rate of royalty or implied rate of royalty from a licence agreement or a similar agreement, it's something that in principle is something one could have regard to in terms of apportionment? A. It's possible. I mean, I think obviously one distinction between both of those cases and this particular case is that a patent is quite distinct from a trademark. Selling a jumper with a logo on it, you know, just because you haven't got the logo, you can still sell a jumper. Trademarks -- they do sometimes, but rarely create a complete barrier to entry in the way that patents can. Again, context is important when applying these techniques.”

570. In my judgment, it is a question of law for the Court to determine whether to apportion the profits and, if so, on what basis having found the underlying facts. It is also a question of law whether to award the patentee 100% of those profits or whether to adopt a royalty or licensing approach (as in *Cipriani* or *Jack Wills*). Furthermore, Mr Ryan, Mr Cuddigan's own expert, expressed this view in relation to apportionment as I explain below. Expert evidence may assist the Court to choose the appropriate methodology and also how to apply it. It may also assist the Court in providing evidence of economic theory. But in my judgment, the basis for apportionment and the ultimate proportions are matters for the Court, as Mr Bezant quite properly recognised in both of these passages.

571. As it happens, I agree with both Mr Bezant and Mr Ryan that where the purpose of the exercise is to apportion the profits between the patent and other factors which contributed to those profits a royalty or licensing approach may be possible. I also agree with Mr Bezant that it may be appropriate because the “outcome of that process tells you how two commercial parties decided to split profits upfront” and “tells you how the parties agreed to isolate the value of that patent in the hands of the user”. Indeed, in many cases the royalty or licensing approach may provide the only logical alternative to the distribution of costs approach which Laddie J applied in *Celanese*.

572. Mr Bezant also accepted that the differential profits approach is to be preferred and that no apportionment may even be necessary where the profits derived from the infringement can be isolated perfectly. Again, I agree. Where it is clear that either all of the profits made by the infringer from a complex product or a specific proportion of them can be attributed solely to the infringement of the patent, then the Court will adopt a differential profits approach to apportionment. But that is not this case. I have found that the infringement was not the legal or proximate cause of the Defendants' profits and Lufthansa did not argue that a particular profit stream or proportion of the profits could be attributed solely to the infringement of the Patent. For instance, Lufthansa might have argued that it was entitled to all of the profits on direct, power only sales and a royalty for the profits on the integrated sales. But it chose not to advance a positive case on apportionment at all (as I explain below).
573. Finally, I can find nothing in *Lifestyle Equities* which prevents the Court from adopting a royalty or licensing approach to the apportionment of profits where appropriate. As I have already stated above, Lord Leggatt was considering the purpose of an account of profits in the context of the mental element for accessory liability and none of the authorities on apportionment were cited to the Court. But in any event, the purpose of both a differential profits analysis or an apportionment analysis is to put the infringer back in the same position financially as if no infringement had taken place by attempting to isolate or identify those profits which were caused by the infringement. Where the infringer generates a single pool of profits from a complex product by multiple causes, the closest approximation may be to decide how much the patentee would have agreed to accept for a licence to commit the infringing acts.

(2) *The statements of case*

(i) The Defendants' case

574. The Defendants pleaded by re-amendment four alternative ways of apportioning their profits: patent counting, the cost of the Components, the causative effects of the Patent and other factors and, finally, by reference to the 2014 Teaming Agreement. They also pleaded a separate case in relation to Safran. I set out the relevant paragraphs from the Points of Defence (without colour or underlining):

“19. The profits for which Safran is liable to account are those derived

from its infringements, that is to say its assembly of components of EmPower Systems into EmPower Systems. Safran assembles components of EmPower Systems that are provided by its customers (and owned by its customers) into seats in the UK and sells the seats to its customers. It makes no profit from assembling EmPower Systems. Alternatively the only profit derived from Safran's infringement is a portion of the proportion of its profit on its sales of seats attributable to the assembly of EmPower Systems. The portion of Safran's profit on its sales of seats attributable to the assembly of EmPower Systems can be assessed by comparing Safran's total direct costs associated with the assembly of EmPower Systems into the aircraft seats it has sold and the total direct costs of manufacturing those aircraft seats. Further, the portion of profit so derived for which Safran is liable to account (if its primary case that it is not liable to account for any profit is not accepted) is set out below."

"24. In the premises, Lufthansa is only entitled to a portion of the overall profits earned by the Defendants from their activities in respect of EmPower Systems, being that portion attributable to the Components. The basis for that apportionment is a matter for evidence. Without prejudice to the foregoing, the Defendants will say that the appropriate portion is no higher than the cost of the Components as a proportion of the total cost of all the components of the EmPower System.

24A. Further or alternatively, Lufthansa is only entitled to a portion of the overall profits earned by the Defendants from their activities in respect of PPD EmPower Systems, such portion being quantified by reference to the total number of patents which protected the Primary Components ("Total Patents") of which the Patent was but one. The remaining patents (the "Other Patents") relate to ISPS/SBP/SPM units in the manner identified in Annex 5. The Defendants will say that insofar as the technology residing in the Primary Components was the subject of patent protection, the Patent and each of the Other Patents should be treated as equally important for the purposes of this Account. In the premises, the proportion of the overall profits to which Lufthansa is entitled in respect of PPD EmPower Systems comprising the ISPS/SBP/SPM Units in Annex 5 is no more than the reciprocal of the number of Total Patents set out therein.

24B. Further or alternatively, the Defendants will say that the appropriate portion of the profits to which Lufthansa is entitled is to be assessed by reference to the facts and matters set out in paragraphs 21-23 above."

"28B. Further or alternatively, the Defendants will say that the appropriate measure of the profits to which Lufthansa is entitled is to be assessed by reference to the payment provisions of the 2014 Teaming Agreement referred to in paragraph 37e below. The Defendants will say that the profit due to Lufthansa throughout the Relevant Period is no more than the rate payable per sale of Outlet Unit in the 2014 Teaming Agreement."

575. The primary case which the Defendants advanced in reliance upon Mr Bezant's evidence was that the Court should apportion their profits by reference to the provisions of the 2014 Teaming Agreement: see ¶28B. They advanced an alternative or complimentary

case based on the respective values of the Patent by comparison with (i) other patented technologies and (ii) other features related to patented technologies. However, Lufthansa objected to this case on the basis that they had only pleaded a conventional “patent counting” exercise: see ¶24A. Their second alternative case was that the apportionment should be based on the cost of the Components: see ¶24. The Defendants did not advance a separate case based on the portmanteau allegation pleaded in ¶24B.<sup>5</sup> But it remained part of the Defendants’ pleaded case at all times.

(ii) Lufthansa’s case

576. Lufthansa denied that the Defendants’ profits were to be apportioned on any of these alternative bases. But they did not advance a positive case that their profits were to be apportioned in any other way. They pleaded to the Defendants’ case as follows in the Points of Reply (and again I omit the colour and underlining):

“12. As to paragraph 24, Lufthansa will say that an apportionment of profit by reference to the cost of components is inconsistent with s.61 of the Patents Act 1977 and wrong in principle. It is in any event the wrong approach on the facts of this case, for the reasons set out in the Points of Claim and above.

12A. As to paragraphs 24A-24B, the Defendants are put to proof in respect of the alleged Total Patents. The Defendants have not pleaded any facts or matters in support of the contention that each of the alleged Total Patents is equally important and/or which in law justify either of the alternative outcomes for which the Defendants contend. In the premises, paragraphs 24A and 24B are denied.”

“14A...(b) Paragraph 28B is directed to the ‘comparables’ case, which is denied as a matter of law. In any event, the royalty rate in the 2014 Teaming Agreement was agreed against a factual background in which the Defendants were engaged in the Infringing Dealings, and accordingly is not an appropriate ‘comparable’ for the counterfactual in which the Defendants were not so engaged.”

577. This was a considered position. Mr Cuddigan said as much before me at the hearing of the applications in July 2024. Moreover, Bacon J stated clearly at a hearing on 1 December 2023 that if Lufthansa wanted to run a positive case on apportionment it should be pleaded in the Reply:

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<sup>5</sup> The Points of Defence, ¶21 to ¶23 pleaded the detailed technical and commercial reasons why the Patent was not the proximate cause of the profits which I have considered in deciding whether it was appropriate to order apportionment: see section VIII (above).

“MR. HALL: In the light of that letter I want to be clear about our position on apportionment. The defendants are running a case that essentially none of their profits should be apportioned to the invention, and we intend to challenge that case. We intend to do so in two ways. The first way we are going to challenge that case is by running a positive case that no apportionment is appropriate, and we should get 100% of the profits. MRS. JUSTICE BACON: That is the case referred to in this letter. MR. HALL: That is the case that they refer to in this letter, yes, and that is our positive case, the one that I have called commercial causation on our points of claim. If it turns out that apportionment is appropriate, then the court will have to decide upon the correct figure, and that is all a matter of weighting these different factors against each other, so it may be that 10% is contributed to a technical factor or 20% to a commercial factor, whatever it is. Lufthansa is likely to challenge the defendants' case by attacking each of the weightings that the defendants propose. So we may say, for example, that the defendants attach too much weight to that technical factor, or to this commercial factor, with the result that we will argue that the overall apportionment should go up. My submission is that this is a reflection of the fact that the court, at the quantum trial, is not restricted to making a binary decision between either 0 or 100. The judge may be perfectly entitled to take the view that neither extreme is correct, and the correct result is somewhere in the middle: 50, 60%, 40%, whatever the judge decides on the materials. The important point is that we are entitled to disclosure and then to lead evidence and make submissions in respect of that middle ground. That is what we intend to do. My Lady, I hope that that sets the background for the case, and what the dispute is and the key disputes on the pleadings. MRS. JUSTICE BACON: Is that middle ground case pleaded in the points of reply? Because if that is your case, then one would expect to see that there. MR. HALL: We are not pleading specific positive aspects, saying, for example, this particular technical feature carries less weight than that technical feature, or something to that extent. We do not actually have that pleading to respond to. You have seen the apportionment pleading of the defendants, and it simply lists various factors. It does not say the weighting here should be 5% or 2%. It just says there are lots of factors that are relevant. MRS. JUSTICE BACON: That goes to a case that none of the profits should be apportioned to the invention, so if your case is that some of those might be relevant, then is that not something that you would have had to plead? Because at the moment if one sees the party's pleaded case it is either nothing is relevant and there should be no apportionment, and your case that there should not be any apportionment at all and you should get 100%. So if you are saying that, as an alternative, fall-back option, which I understand your case to be, that the court will then have to weigh it and come down to a figure that is somewhere between 0 and 100, I would have expected to see that pleaded. MR. HALL: If we need to plead a line in our reply that says in the alternative we will fall back to the middle ground, effectively, and we reserve our position in that respect, then of course we can put that in our reply. But it does not take matters any further forward, in my submission. Where this ends up crystallising in these kind of quantum disputes is when the expert evidence comes in and one sees the opinions of the experts as to

the various factors that matter. So there will be technical experts who will be opining on which are the more important functional aspects, there will be regulatory experts arguing about what is more important from a certification perspective, et cetera. Sir Anthony Mann gave the parties permission to call five experts in this action, so there is all sorts of evidence there that is going to inform the court's assessment between the extreme goal-posts that the parties are both taking. Because the alternative is -- ultimately the court is trying to get to what the right answer is, I think is where my submission lies. If we have to amend our pleading to say that is our position then we will do so. We do not have a specific positive case as to what the number should be; it is just a case that we will challenge ----  
MRS. JUSTICE BACON: No, but if your case is that in the alternative some of those might be relevant and it will be for the court at trial to consider the weight to be given to each of the points relied on by the defendants, then if there seems to be some doubt as to whether you are pleading that, I think you are going to need to clarify that. MR. HALL: We have been asked a Part 18 request in that regard and we are due to respond to that next week so that is probably the appropriate place to do it. So we will take what my Lady says on board.”

(3) *The Expert Evidence*

(i) Mr Bezant

578. *Bezant 1*. Mr Bezant calculated that a royalty of US \$3.4 million would have been payable to Astronics under the 2014 Teaming Agreement and that this implied a royalty percentage of 21% deducting all overheads and a royalty percentage of 13% deducting incremental overheads only: see *Bezant 1*, ¶7.9 to ¶7.14. He made no adjustment for the rights in Article 2. Nor did he take account of the fact that Astronics’ sales were significantly higher than KID’s sales: see *Bezant 1*, ¶7.14. He then carried out a separate exercise to calculate the proportion of Astronics’ profits generated by (i) patented technologies and (ii) other features unrelated to the patented technologies (e.g. brand, customer relationships, know-how, marketing, manufacturing and design): see *Bezant 1*, ¶7.18 to ¶7.42. This exercise resulted in a royalty range of 8% to 17%: see *Bezant 1*, ¶7.42. Finally, he gave evidence that the cost of the infringing parts was 6% of Astronics’ total costs: see *Bezant 1*, ¶7.47.

579. To arrive at a final percentage for both Astronics and Safran Mr Bezant took all three figures into account because of the inherent uncertainty involved in an apportionment assessment and adopted a range of 10% to 20% deducting either all overheads or incremental overheads only. He also gave evidence that the lower end of the range might

be appropriate for various reasons: see *Bezant 1*, ¶7.53 and ¶7.54. He made a further adjustment to Panasonic's sales to take into account the fact that the amounts which it paid to Astronics included a mark-up and that it incurred additional costs in relation to its IFE systems. He arrived at a royalty range of 7% to 13% deducting all overheads and a royalty range of 10% to 19% deducting incremental overheads only: see *Bezant 1*, ¶7.55 to ¶7.62.

580. *Bezant 2*. Mr Bezant did not address apportionment in relation to either Astronics or Safran in *Bezant 2* because Mr Ryan had not addressed the issue at all. However, he did consider an alternative approach to Safran's costs by excluding the cost of materials and apportioned Safran's profits by reference to the proportion of its total direct labour costs which were related to the installation of the EmPower systems. On this basis, he arrived at a figure of US \$81,800 deducting all overheads and US \$567,600 deducting only variable overheads: see *Bezant 2*, ¶6.33 to ¶6.37.
581. *Bezant 3*. Mr Ryan addressed the question of apportionment for the first time in *Ryan 2* (below). Mr Bezant responded to Mr Ryan's criticisms of his evidence in *Bezant 3*. In particular, he addressed Mr Ryan's criticisms of his methodology and his alternative approaches in detail. Mr Bezant also dealt with Mr Ryan's evidence given for the first time in *Ryan 2* that the 1998 Teaming Agreement was a better comparable than the 2014 Teaming Agreement.
582. *Cross-examination*. Mr Cuddigan challenged Mr Bezant's reliance on the 2014 Teaming Agreement for a number of reasons which I consider in the next section (below). Mr Cuddigan also challenged his second basis of apportionment on the basis that it was not pleaded and Mr Bezant accepted this:

“MR CUDDIGAN: So it's {B1/7/26} and let me be absolutely clear that it is our understanding that the exercise you have done here is not the pleaded apportionment. I will give you advanced warning of where I'm going. Firstly, it's not the pleaded apportionment because the dark blue share is not found anywhere in paragraph 24 and, secondly, it's not the pleaded apportionment because you haven't done a patent-counting one over N exercise. Instead, what you've done instead is investigated preferential patents. Do you understand what I'm — A. So I haven't done the one over N that is described here, which has a higher number of patents. Q. Yes. A. I've talked about the other patents in my analysis, but I've not ascribed value to them. So in a sense there has been a first round patent count to say, well, I'm not going to put much value into these, and a second round

patent count essentially by relationship to three remaining patents. Q. And the dark blue share? A. Well, the dark blue share ... Q. In terms of the language of paragraph 24A? A. I wouldn't have used the word "over," or — well, I'm going in two steps. This is going in one step. Q. Okay. A. That's really why I'm just not quite sure. Q. But they are very different steps. A. I understand that, which is why I'm giving you the answer I gave you. Q. So let's see what you did. So this is paragraphs 7.29 {D2/5/104} of your statement. You rely on a series of propositions from Mr Markert's evidence about Astronics' superior technology and new innovations and marketing brilliance and you conclude in paragraph 7.29 that these factors should result in an apportionment of between 20% and 50% of the profits in issue. A. By reference to the way that, again, licensing customer practice thinks about allocating value between patents and non-patents in a business. Q. Yes, but the difficulty that we face on our side, Mr Bezant, is that where you get to is removing up to three-quarters of the sums — the profits in issue by reference to a completely unpleaded apportionment. A. So I'm dealing with how I've thought about the problem. Q. Yes. A. And how I've approached the exercise, as an apportionment exercise and an apportionment question. How that maps to the pleadings or not is not something I can contribute to. Q. So is this fair, and again I mean no criticism, but you considered in addressing the apportionment issue that you were unconstrained by the pleaded arguments? A. No, I wouldn't put it in those terms, but I have tried to think about how one might approach the question of apportionment. It's a difficult question.”

(ii) Mr Ryan

583. *Ryan 2*. Mr Ryan did not deal with apportionment in Ryan 1 or Ryan 3. He accepted that he had been instructed not to deal with this issue and that it was “principally a legal and factual issue”: see Ryan 2, ¶3.1.3 and ¶3.2.2. However, he made a number of criticisms of all of Mr Bezant’s approaches and, in particular, his reliance on the 2014 Teaming Agreement in reply. He also gave evidence that the 1998 Teaming Agreement was a more reliable benchmark, that Astronics would have paid royalties of US \$14 million under it and that it implied a royalty rate of 84% of profits or 23% of revenue.
584. *Cross-examination*. Mr Ryan accepted that he had been instructed not to deal with apportionment because it was a matter of law. He also gave evidence that he had not expected to deal with apportionment, that his instructions remained the same and that his comments in Ryan 2 were limited to commenting on Mr Bezant’s approach. Finally, when Mr Howe pressed him on Mr Bezant’s use of the royalty or licensing approach, Mr Ryan did not directly answer the question. But he did not suggest that he had any objection to it in principle:



“Q. Now, in your second report you explained you weren't instructed to deal with the apportionment in your first report; do you remember that? A. That is correct, yes. Q. Although you were instructed not to deal with the apportionment in your first report, it would have been something -- on the assumption that it is correct to assume the court will go on to apportion, it is something that would have been within the competence of a forensic accountant such as yourself to address? A. Well, I'm not sure whether it would. My understanding is that it really is for the court to determine the apportionment percentage taking into account a legal and factual overlay and, you know, yes, there is economic analysis and in my second report I commented on the economic licensing analysis that Mr Bezant had done, which is within my competence and expertise. But frankly, I did not know that Mr Bezant was going to deal with apportionment. I had not expected to deal with apportionment. My understanding was that was not a matter for the experts and I was not instructed to deal with it. Q. You were instructed not to deal with it? A. No. I didn't say I was instructed not to deal with it. I was not instructed to deal with it. Q. I see. A. I was not given any guidance as to what the framework would be. When one is doing a damages inquiry, for instance, and looking at lost profits and the establishment of a reasonable royalty or other things, there is an established framework and the experts are usually instructed as to what that framework is and that is set out very clearly in their reports in my experience. I would certainly always say I am instructed that this is the way to do it. I had no such framework. I was given no such framework. I still don't have any such framework. I haven't received instruction. Mr Bezant has not set out any framework. I don't know what that framework is. If there is a framework, I can apply my economic and accounting skills to the best of my ability, and you know, in my second report I sought to provide the assistance that I could to the court within the confines of my expertise. Q. So it is within your competence and expertise to critique Mr Bezant's various proposed methods of apportionment, but not to address them independently yourself and to make any suggestions of your own? A. It is within my competence to comment on the implications of Mr Bezant's licensing analysis. Q. And you remained not instructed to deal with the second step of apportionment, ie to put forward any suggestions or proposals or positive approaches of your own, in your second report and in your third report; correct? A. As I have had no such instruction. I am not sure it is within my competence to do so, because it takes into account, as I've said, a legal and a factual framework. Q. Nor in the joint statement? A. No. Q. Have you actually ever asked for these instructions? A. Well, my understanding is that it is for the court to determine an apportionment percentage, that it isn't a matter for experts, therefore, I have not sought instruction on it. It's not for me to put forward my own evidence. It's for me to be instructed on the issues that my instructing solicitors consider they would like my opinion on. Q. I see and you consider you have given the court all the assistance you can give it? A. I consider that I have, yes. Q. Now, is it the case that you take issue with Mr Bezant's proposed approaches to assessing apportionment in this matter on the facts of this case or do you have an in-principle objection to it? A. It's not for me to determine the facts. I think that -- Q. On the assumed facts? A. On the

facts assumed by Mr Bezant? Q. Well, on the facts assumed by you in your reports? A. I don't take issue on a factual basis. My issues or rather the opinions that I have set out are a commentary on the implications of Mr Bezant's analysis. That is the limit of the evidence that I have given. Q. Right. So you don't have an in-principle objection to, for example, the application of an approach to apportionment based upon an implied royalty rate derived from a licensing or similar agreement, if that is relevant on the facts of the case? A. Well, I have pointed out that the economic benefits approach results, as you know, it's clear in terms of the approach that Mr Bezant has applied and that I would agree is common in licensing to attribute between 25 and 50% of the economic benefits to the licensor. I have commented that that implies a cap on the profits that the patent owner can receive, and my understanding is that there isn't a cap, that it is possible for an IP owner to receive 100%. I have -- it's not for me to say whether that is or is not correct. That is a matter of law, but I have commented that, as a matter of principle, the implication of Mr Bezant's approach is that it does imply a cap."

585. Mr Ryan's instructions were reflected in the Joint Statement itself. The parties agreed some basic propositions (which I set out below). But they did not give any further evidence in the Joint Statement either in relation to each of Mr Bezant's three approaches or his figures. They explained their reasons as follows:

"In this joint statement, the Experts do not discuss their respective comments on apportionment, which are covered in Section 7 of MB1 and Section 3 of DR2. This is because Mr Ryan is instructed that this joint statement is not the appropriate place to introduce new expert evidence responsive to the Experts' second reports, being the report in which Mr Ryan's comments on Mr Bezant's approach to apportionment were first addressed. Mr Bezant responded to Mr Ryan's comments on apportionment in MB3."

(4) *Conclusions*

(i) The Defendant's case

586. In my judgment, Lufthansa's objection to Mr Bezant's evidence in relation to the comparison between patented technologies and other features is well-founded. The Defendants pleaded a case by reference to the total number of patents which were required to produce the infringing products, i.e. "patent-counting". However, in his evidence Mr Bezant apportioned the profits by reference to other commercial factors and then between the three essential patents, the Patent itself and the GD AES Patents.

587. I accept that this was only one method by which Mr Bezant arrived at his overall

percentage range of 10% to 20% and might, therefore, be considered as a cross-check on the conclusions which he drew from the 2014 Teaming Agreement. However, I consider that it would not be appropriate to place any reliance on that evidence because of the prejudice caused to Lufthansa by doing so. In their written Closing Submissions, the Lufthansa team submitted that if the Defendants had pleaded this case, they would have challenged the validity of the GD AES Patents and adduced other evidence to challenge the evidence of Mr Jouper or Mr Markert about their commercial value.

588. I am also satisfied that Lufthansa's objection to Mr Bezant's evidence in relation to the additional adjustment to Panasonic's profits is well-founded. This adjustment was based on the assumption that Panasonic paid market rates for Astronics' products. But Mr Bezant did not refer to any documents or witness evidence upon which he had based this assumption. Lufthansa also submitted that as a matter of law the adjustment was impermissible on the basis that Lufthansa was entitled to seek an account separately from each party in the chain: see *Spring Form* (above) at [29]. This point was not fully argued before me and, in my judgment, the appropriate course is to disallow this part of Mr Bezant's evidence.

589. Lufthansa did not, however, challenge Mr Bezant's evidence in relation to his alternative approach to the apportionment of Safran's profits and, in my judgment, they were right not to do so. The difference between Mr Bezant's original approach and his alternative approach was that the "total direct costs" which the Court should use to apportion its profits should exclude the costs of materials and I am satisfied that either case is pleaded in the Points of Claim, ¶19.

(ii) Lufthansa's case

590. I agree with Bacon J that if Lufthansa was going to put forward a positive case either in relation to the methodology which the Court should adopt or in relation to an appropriate comparable or, indeed, in relation to the percentage proportion which the Court should award, then it ought to have done so in the Reply. But it elected not to do so and this was a considered decision. In my judgment, this did not prevent Lufthansa from arguing that it was entitled to 100% of those profits on the basis that it was essential to all of the sales and drove all of the profits or to testing Mr Bezant's evidence. But it did not entitle Lufthansa to advance an alternative case in relation to a proportion of the profits or

alternative comparables.

591. Accordingly, I disallow Mr Ryan's evidence in relation to the 1998 Teaming Agreement. In my judgment, this extended beyond an expert analysis or commentary on Mr Bezant's approach and was an attempt to advance a positive case. Moreover, if Lufthansa had intended to rely on the 1998 Teaming Agreement as an alternative to the 2014 Teaming Agreement, Mr Ryan should have given evidence about it in Ryan 1 and given Mr Bezant an opportunity to answer it in Ryan 2. It should also have been the subject of discussion between the experts and dealt with in the Joint Statement.
592. Finally, the Lufthansa team submitted that I should reject Mr Bezant's evidence in relation to the 2014 Teaming Agreement and I address that submission below. However, I do so in the context of Mr Ryan's evidence in cross-examination. He accepted that it was possible to apportion profits by reference to an implied royalty rate taken from a comparable licence agreement. Mr Howe also pressed him on whether he had any objection in principle to the methods of apportionment which Mr Bezant had adopted and he declined to answer the question. If he had had a reasoned objection to the use of any of those methodologies and, in particular, to either the royalty or licensing approach or the distribution of cost approach, this was the time to make it clear.

#### R. Application

593. The experts were agreed that the first step is to identify the gross profits (being revenue less direct costs) made on the Defendants' relevant sales. They were also agreed that the second step was to deduct the overheads and tax attributable to the relevant sales. They also stated that they had both performed their calculations on the basis that overheads (excluding tax) are deductible where: (1) they were incremental to the relevant sales; or (2) those overheads could have been used to support sales of an alternative non-infringing product. Finally, they were also agreed that, where applicable as a matter of law, the final step was to apportion the Defendants' net profits to the infringement and that the aim of this apportionment was to recognise the relative contribution of the Patent as opposed to other factors in generating the profits that relate to the relevant sales: see the Joint Statement, ¶3.1 to ¶3.3.
594. I have carried out the first and second steps for each of the Defendants in section VII (above). The experts agreed the incremental costs in Tables 4-1 and 5-1 and I accepted

Mr Bezant's evidence in relation to Safran's incremental overheads in Table 6-1. On the basis of my earlier findings of fact, it was unnecessary to consider whether overheads could have been used to support sales on an NIA and I have found, therefore, that the net profits made by each of the Defendants were as follows:

- (1) *Astronics*: US \$34.0 million;
- (2) *Panasonic*: US \$56.8 million; and
- (3) *Safran*: US \$168.5 million.<sup>6</sup>

595. I turn, therefore, to consider the third and final step agreed by Mr Ryan and Mr Bezant, namely, to apportion each pool of profits bearing in mind the overall aim of recognising the relative contribution of the Patent as opposed to other factors in generating the profits that relate to the relevant sales. I begin with Astronics.

(1) *Astronics*

596. Mr Bezant calculated that Astronics would have paid Lufthansa US \$3.4 million under the terms of the 2014 Teaming Agreement. To reach this sum he used the per-unit royalty rate although he did not adjust it upwards for inflation in later years or downwards for the royalty rate payable before it came into effect. He also assumed that Astronics would have paid the same lump sum as KID. He also concluded that this sum implied a royalty percentage of 21% deducting all overheads and a royalty percentage of 13% deducting incremental overheads only. Lufthansa advanced six objections to Mr Bezant's evidence and I deal with each in turn.

(i) Profit-sharing

597. Lufthansa's primary submission was that the licensing or royalty approach permitted Astronics to share its profits with Lufthansa whereas the purpose of an account of profits was to require Astronics to disgorge all of its profits. The Lufthansa team placed particular reliance upon the extract from Patent Remedies for Complex Products which Mr Cuddigan put to Mr Bezant (above). They also placed reliance upon Mr Bezant's acceptance in cross-examination that in the real world a licence involved a profit split

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<sup>6</sup> The reason for the imbalance between Safran's profits and those of the other parties arises principally because none of its operating costs were incremental costs. This is a point to which I return below.

between the patentee and the licensee.

598. I reject this submission. Its premise is that Lufthansa was entitled to all of Astronics' profits from the sale of products which included the infringing EmPower system. But I have rejected this premise in reaching the conclusion that the infringement was not the legal or proximate cause of those profits. Given that the sale of the products generated a single pool of profits, the function of an apportionment is to divide the profits by reference to the relative contribution of the Patent and the other factors which generated the relevant sales (as the experts agreed). The licensing approach enables the Court to place a value on that contribution by looking at comparable transactions in the market in which parties negotiating at arm's length have placed a value on that contribution.

(ii) The pool of profits

599. Lufthansa submitted next that the 2014 Teaming Agreement was an unreliable comparable because it was impossible to identify the "pool of profits" which KID expected to make at the time of the agreement. The Lufthansa team also relied upon Mr Muirhead's evidence that KID's poor performance led to the renegotiation of terms because it needed better conditions to function in the market. Despite these objections, I reject the submission that the 2014 Teaming Agreement is not a reliable comparable for the following reasons:

- (1) I accept Mr Muirhead's unchallenged evidence that KID's poor performance in the market was the reason why the parties agreed to re-negotiate the terms of the 1998 Teaming Agreement and to a much lower royalty. As Mr Ryan pointed out, the implied royalty rate under the 1998 Teaming Agreement was [REDACTED] of profits and [REDACTED] of revenue and KID was unable to compete on those terms.
- (2) But it does not follow from this evidence that Astronics would have agreed to pay a much higher royalty than KID agreed to pay under the 2014 Teaming Agreement. Mr Bezant gave evidence that there were two reasons why the 2014 Teaming Agreement might have overstated the royalties payable by Astronics. The first was that Article 2 of the 2014 Teaming Agreement imposed obligations to [REDACTED] and that this might be a valuable right.

- (3) I agree with Mr Bezant that Article 2 conferred valuable rights upon KID. For example, under the agreement made in August 2006 between DLH, Lufthansa and Panasonic, Panasonic was required to use the KID SPM even though Airbus had not yet approved it as linefit offerable. [REDACTED].
- (4) Mr Bezant's second reason was that Astronics' sales of the EmPower systems were significantly higher than KID's equivalent sales at the date of the 2014 Teaming Agreement. His evidence was that Astronics might well have negotiated a lower royalty rate to reflect the fact that it had greater bargaining strength and that Lufthansa might have agreed a lower royalty rate per device than it did with KID to reflect the higher aggregate amount. Again, I agree with Mr Bezant that this was a plausible reason why Astronics would have negotiated better terms than KID.
- (5) Mr Bezant stated in his very first report that he was unable to quantify the value of the two commercial factors which he had identified or what effect Mr Muirhead's evidence should have on the royalty rate because of the limited information available to him. Indeed, he stated in terms: "I have not been provided with documents which show the basis for the royalty rate agreed in the 2014 Teaming Agreement."
- (6) Despite this, Lufthansa did not disclose any documents relating to the commercial negotiations for the 2014 Teaming Agreement and very few documents relating to the 1998 Teaming Agreement. It successfully resisted disclosure of the commercial negotiations for the 2014 Teaming Agreement altogether and asserted that the negotiations for the 1998 Agreement were conducted orally and that records were no longer available. But if it had wanted to do so Lufthansa could easily have disclosed the pool of profits which the parties expected KID to make at the time of the 2014 Teaming Agreement and how that expectation informed the negotiations.
- (7) Mr Muirhead also gave evidence that he was personally involved in the 1998 Teaming Agreement and that he remained closely involved in the project thereafter. Again, either he or a colleague could easily have given evidence about the commercial expectations of the parties at the time of the 2014 Teaming Agreement and their effect on negotiations, but he did not do so.
- (8) In the absence of disclosure by Lufthansa of the commercial negotiations or direct

evidence from Mr Muirhead dealing with them, I am not prepared to draw the inference that Lufthansa would have negotiated the payment of a much higher royalty rate from Astronics or that the commercial factors which Mr Bezant identified would not have balanced or outweighed KID's poor performance under the 1998 Teaming Agreement.

(iii) A barrier or gateway patent

600. Lufthansa submitted next that the 2014 Teaming Agreement did not reflect the key dispute about the width of Claim 1 or the value to be attributed to the Patent if there was no NIA. Lufthansa relied on the preamble as evidence that the parties anticipated that Astronics would continue to compete in the market with KID, the decision of the German Court on 18 December 2013 that a combination of Claim 1 and Claim 2 were valid and Mr Jouper's evidence that it was relatively easy to design a way round Claim 1 by removing the timing feature. Mr Cuddigan put these points to Mr Bezant and he began by suggesting that he had taken no account of the "claim width" in his assessment:

"Q. Now, in your analysis of apportionment by reference to the 2014 teaming agreement, the figures you extract from that agreement take no account of this claim width issue, do they? A. Well, they take account of the fact that Lufthansa, as patentee, is licensing KID, who's a related party. I would have expected the negotiations to assume that the patent was valid and important, rather than not. Q. Yes, perhaps valid, perhaps important - A. Well, that would be the basis of the negotiation, you would say, "I've got a powerful patent and it's important to your market, what are you going to pay for it?" That would be the negotiation. Q. But in relation to your analysis it is not an input to your analysis whether the patent is held to be wafer-thin or a complete barrier to Astronics in this market? A. That's -- in this analysis, yes, I'm driving off of whatever Lufthansa and KID proceeded on by reference to their licence agreement. But as I say, you would expect the discussion by Lufthansa, as the parent, to say, "I've got a powerful patent and it's important to your market." Q. The reason it's not an input into your calculations is that KID and Lufthansa will have had their own view of the extent to which the patent effectively barred Astronics and others from the market? A. I imagine so. I don't know what has been disclosed around the negotiations. I think some questions were asked -- I don't quite recall what has been provided. Q. Right. But that view is not going to be the same as the conclusion of the court, is it? A. Um, possibly not. Q. I mean, doesn't it follow -- A. As I say I expect Lufthansa wouldn't be saying, "KID, I've got this terrible patent," they would be saying, "I've got a very strong patent and it's important for your products." Q. But conversely, Mr Bezant, KID are not going to be saying "That's the most amazing patent, you are obviously going to dominate the market, we



will give you all your money." It is a negotiation. A. It is a negotiation by reference to an understanding of the patent. Q. Right, so what I put to you is that your analysis is too generous, your analysis based on the 2014 teaming agreement, is too generous to Lufthansa if the claim is wafer-thin and too generous to the defendants if the claim is broad? A. It depends upon the basis on which they conducted their negotiation. Q. Well, the reason I put it like that is I don't think it does depend on that. I think it's inconceivable that either party concluded an agreement on either of those bases. A. I don't know, without the information around this particular negotiation, which I think I tried to get some information about in order to interpret the outcome of this licensing negotiation."

601. Mr Cuddigan then put the preamble to the 2014 Teaming Agreement to Mr Bezant and put to him directly the contention that the parties had contracted on the basis that the Patent was not a barrier to entry into the market:

"Q. Can we look at the second -- no, not the second, the third paragraph there: "The Parties wish to adapt the existing collaboration to a market situation, which has changed since the First Teaming Agreement was signed, in particular with respect to the products manufactured and offered by Astronics ... which are competing with the Advanced System." Do you see that? A. Yes. Q. I suggest to you that they were contracting on the basis that the patent was not a barrier to entry for Astronics? A. Well, they're contracting where Astronics is in the market generally, and I can't remember whether the litigation was in suit at that time against Astronics or what the expectation would have been as to whether they would have succeeded and got an injunction, and so on. So I don't know what they were assuming, and that has not been provided. Q. Well, that will be my submission to the court."

602. Again, I reject this submission. Lufthansa adduced no evidence before me that the parties entered into the 2014 Teaming Agreement on the understanding that the Patent was not a barrier to the market and I am not prepared to draw that inference from the preamble alone. As the Defendants pointed out in their written Closing Submissions, Lufthansa had already commenced legal proceedings to enforce the Patent in both Germany and the USA and Article 8 expressly referred to those actions. On 28 December 2017 the Claim Form was issued in these proceedings, and I see no reason why Lufthansa would not have had proceedings in the United Kingdom or other jurisdictions in mind.

603. Moreover, I am satisfied that Mr Bezant's assumption about Lufthansa's approach to the negotiations was a reasonable one given the absence of disclosure. In my judgment, it was perfectly reasonable to assume that Lufthansa would have approached those negotiations on the basis that it would be saying "I've got a powerful patent and it's

important to your market" or "I've got a very strong patent and it's important for your products" rather than "KID, I've got this terrible patent". Moreover, I do not consider this to be inconsistent with the preamble. The inference which I draw is that Lufthansa would have been negotiating with KID on the basis that although it was currently in competition with KID, there was a reasonable prospect that it could take Astronics out of the market. After all, that is the basis on which it has claimed to be entitled to recover all of its profits on the Account.

(iv) Revenues not profits

604. Lufthansa next submitted that licensing agreements do not set royalties based on net profits but on a revenue price per unit basis and that the 2014 Teaming Agreement was, therefore, an inappropriate guideline by which to divide net profits on an account. I also reject this submission. The 2014 Teaming Agreement imposed a [REDACTED] and Mr Bezant calculated the royalty payable by Astronics by applying its terms to Astronics' revenue. He then expressed the royalty amounts as a proportion of Astronics' net profits for the relevant sales over the Relevant Period. This was a simple calculation involving one variable (total overheads or incremental overheads). Moreover, this was not an objection which Mr Ryan took with applying the terms of the 2014 Teaming Agreement: see Ryan 2, ¶3.3.6 to ¶3.3.12. Finally, Mr Cuddigan did not challenge Mr Bezant's calculations in cross-examination.

(v) The lump sum/introduction fees

605. Lufthansa next submitted that Mr Bezant had [REDACTED] 2014 Teaming Agreement and the sums which Lufthansa stood to make under Article 3 by introducing Lufthansa as its installation partner. Mr Cuddigan put the second point to Mr Bezant in cross-examination and he gave evidence that he could not place a value on the rights under Article 3:

“MR CUDDIGAN: Mr Bezant, we were looking at Article of the 2014 teaming agreement, which anticipates that Lufthansa will be providing installation and certification services, okay? What I was telling you is that the court has received evidence that the price of these services could comprise up to 50% of the total costs of a project, very considerably more than the cost of the power supply hardware, and I put it to you that Lufthansa would expect to profit from providing those installation and certification services. A. I think it has a right of first refusal. If it takes

them up, then it would expect to make a profit from so doing. Q. And a proper analysis of the profit share under the 2014 teaming agreement would need to take account of the anticipated profits from installation and certification? A. Well, it depends upon the alternatives available to Lufthansa. We're back to the alternatives available in this case to the licensor. Do they need KID to make the introduction? Does KID's introduction assist their chances of winning? If the answer is, no, not much, or, no, not really, then they haven't really received any benefit under this arrangement. Again, I don't have the factual information as to what was influencing Lufthansa's decision-making processes. Q. Well, we do know a bit more than that, Mr Bezant. We know that Lufthansa has negotiated this requirement into Article 3 of the teaming agreement. So we can infer, because it's an obligation on KID, we can infer that it's to the benefit of Lufthansa, can't we? A. They've negotiated, as I say, a right of first refusal. That may have some value. It may not have much value relative to it not being there, again, relative to Lufthansa's options. Q. Right, and all I was putting to you was that any analysis of the profit share of the 2014 teaming agreement needs to take account of all the value that is made available to either party from the agreement? A. It would need to take that into account. I don't have the information. As I've said, the background to these negotiations and the understandings of Lufthansa's mindset has not been provided. Q. No, but this is not -- A. I'm doing -- I'm doing the best I can with the available information. Q. Absolutely. It's your client's case, it's not Lufthansa's case, but all I'm putting to you, really -- again, it's not a personal criticism. I quite understand you are doing your best with the information available, but what I'm putting to you is that that case has not been properly costed because it doesn't take account of this profit opportunity for Lufthansa. A. So the -- the value of the right of first refusal relative to Lufthansa's other possibilities, I can't tell you how much that -- it's not -- it's not -- the client doesn't have to accept the offer, they don't have to make an offer, it's just an introduction.”

606. I begin with the lump sum. It was incorrect to state that Mr Bezant ignored the lump sum and it is quite clear that he took it into account in calculating the sum which would have been payable by Astronics: see Bezant 1, Table 7-1. His evidence was that he did not know what it covered and so he made no adjustment: see Bezant 1, ¶7.11. Moreover, this was not a criticism which Mr Ryan made of Mr Bezant's calculation or one which Mr Cuddigan put to him in cross-examination. I, therefore, reject it.
607. I also reject Lufthansa's submission in relation to Article 3 and the value of the right to introduce Lufthansa as an installation partner. Lufthansa adduced no evidence before me that the parties attributed any value to this right in the negotiations for the 2014 Teaming Agreement. Moreover, Article 3 of the 1998 Teaming Agreement was in almost identical terms and Lufthansa adduced no evidence that Lufthansa ever paid an introduction fee to

KID under Article 3. In the absence of any disclosure of this nature, I find that it was reasonable for Mr Bezant to attribute no value to KID's rights under Article 3.

608. I add that in their written Closing Submissions the Lufthansa team relied on a brochure produced by Olin which suggested that the "installation slice" of the ISPSS "cake" was substantial in the late 1990s. This document appears to have been the basis on which Mr Cuddigan suggested to Mr Bezant that there was evidence before the Court that the price of installation services could comprise up to 50% of the total costs of a project. I attribute no weight to this document. It bears no date, but it must have been produced before Olin spun off Primex in October 1996. Furthermore, it appears to have been produced even before the introduction of AC power. Indeed, reliance on this document begs more questions than it answers. If KID's rights under Article 3 had so much value, one would have expected Lufthansa to be able to produce internal documents to this effect rather than rely on a document produced by the Defendants about 18 years before the parties entered into the 2014 Teaming Agreement.

(vi) KID's reporting

609. The sixth and final objection which Lufthansa took to Mr Bezant's reliance upon the 2014 Teaming Agreement was that the parties entered into it on the false premise that KID had declining sales relying on the unchallenged evidence of Mr Muirhead. [REDACTED] on the basis of the recalculations performed during the audit [REDACTED]: see [120] (above).

610. I also reject this submission. Mr Muirhead did not suggest that in his written evidence that KID's [REDACTED] would have had any effect on the terms of the 2014 Teaming Agreement and Mr Howe did not explore that point in cross-examination (as he was perfectly entitled to do). Mr Mosebach did not give evidence to that effect either. He made no mention of the 2014 Teaming Agreement either in Mosebach WS or either of his experts reports.

611. The only evidence upon which Lufthansa relied in its written Closing submissions was Mr Ryan's evidence in Ryan 2 that Lufthansa would never have agreed to the terms of the 2014 Teaming Agreement had it known about [REDACTED]. When Mr Howe cross-examined him about the [REDACTED], he suggested that it would have been higher if KID had reported its sales accurately. But he accepted that he had not seen any

evidence to that effect:

“Q. Well, LHT has not provided any evidence, has it, as to what the 2014 Teaming Agreement actually represented; correct? A. I understand that there was a dispute after the agreement was signed because of issues in relation to [REDACTED]. Whether that is a reference point, I mean, it's obviously a significantly higher amount that was paid than the amounts that were due under the 2014 Teaming Agreement. Q. But there isn't any evidence as to what the [REDACTED] was intended to cover, is there, in this? A. As I haven't seen any evidence of that. Q. Or in relation to the moving parts of the agreement? A. No, there isn't, which is why I don't think it is possible to adjust and use that Teaming Agreement.”

612. Given Mr Ryan's inability to identify the source of his information and the absence of any other evidence that KID's [REDACTED] had an effect on the terms of the 2014 Teaming Agreement, I dismiss this objection. If anything, KID's conduct and Mr Mosebach's reticence about the 2014 Teaming Agreement emphasise the arm's length nature of the relationship between Lufthansa and KID. Having dismissed all of Lufthansa's objections I accept Mr Bezant's evidence and I find that the licensing or royalty approach is appropriate in the present case. I also find that the 2014 Teaming Agreement is an appropriate and reliable comparable of the relative contribution of the Patent to the Defendants' profits as opposed to other factors in generating the profits that relate to the relevant sales.
613. Finally, I accept Mr Bezant's analysis in Bezant 1, Tables 7-1 and 7-2 figures and I find that the apportionment percentage to be implied from the 2014 Teaming Agreement is either 13% (after deduction of incremental overheads) or 21% (after deduction of all relevant overheads). Mr Cuddigan did not challenge those figures or their build-up in Mr Bezant's cross-examination. Moreover, Mr Ryan challenged Mr Bezant's evidence in relation to the 2014 Teaming Agreement for a host of reasons in Ryan 2, ¶3.3.6 to ¶3.3.29. But he did not challenge Mr Bezant's figures or their build-up either: see, in particular, Ryan 2, ¶3.3.25.

(vii) The royalty rate

614. The final issue which I must determine is whether I should adopt a royalty rate of 13% or 21% or the middle of that range and also whether I should adopt Mr Bezant's overall range of 10% to 20%. The difference between the implied royalty percentage derived from the 2014 Teaming Agreement turns on whether it is appropriate to deduct all

overheads from Astronics' profits or incremental profits only and Mr Bezant's overall range was based on evidence which I have disallowed on the basis that the exercise which Mr Bezant carried out was not pleaded and Lufthansa did not have an opportunity to address it evidentially.

615. In my judgment, it would be unjust to adopt a range of 10% to 20% having disallowed Mr Bezant's evidence in relation to his second approach. Mr Bezant did not express a firm opinion on the question which of his implied rates to adopt although he expressed the tentative view that the lower figure might be preferable. I agree but for different reasons.

- (1) The experts were agreed that it was appropriate to deduct either incremental overheads or, alternatively, overheads which would have been used to support sales of an NIA and agreed the figures on that basis. I have held that the second basis does not apply and that Astronics made net profits of US \$34.0 million and Panasonic made net profits of US \$56.8 million after deduction of incremental costs only.
- (2) It would be inconsistent with these findings, therefore, to deduct all relevant overheads from their profits in order to reach an implied apportionment. Astronics would have made lower net profits if all relevant overheads had been deducted for the Relevant Period.
- (3) Such a conclusion also seems to me to be consistent with the authorities. In *OOO Abbott* (above) Lewison LJ stated that two conditions had to be satisfied before general overheads could be deducted from gross profits. After citing the judgment of Kitchin LJ in *Hollister v Medik Ostomy Supplies* [2013] FSR 24 at [85] and [86] he stated as follows:

“42. I do not consider that Kitchin LJ was suggesting any departure from *Dart Industries v Decor Corp* [1994] F.S.R. 567 particularly since he said in terms that he found the reasoning persuasive. His observations at [86] were clearly and avowedly obiter. But in any event as I read [86] all four conditions will need to be fulfilled before an infringer is prevented from offsetting any overheads against the gross profits derived from the infringement. It seems to me to be clear that if the infringer would have manufactured or sold non-infringing products had he not infringed and would have incurred overheads in supporting that manufacture or sale, then he ought to be allowed a proportion of

his general overheads. The question is not dependent on whether the infringer is or is not working to capacity. The bottom line is whether (a) the overheads would have been incurred anyway even if the infringement had not occurred and (b) the sale of infringing products would not have been replaced by sale of non-infringing products. It is in those circumstances that an allowance for overheads will not be permitted.”

- (4) His Honour Judge Hacon restated the principles for deduction of overheads in *OOO Abbott* when it was remitted to him for further consideration. He also pointed out that the same approach had been adopted in *Jack Wills*. He summarised the principles as follows:

“In paragraph 38 of the first account judgment, I summarised the principles to be applied to whether costs incurred by a defendant in his infringing business may be deducted from the gross relevant profits assessed by the court in an account of profits. The Court of Appeal criticised the third principle. Guided by this and so that the parties understand how I have approached the second remitted issue, I amend and restate that summary as follows: (1) Costs that were associated solely with the defendant’s acts of infringement are to be distinguished from general overheads which supported both the infringing business and the defendant’s other, non-infringing, businesses. (2) The defendant is entitled to deduct the former costs from gross relevant profits. (3) A proportion of the infringer’s general overheads may be deducted from gross relevant profits unless (a) the overheads would have been incurred anyway even if the infringement had not occurred, and (b) the sale of infringing products would not have been replaced by the sale of non-infringing products.”

- (5) In the present case, neither expert considered point (a) or identified any general overheads which fell into that category. But in any event, I have decided point (b) against the Defendants on the basis that the sale of the infringing EmPower Fusion systems would not have been replaced by either the 1171M or any of the third-party products.

616. Nevertheless, I express this as a provisional finding only and I will give the parties an opportunity to make submissions on this point at the consequential hearing. It is a significant issue and I did not hear full argument on it. Mr Bezant did not express a clear or reasoned view and although Mr Howe put the implied royalty percentages to Mr Ryan he did not explore this particular issue with him. However, I make it clear that the parties remain bound by my finding as to the alternative percentages (above). The time for

Lufthansa to challenge them was in Mr Ryan's reply report and in Mr Bezant's cross-examination. I also make it clear that I will not entertain any attempt to re-open my findings in relation to causation or apportionment. They must be the subject of an appeal.

(viii) Conclusion

617. Based on my provisional finding and subject to any further argument on the implied apportionment percentage, I hold that Astronics derived profits of US \$4.42 million (i.e. 13% of US \$34.0 million) from the infringement of the Patent during the Relevant Period and that it is liable to account to Lufthansa for that sum under section 61 of the PA 1977.

(2) *Panasonic*

618. Mr Bezant adopted the same assumptions in relation to the net profits of Panasonic as he had done in relation to the net profits of Astronics subject to the further adjustment in relation to the mark-up paid to Astronics and its additional costs. I have disallowed that evidence and I am not prepared to make any further adjustment. Based on my provisional finding and subject to any further argument on the implied apportionment percentage, I hold that Panasonic derived profits of US \$7.384 million (i.e. 13% of US \$56.8 million) from the infringement of the Patent during the Relevant Period and that it is liable to account to Lufthansa for that sum under section 61 of the PA 1977.

(3) *Safran*

(i) The factual evidence

619. It was common ground that Safran did not buy the EmPower systems from Astronics or IFE systems from Panasonic and resell them to the airlines but simply installed those systems into its seats. There was a factual issue between the parties whether Safran sold its seats at a higher price because they incorporated EmPower systems and whether it made increased sales as a consequence. Mr Mosebach gave some general evidence for Lufthansa that AC power was particularly attractive: see Mosebach E1, ¶30 and ¶31. But he was unable to give any direct evidence that it increased prices or sales.

620. Ms Gemma Hill, Safran's Chief Financial Officer, gave very detailed evidence about Safran's seat pricing and sales and none of that was challenged. She stated in terms that Safran did not take BFE into account for the simple reason that Safran did not know what



BFE would be included. In cross-examination she said that any profit on BFE would be in the labour element. She also accepted that the price of the seat would take into account the design costs as well as labour:

“Q. Now, we just looked at — I think you've agreed with me — the final price includes both materials and labour. It takes those two things into account? A. Yes it does. Q. You may just need to speak up a little bit. A. Sorry. Q. In the case of buyer-furnished equipment, of course, there is no materials cost associated with that to you? A. No. There's no material. It comes in free of charge. Q. So in the case of IFE systems, and in-seat power supply systems, the profit Safran makes on them is exclusively associated with the labour cost. A. If there is profit on those seats, then yes, they would be within the labour element of it. Q. And Mr Hilbert who I think you took over from — A. Yes. Q. — he estimated that 10 per cent of the time spent assembling a seat is spent installing the electronics. A. Yes. Q. So the cost of installing the electronics and everything that's in there, which includes ISPS systems will have been taken into account in the price of the seat. A. Yes. 10 per cent of the final labour. Q. And there's a profit element associated with that. A. When we make a profit, yes. Q. And not just the cost of installing the electronics, but the cost of designing the installation so that the electronics can be installed, that, too, will have been taken into account when you price the seat. A. Yes. That comes in with the initial part on the non-recurring element. Q. And there will be a profit element on that as well. A. At the time when we do the bids there should be a profit element on there. Q. Now, we were just discussing that with buyer-furnished equipment there is no materials cost to Safran? A. Yes. Q. And one of the reasons for that is that airlines don't want to pay a materials mark-up. A. Yes. That's correct. Q. But you can charge a labour mark-up on those products. A. If we have to install those items, then there will be a mark-up within our labour.”

(ii) Mr Bezant

621. Mr Bezant applied an apportionment percentage of 0.02% on the basis of the time spent by Safran on installing the Components. He calculated his percentage by comparing the installation costs to Safran's total direct costs: see the Joint Statement, ¶6.14. However, he also put forward an alternative basis for apportionment in Bezant 2, ¶6.33 to ¶6.37. Instead of apportioning Safran's profits by reference to all of Safran's direct costs, he calculated by reference to the ratio between Safran's labour costs associated with the EmPower system and its total labour costs. He pointed out that the benefit of this comparison was that it did not depend on whether the Components were BFE purchased by the airlines or bought and resold by Safran (although he assumed that Safran would charge a mark-up on its total labour costs).

622. Mr Bezant calculated that the total labour costs for the Relevant Period were US \$4,024,000 and the labour costs associated with the EmPower system were US \$14,500. He also calculated that the profit attributable to the EmPower system was US \$81,000 (deducting all overheads) and US \$567,600 (deducting variable overheads only). He was not cross-examined about this alternative approach. However, Mr Hall put Ms Hill's evidence about the design element to him:

“Q. You can take it from me that in Ms Hill's oral evidence she confirmed, in fact, that Safran does in fact take the cost of installing IFE systems and in-seat power supply systems into account in-seat pricing. A. So if she said they take into account the labour cost of installing it, that's different to taking into account the purchase price of the equipment itself that they don't incur. And paragraph 33 is saying, look, we can't take into account the purchase price of BFE, because we don't know what it's going to be. I think that's answering a different question. Q. But the point she confirmed to me is that Safran does know that in every seat there will be in-flight entertainment systems and ISPS systems? A. Right, but it doesn't know which ones they will be or how much they cost. So it can't price for something when it doesn't know what the cost of it is. Q. So she told me, her sworn evidence was, that Safran does take the cost of installing in-seat power supply systems into account in Safran's seat pricing. A. Right, so take — Q. The cost of installing, not the cost of the equipment itself, the cost of installing? A. Okay, fine. So this is her evidence and what I had understood her and Safran to be saying is, there are labour costs incurred in the active installation for a short period of time, that cost has to be recovered to make a profit, it is a very small part of everything so they don't explicitly think about it, but they know they incur a number of manhours in the active installation, a fraction of which is the active installing the equipment into the seat. They don't take into account the cost of the equipment that they're installing into the seat. They take into account the cost of the labour used in installing the equipment into the seat. Q. She also confirmed that they take into account the cost of designing that equipment into the seat when pricing their seats. A. Okay, so we're getting into what her evidence was. I think to the extent Safran is involved in the design of the seat will obviously take into account the costs because it will try to recover it. If those design activities do not engage with the question of installing EmPower systems is not relevant to the design function, then they won't take into account any costs relevant to installing IFE systems, they'll just take into account the act of the labour costs. Again, this is her evidence, but I had understood Safran to say — I can't remember where — that there isn't a design element in the sense of, you know, proper R&D attaching to how you fit the EmPower system into a seat. Q. So just so I understand, so the approaches that you have taken in your written evidence assume that Safran does not take into account, when setting its seat pricing, the cost of designing ISPS systems into their seats? A. I think that's right, yes. Q. And did you take into — did you assume that Safran does not price the cost of installing ISPS systems into account? A. No, I didn't say that, I

said they do, because there's a sliver of labour element. Q. Okay. A. It obviously is captured in the overall price, but it is a very small fraction of the cost. Seats cost £200,000 or something like that, right? So you're not going to be worrying about a 15-minute labour charge at that level. You're worried about other parts.”

(iii) Mr Ryan

623. Mr Ryan applied an apportionment percentage of 5.9%. He accepted in cross-examination that Safran did not buy or sell on the EmPower system and charged no mark-up. He also accepted that Safran’s activities were to instal the Components. When Mr Howe put it to him that he apportioned Safran’s profit by reference to the value of the product, he did not directly answer the question. But it was clear from his answers that he had adopted his percentage on the basis that the price of the seats reflected a value or contribution derived from the EmPower system:

“Q. But perhaps, just stepping back, your approach is to take the entire value or to seek to take the entire value of the EmPower system into account, not the value of the installation of the components in it; that's right, isn't it? A. Well, it's a question of how much of the value of the overall product does the EmPower system reflect, and I mean when one is dealing with IP cases, my Lord, you know, often the starting point is what is the end product and how does one then allocate, you know, the relative contribution across that? My observation, based on Safran's calculation, was that it was a very de minimis percentage, because of the way that, you know, they operate. They don't charge a markup for it and apparently it is straightforward to install. My observation was that either the seats that they sold either contained EmPower or another AC-type system. So, you know, that's quite an important part of the product that the customer is buying. Therefore, is there another way of looking at it? Is there a different allocation key? So in the same way that one allocates costs, should one allocate profits using something other than the installation cost? Which is why looking to accounting principles and the way that buyer furnished equipment is treated in some contexts and in particular one of the factors that one has to take -- there is, I think, three key factors. Two of which are: are you responsible when you get this equipment for making sure it gets put in and then sent to the customer? And if there is inventory risk, which Safran does bear risk, if it breaks the EmPower system before it installs, it has to replace it. So there is an element of risk-taking there. It is not just, it is nothing too with it. So, you know, the analogy that I look to from accounting principles was, you know, buyer furnished equipment in terms of including it on a revenue basis. It's -- I thought that might be helpful to the court as an alternative way of considering the allocation of profits. MR JUSTICE LEECH: One way to look at it is that Safran are not installing the EmPower system for no markup out of the goodness of their heart. There is obviously something in it for them to do it. The question is how

you isolate that. A. It's always been surprising and one of the questions that we asked, and I understand that we asked our instructing solicitors to ask, was how are seats priced? What is the pricing mechanism? You know it must be taken into account somewhere. My understanding is that representatives are heavily involved in the design of the seat. You know, so it is not just the cost of the system. They are incurring costs in the development of the seat and, as you say, my Lord, you know, they are not doing it out of the kindness of their hearts. MR HOWE: What is the basis of that understanding that you say representatives of Safran are heavily involved in the design of the seat? A. That was based on my discussions with my instructing solicitors. Q. I see. That's all it's based upon? A. It is, yes. Q. Not on any evidence you have heard? A. No.”

624. Mr Ryan had originally given evidence that the incorporation of the EmPower system “made a significant contribution to the attractiveness of Safran’s seats”: see Ryan 1, ¶8.5.7. However, he accepted that this was based on Mr Mosebach’s evidence and by the time of the Joint Statement he had retreated from this position and was no longer putting forward a positive case to that effect. He accepted this in cross-examination:

“Q. Then at B1, 51 to 52, B4, tab 1, pages 51 to 52 {B4/1/51-52}, which is the joint memorandum, the foot of the page on the right-hand column, Mr Bezant pointed out that now in the joint statement stage you are applying a different attribution approach to Safran. He points out that your understanding in your first and second reports that the EmPower system made a significant contribution to the attractiveness of Safran's seats, points to the fact there wasn't a source of understanding identified in the first report. Looking to the bottom of the page and over to the next page, he points out the source of your understanding, as identified in your second report, Mr Mosebach's views does not bear upon this. Your position in the joint report at 6.13 on pages 51, if we go back to 51 to 52, just go back one page. Can you see the left-hand column: “Mr Ryan considers that, in the circumstances where the Court determines that the EmPower system made significant contribution to the attractiveness of Safran's seats, the attribution percentage put forward by Safran does not reflect the economic reality ... ” Your position is if the court determines that. You are not putting that forward as the basis any longer of an understanding on which you are founding a positive position, are you? A. No, as I said earlier, my Lord, when I did my first report, I didn't know it was in dispute. It seemed to me that it was important because all of the seats contained AC power, but I recognised that that's a factual point, not for me, and that if you agree or if you determine that it was important, I don't think Safran's cost-based allocation reflects the importance in terms of the profits that it attributes to the EmPower system. Q. Isn't the key point, Mr Ryan, here, that the airlines have already paid for the EmPower systems as BFE the full amount according to their commercial value; correct? A. They have, but I'm not sure what you mean -- Q. So -- A. -- the importance of that point is. Q. If they were to pay again based on an attribution, in an attribution context,

they would have to pay again on their full commercial value to the installer Safran, that would be double counting, wouldn't it? A. I don't follow that question. Q. Because you are treating -- your approach, I respectfully suggest, is not recognising the underlying economic reality at all. It is treating Safran as a buyers or seller of the entire system, when it is not as we have accepted -- as we have established? A. As I have said, IFRS 15 it deals with this issue when one is, you know, using buyer furnished equipment. That essentially -- MR JUSTICE LEECH: Can you show me the IFRS 15? A. I don't know whether it's in the bundle. MR HOWE: I'm not sure it is anywhere in the bundle. A. I'm sure we can find that for you, my Lord. MR HOWE: It's correct, isn't it, Mr Ryan, that your approach to attribution is by reference to the entire value of the supply of the EmPower system as a whole; that is correct? A. That's right and, therefore, in my view it allocates profit, but it doesn't do an apportionment of the relative value of the patent. Q. Not by reference to the value attributable to the installation of the EmPower system in the seats? A. That is correct and the reason for that, as we have discussed, my Lord, is this is essentially a sort of bundled product. There isn't that explicit charging for the installation. My analysis seeks to recognise the overall contribution, as opposed to simply the cost of installation."

(iv) Conclusions

625. Lufthansa failed to persuade me that apart from the mark-up on the additional labour costs, Safran charged higher prices for its seats because of the installation of ISPSS or IFE into its seats. Nor did it persuade me that Safran's seats were more attractive or that it sold more seats as a consequence of installing EmPower systems into its seats. I find that Safran did not make an additional profit or any additional sales as a result of its infringing activities for the following reasons:

- (1) Mr Mosebach's evidence was in the most general terms and did not support the conclusion that Safran charged higher prices or made more sales by installing the EmPower system. Further, although Mr Ryan had put forward a positive case on the basis of Mr Mosebach's evidence in Ryan 1, his position had changed and he was no longer doing so by the time of the Joint Statement.
- (2) The only other evidence to which Lufthansa could point was Ms Hill's evidence in cross-examination. In my judgment, this was no more than a skilful attempt by Mr Hall to get her to concede that Safran included an additional mark-up for the EmPower systems in its seat prices. However, her evidence in chief was very clear about this and having read and re-read the transcript of her evidence, I am satisfied that she was saying no more than that Safran included a mark-up on its design costs

in the price of its seats. As Mr Bezant pointed out, it would have been surprising had it not done so.

- (3) Furthermore, Mr Hall elicited no evidence from Ms Hill that there were any special design or build requirements for the installation of EmPower systems which would have significantly increased the overall design costs of the seat. Indeed, in a letter dated 6 August 2024 Pinsent Masons wrote to Jones Day in answer to a query from Mr Ryan stating that there were no such requirements. I accept that the Defendants did not formerly put this letter in evidence by asking Ms Hill to prove its contents. But Mr Ryan referred to this letter himself in cross-examination and confirmed that he had relied on it.
- (4) Mr Howe put it to Mr Ryan that the airlines had paid the full commercial value of the EmPower system to Panasonic and other IFE providers when they purchased it as BFE and before it was installed into Safran's seats. Mr Howe's point was that they would not have been willing to pay an additional mark-up to Safran, which never at any point in the supply chain sourced or owned the product. I found this point persuasive and Mr Ryan had no answer to it.
- (5) I also take some comfort from the fact that Mr Bezant shared my view about Ms Hill's evidence. He properly accepted that it was an issue for the Court but he pointed out that Safran was bound to include a mark-up for its R&D costs in its seat prices but it was not going to include a separate element for the design and installation of the EmPower systems when it took a matter of minutes.

626. In the light of this finding of fact, I accept Mr Bezant's approach to apportionment and I reject Mr Ryan's evidence that it is appropriate to attribute 5.9% of Safran's profits to the infringement of the Patent. He accepted that his percentage involved an element of profit to reflect the additional attraction of including AC power sockets in its seats. But since I have found that this did not result in an increase in price or sales, there is no justification for this approach to apportionment and it falls away. I also take into account the fact that Mr Ryan's evidence was that apportionment was a matter of law and fact for the Court and that he disavowed any attempt to carry out an apportionment exercise.

627. This leaves a choice between Mr Bezant's primary approach and his alternative approach. There is little to choose between them because they are alternative methods of isolating

the profit on the additional labour costs which Safran was able to charge for installing ISPSS. On balance, I prefer Mr Bezant's alternative approach because it more fairly reflects the profit which Safran made on its additional labour costs. I find, therefore, that during the Relevant Period Safran made a net profit of US \$81,800 from the mark-up on additional labour costs from installing infringing EmPower systems deducting all overheads and a net profit of US \$567,800 deducting only variable overheads.

628. It is also my provisional conclusion that it is appropriate to deduct all overheads from that figure because Safran would have incurred them in manufacturing and selling the same airline seats and because the sale of its infringing products would have been replaced by the sale of non-infringing products. I accept that Lufthansa established but for causation and proved on a balance of probabilities that Astronics would not have been able to manufacture or supply an NIA. However, it formed no part of Lufthansa's case that the airlines would not have bought airline seats at all or would not have been able to source alternative ISPSS or IFE systems if Astronics had been unable to supply its infringing EmPower systems.
629. I test this Counterfactual in the following way. If Lufthansa had obtained an injunction against Astronics and Panasonic at the beginning of the Relevant Period, then it is probable, in my judgment, that Astronics would either have negotiated a new licence from Lufthansa under pressure from Panasonic and the airlines, or Panasonic and the airlines would have sourced a third party product such as the KID SPM (subject to it resolving its technical difficulties). Finally, even if it had been absolutely impossible to obtain an alternative product, I have no doubt that the airlines would have ordered a modified IFE system (incorporating USB outlets only). In all of these factual situations, Safran would have manufactured the same seats and incurred the same overheads.
630. Again, I express this as a provisional finding only and I will give the parties an opportunity to make submissions on this point at the consequential hearing. It is an issue worth US \$485,800 and I did not hear full argument on it. Moreover, it is clear from Bezant 2, Table 6-4 that Safran made no profit at all from the additional labour costs of installing the EmPower system if it is appropriate to take into account both total overheads and also losses. I will, therefore, permit Safran to argue that it is appropriate to take into account those losses. But I make it clear again that the parties remain bound by my finding as to the alternative figures (above). The time for Lufthansa to challenge

them was in cross-examination or in Ryan 3.

631. Based on my provisional finding and subject to any further argument in relation to the deduction of all overheads or variable overheads and in relation to the inclusion of losses in other years, I hold that Safran derived profits of US \$81,800 from the infringement of the Patent during the Relevant Period and that it is liable to account to Lufthansa for that sum under section 61 of the PA 1977.

### **IX. The 1998 Teaming Agreement**

632. The final substantive issue which I have to determine is whether there should be a deduction from the amounts for which Astronics and Panasonic are liable because Lufthansa granted an “exclusive user’s right” to KID under Article 6 of the 1998 Teaming Agreement and KID compromised its claims to assert that right against both Astronics and Panasonic under the 2003 Settlement Agreement.
633. This issue turns on the question whether KID was entitled to bring proceedings against Astronics for an account of profits under S.61(1)(d) (above). There was no dispute between the parties that KID would only have been entitled to bring a claim against Astronics in this jurisdiction if it was an exclusive licensee and entitled to bring a claim under section 67 of the PA 1977 which provides as follows:

“(1) Subject to the provisions of this section, the holder of an exclusive licence under a patent shall have the same right as the proprietor of the patent to bring proceedings in respect of any infringement of the patent committed after the date of the licence; and references to the proprietor of the patent in the provisions of this Act relating to infringement shall be construed accordingly.

(2) In awarding damages or granting any other relief in any such proceedings the court or the comptroller shall take into consideration any loss suffered or likely to be suffered by the exclusive licensee as such as a result of the infringement, or, as the case may be, the profits derived from the infringement, so far as it constitutes an infringement of the rights of the exclusive licensee as such.

(3) In any proceedings taken by an exclusive licensee by virtue of this section the proprietor of the patent shall be made a party to the proceedings, but if made a defendant or defender shall not be liable for any costs or expenses unless he enters an appearance and takes part in the proceedings.”

634. The statutory predecessor to section 67 was introduced following the Final Report of the



Departmental Committee on the Patents and Designs Acts Cmd 7206 (September 1947) chaired by Kenneth Swan QC to enable an exclusive licensee to recover its own losses or a share of the infringer's profits: see *Neurim Pharmaceuticals (1991) Ltd v Generics (UK) Ltd* [2022] EWCA Civ 359 at [22] (Arnold LJ). The Swan report stated as follows at §129:

“But in the case assumed, where the invention is being exclusively worked by the licensee, his trade may have suffered serious loss; whereas the patentee, who is the nominal plaintiff in the action, may have suffered little or no damage. In such circumstances, the exclusive licensee, as the law stands at present, has no means of recovering compensation for any loss he may have suffered in consequence of the infringement.”

635. Section 130(1) defines the term “exclusive licence” as a licence conferring on the licensee any rights in relation to the patent to the exclusion not only of third parties but also the patentee:

““exclusive licence” means a licence from the proprietor or applicant for a patent conferring on the licensee, or on him and persons authorised by him, to the exclusion of all other persons (including the proprietor or applicant), any right in respect of the invention to which the patent or application relates, and “exclusive licensee” and “non-exclusive licence” shall be construed accordingly;”

636. English lawyers often distinguish between an “exclusive licence” which gives the licensee rights against all the world including the patentee and a “sole licence” which grants the licensee the right to work the invention of the Patent to the exclusion of all third parties except the patentee. A patentee may limit both an exclusive and a sole licence. Those limits may be territorial but they may also relate to specific acts. In *Spring Form* (above) Pumfrey J gave an example at [20]. He began by referring to the definition section 130 (above). He then continued:

“This definition is essential to an understanding of subsection 67(2). There can be more than one exclusive licensee under a patent, as there is more than one “right in respect of the invention”. In my judgment this term does not merely relate to the list of ways of infringing the patent set out in section 60, which are not described as rights, but to any subdivision of the monopoly conferred on the proprietor. To take an example proposed in argument, in the case of a pharmaceutical product, one manufacturer may have an exclusive licence in respect of manufacture and sale of dosage forms for veterinary purposes and another may have an exclusive licence in respect of manufacture and sale of material of dosage forms for

administration to humans. The veterinary licensee has no interest in recovery in respect of human products although he has a cause of action in respect of them. Subsection 67(2) is directed to ensuring that the exclusive licensee obtains compensation, to use a neutral term, only where the infringement affects his slice of the monopoly conferred by the patent.”

637. German lawyers use similar terms but with different meanings, as I explain below. In their written Closing Submissions the Lufthansa team used the terms “true exclusive licence” to describe an exclusive licence which falls within section 130 and “sole exclusive licence” to describe a licence which excludes all third parties but not the rights of the patentee. I adopt these terms.

## S. Factual Background

### *(1) Lufthansa’s knowledge*

638. It was common ground that by its letter dated 15 May 2002 KID wrote to GD asserting that it had infringed against KID’s right of exclusive use under the 1998 Teaming Agreement. It was also common ground that KID stated in that letter that Lufthansa had agreed to legal steps which KID proposed to take in the absence of a negotiated solution. However, Mr Muirhead gave evidence that Lufthansa was unaware of this letter and that he did not discover until 2009 that KID had agreed a settlement with Astronics and that this came as a shock to him.

639. I accept Mr Muirhead’s evidence. It was not challenged in cross-examination and there was no documentary evidence to suggest that KID ever informed Lufthansa about its claim against Astronics or the subsequent settlement. Although not directly relevant to the legal issues which I have to determine or the construction of the 1998 Teaming Agreement, I approach them on the basis that Lufthansa did not authorise or consent to KID making a claim against Astronics and that it did not authorise or consent to the terms of the 2003 Settlement Agreement. I also approach those issues on the basis that Astronics was led to believe that Lufthansa had authorised the claim and that KID itself had an independent right to make it. In the 2003 Settlement Agreement KID represented or warranted to Astronics that it had an independent right to claim for infringement.

### *(2) The benefit of the covenant*

640. Clause 7(i) of the 2003 Settlement Agreement contained a qualified covenant against

assignment without the prior written consent of all of the other parties except that it permitted Astronics to assign the benefit of it without consent in connection with a sale or transfer of all or substantially all of the assets relating to its Airborne Electronic Systems group. Neither party called evidence relating to the law of the Eastern District of Virginia and I assume that it is the same as English law. Lufthansa did not dispute that the 2005 Asset Purchase Agreement would have been effective as a matter of law to assign the benefit of the covenant not to sue in the 2003 Settlement Agreement. But there was no evidence of consent to the assignment and it submitted that Astronics had failed to prove that it had acquired all or substantially all of the assets relating to its GD's Airborne Electronic Systems group.

641. Mr Jouper was the only witness to give evidence about the various corporate changes which I have described in section II (above). In Jouper 4 he gave evidence that in February 2005 Astronics' parent company, Astronics Corporation acquired the assets of GD's Airborne Electronic Systems:

“13. I stayed in the role of Senior Electrical Engineer until 2004. During that period, the company underwent a series of reorganizations and name changes. In October 1996, Olin spun off its ordnance and aerospace divisions to shareholders as an independent company called Primex Technologies Inc. In 2000, General Dynamics acquired Primex Technologies, Inc.

14. In 2000, I was the lead Engineer on the development of the Advanced Master Control Unit (“AMCU”). In 2004, I was promoted again to Senior Staff Electrical Engineer (at this point the company was called General Dynamics). However, in February 2005, Astronics Corporation (the parent company of AES) acquired the assets of the Airborne Electronic Systems subsidiary of General Dynamics and my division became part of AES.”

642. In cross-examination Mr Jouper was asked about these corporate changes and the extent to which each parent was a defence contractor or a civil aviation contractor. Mr Jouper's evidence was as follows:

“Q. Now, you give evidence about a series of corporate reorganisations between 1996 and 2005. Were these transactions which you were personally involved in? A. I was not. Q. So what is the state of your personal knowledge about them? A. Other than just the name changes as they happened. Q. So the first we had Olin divesting itself of its ordnance and aerospace divisions. Those two divisions became Primex in 1996; is that right? A. Correct, Primex was a spin off from Olin. Q. Yes and at that

time Primex had revenue of about \$500 million a year? A. Yes. Q. And of that around \$50 million was aerospace? A. That is correct. Q. So it was very much a defence contractor? A. Yes. Q. Then in 2000 Primex was bought by General Dynamics? A. Yes, it was. Q. And at that time General Dynamics was one of the world's largest defence contractors? A. Yes. Q. And Primex became part of a subsidiary of General Dynamics called Airborne Electronic Systems? A. Yes. Q. Airborne Electronic Systems was involved in defence work and in civilian aerospace work, wasn't it? A. Correct. Q. And -- A. And a small section of military still. Q. And in 2005 Astronics' involvement in defence work was limited, minimal or? A. Prior to 2005 I don't know what Astronics was comprised of. Q. But in 2005 Astronics bought the civilian side of the AES business? A. That is correct. Q. And the defence assets were left in General Dynamics? A. Correct."

643. Lufthansa submitted that Mr Jouper accepted that GD had acquired the business of Primex which had 90/10 split between defence and civil aviation and that Astronics only acquired the civil aviation side of that business. Lufthansa argued, therefore, that Astronics had not proved that it had acquired all or substantially all of the Airborne Electronic Systems group. In my judgment, this was not a fair reflection of Mr Jouper's evidence. He was only asked about the revenue of Primex prior to the sale to GD. When he was specifically asked about the Airborne Electronic Systems subsidiary, he stated clearly that it only had a small section of military business and that Astronics bought the civil aviation side of the business.
644. I am satisfied that Mr Jouper gave evidence that Astronics acquired substantially all of the assets relating to GD's Airborne Electronic Systems group. However, it is only fair to say that he did so in vague and very general terms. Moreover, Mr Jouper's evidence in his witness statement was not quite accurate because it was not Astronics' parent company but Astronics itself which acquired the assets of the GD subsidiary but then changed its name immediately afterwards.
645. Despite the vague, general and slightly inaccurate evidence which Mr Jouper gave, I accept it and I find on a balance of probabilities that Astronics acquired all or substantially all of the assets relating to GD's Airborne Electronic Systems group. His evidence was supported by the recitals to the 2005 Asset Purchase Agreement which I have admitted under the CEA. It is also supported by the decision of the Oberlandesgericht in Appeal II in which the Court held that Astronics was "the legal successor of General Dynamics OTS with regard to the "Covenant not to sue"". Finally, it is supported by the Form 8-K which Astronics filed in the US pursuant to the Securities

Exchange Act 1934 and which I have also admitted under the CEA.

(3) *Customary Practices*

646. Lufthansa submitted next that Article 3 of the 1998 Teaming Agreement had to be construed by reference to the customary practices in the airline construction industry. In particular, it submitted that a Maintenance, Repair and Overhaul (“MRO”) facility would carry out the retrofit of an aircraft including the installation of ISPSS and IFE systems and that the nominated installer and “systems integrator” would control and carry out the entire process from beginning to end in order to minimise the time which the aircraft was out of service. Lufthansa also submitted that the meaning of the term “turnkey package” in Article 3 of the Teaming Agreement should be understood in that context.

647. I accept that submission. The Defendants’ witnesses supported this conclusion and Lufthansa relied on a request for proposal dated February 2008 in which the relevant airline invited suppliers to propose “a turnkey maintenance solution to encompass all aspects of the maintenance and support of the (“IFE”) system, either as an individual company or as a joint venture”. Lufthansa also relied on an extract from the Valour report in which the authors used the word “turnkey” in this sense:

“Despite being a new entrant in the aircraft seating market, ST Engineering is confident that the synergy of its design and engineering expertise, aircraft modification capabilities and rich experience in product certification and support will provide a compelling proposition to airlines, especially those preferring turnkey solutions in cabin retrofits. Indeed, the firm can control everything from programme management, design and certification; to building complete interiors and final installation of these products.”

648. Lufthansa also relied on Mr Muirhead’s unchallenged evidence that Lufthansa’s core business was providing MRO services to the airline market globally. I accept Mr Muirhead’s evidence. Lufthansa also submitted that the ISPSS industry often ships components “ex-works” so that they would be assembled and installed by Lufthansa itself. It relied on the fact that the Defendants had expressly pleaded that Astronics supplied to third parties on terms that they were “ex-works” Astronics’ USA manufacturing facility. It also relied on a number of contracts which contained terms to that effect. I accept Lufthansa’s submission. I also accept that the parties to the 1998 Teaming Agreement would have contemplated that a “turnkey package” would include

the assembly and installation of ISPSS and IFE systems.

649. The Defendants did not challenge any of this evidence. However, they submitted that Lufthansa was not entitled to rely on this evidence because it had never pleaded any customary practices, that, although both experts agreed that customary practice can be taken into account in contractual interpretation as a matter of German law, neither had considered any specific evidence and that neither expert had given evidence as to what proof is required to establish a customary practice. They also submitted that they had not been given an opportunity to lead evidence on this issue (and noted that in Appeal II the German Court had not relied on evidence of customary practice). They also appealed to general unfairness of Lufthansa's approach.

650. I reject all of these submissions. Lufthansa relied on unchallenged witness evidence and documents which had been admitted in evidence in order to establish what the 1998 Teaming Agreement meant by a "turnkey package". In my judgment, that material would have been admissible as part of the permissible factual matrix as a matter of English law and it would not have been necessary to plead most (if any) of that material. But in any event, the key point which I took from this evidence was that ISPSS manufacturers regularly shipped components ex-works and that the installer and systems integrator could be expected to assemble those components. I might well have been prepared to make that finding on the basis of the Defendants' own pleading alone and they can hardly complain about the Court relying on it as part of the factual matrix.

651. Furthermore, the question of construction is ultimately one for this Court and not for the experts in German law and the standard of proof and admissibility of evidence are procedural matters for the law of the forum and not the proper law of the contract. Finally, in relation to the general appeal to fairness, I can only repeat the observations which I made at the beginning of this judgment about the attitude of both parties to the pleadings and to pleading points more generally. In my judgment, this was one of those points which did not lead to unfairness.

(4) *The 1998 Purchase Agreement*

652. The Defendants did not submit that the 1998 Purchase Agreement was either inadmissible as an aid to construction or that Lufthansa should have pleaded reliance upon it before the Court could rely on it. In my judgment, it is a useful aid to construction

and it provides evidence that when the parties entered into the 1998 Teaming Agreement, they contemplated that either Lufthansa or a seat manufacturer would assemble and install the SkyPower System. They also contemplated that if any repairs had to be carried out to individual components, they would be carried out by Lufthansa in-house.

## T. Construction

653. The 1998 Teaming Agreement is governed by German law and both Lufthansa and the Defendants called expert evidence. Lufthansa called Professor Axel Metzger of the Humboldt University of Berlin and he made two reports dated 5 July 2024 (“**Metzger 1**”) and 7 August 2024 (“**Metzger 2**”). The Defendants called Professor Christoph Ann of the Technical University of Munich and he also made two reports dated 5 July 2024 (“**Ann 1**”) and 8 August 2024 (“**Ann 2**”).

654. I have set out the terms of the 1998 Teaming Agreement in section II. The issue between the parties related to the true construction of Article 6 and, in particular, the meaning of the term “an exclusive user’s right”. For ease of reference I reproduce Article 6:

### **“Article 6 Patents/Intellectual Property Rights**

The parties agree that LHT remains the owner of the intellectual property rights concerning the Advanced System for which LHT grants to KID an exclusive-user’s right in return for the payment of royalties as stated above for as long as this agreement is in force.

After termination of this Teaming Agreement, KID shall be granted a non-exclusive user's right in return for the payment of royalties as stated above, enabling KID to fulfil any obligations it has entered into with customers up to the time of such termination.”

#### *(1) Principles of construction*

##### (i) Terminology

655. The experts agreed that German law recognises two types of exclusive licence: first, a licence which excludes all third parties including the patentee (an *ausschließliche Lizenz* in German) and, secondly, a non-exclusive licence (a *nicht ausschließliche Lizenz* in German). But they also agreed that there was a third type of licence called a “sole” licence (or *Alleinlizenz* in German). Both experts also agreed that the words “exclusive user’s right” in English were apt to describe either an *ausschließliche Lizenz* or an *Alleinlizenz* under German law. Professor Ann accepted this in cross-examination describing a sole

licence as a sub-category of exclusive licences:

“Q. You explain in your evidence that under German law a Patent Licence can be exclusive or non-exclusive, and you say that within the category of an exclusive license there is a sub-category which is known as a "sole license". Is that correct? A. That is correct. Q. And under a sole exclusive license the licensee can exclude third parties from doing the acts, but the patentee retains a right to do those licensed acts itself. Is that correct? A. Just to be sure, you are saying that under a sole license the licensee can exclude all third parties but not the rights holder. That is correct. Q. But under what I'm calling a true exclusive license, the license also excludes the patentee, the rights holder from doing the licensed acts. Is that correct? A. I wouldn't say it was a true exclusive licence but yes, that is correct. Q. Okay. I'm using the word "true" exclusive license to differentiate the true exclusive license from the sub-category of sole exclusive license. You understand why I'm using that word? A. Yes. I understand that. Q. One of the questions we are trying to answer is whether the words "exclusive user's right" in Article 6 of the Teaming Agreement should be interpreted as a true exclusive licence or as a sole exclusive license. That's correct. A. The first part of your question, you said we want, or you want, to explore that? Q. Just understanding what we're doing here, one of the things we're doing here today is to understand whether the words "exclusive user's right" in Article 6 of the Teaming Agreement, whether those words mean a true exclusive license -- A. Yes. Q. -- or whether they mean a sole exclusive license, because the words themselves -- A. I understand that now, yes. Q. The reason we're doing that is because the words themselves in Article 6 are not determinative. Is that right? A. By "determinative" you mean that they cannot be relied upon solely? Q. Yes. That's what I mean. A. Yes. That is correct.”

(ii) Objective interpretation

656. The experts were also agreed that contracts are concluded by exchanging corresponding declarations of intent which must be interpreted objectively. Professor Ann also accepted Professor Metzger's formulation that the decisive factor in the interpretation of a party's declaration is how a reasonable third party in the position of the recipient of the declaration would have understood the declaration in good faith taking into account customary practices. He also accepted that where the parties had chosen different words in the same agreement, the German Court would assume that they had done so intentionally and for a purpose:

“Q. The next point of principle I want to look at is a point which you mention when you examine the 1998 Teaming Agreement. That's paragraph 16.2.2 of your first report. It's {D2/2/28}. If you are in the same place as me, we're looking at your analysis of what the German court



would be interested in when looking at Article 6. 16.2.2. A.16.2.2, what are the facts and matters that would be available. Yes. Q. Yes, and so what you do first is you reproduce part of Article 6, and the first part of Article 6 refers to an exclusive user's right being granted to KID during the term of the license, and the second part refers to a non-exclusive user's right being granted to KID after termination; yes? A. Yes. Q. And then over the page {D2/2/29} at the top of page 29 you explain that there is a distinction there between the words "exclusive user's right" and "non-exclusive user's right", and at the bottom of the second paragraph you have a sentence that starts: "It would be relevant for the court that the parties of the 1998 Teaming Agreement were contracting exclusive and non-exclusive user's rights as this usually suggests that this contrasting wording was chosen intentionally". So that is another principle of contractual interpretation that contrasting wording in this way is chosen intentionally. Is that right? A. That is right."

(iii) Judicial decisions

657. Again, both experts were agreed that the Court could look at previous judicial decisions as an aid to construction. Professor Ann indicated that it was a matter for the Court to decide what weight to attach to other decisions and that they were not binding. But he also considered that if the Court wished to look at the earlier decisions in the German proceedings, then it was entitled to look at both Appeal I and Appeal II:

"Q. The next thing I want to look at is the importance of previous decisions of the courts. You give quite extensive evidence in both your first and second reports as to how the Karlsruhe Appeal Court interpreted the 1998 Teaming Agreement. Is the reason that you do that because it would be relevant to a German court seeking to interpret the Teaming Agreement to know how the Karlsruhe Appeal Court had itself interpreted it? A. Whether other courts will look to the Karlsruhe judgment is -- some will, some will not -- is -- as an element of -- contains an element of speculation, but I did that in order to show this court how German courts interpret an agreement, and how they apply the relatively -- seemingly vague sections 133 and 157 that also are conceptually flawed a bit. This is something that we both -- my esteemed colleague Metzger and I explain in our expert reports -- and I wanted to show the English court in this case how German courts interpret agreements. Q. So you -- as I understood what you are doing, what you were doing, you were suggesting that a German court would be interested in what the Karlsruhe Court had said about this agreement? Is that right? A. No, I said that some courts might be, others might not. I'm certainly not bound, and some might be interested in reasoning and some might -- I don't know what -- there is no Standard Operating Procedure in that respect, let me say. Q. And focus in your evidence, predominantly, on what was said in the second appeal? A. I -- frankly I think I also addressed appeal one. Q. Well, this was going to be my question -- A. But -- Q. -- you would agree that a German court, insofar

as a German court was interested in what the appeal courts had said, it would be equally interested in both what was said in Appeal 1 and in Appeal 2? A. It would look at both.”

(iv) Later documents

658. Contrary to English law, both experts agreed that documents created or executed after the 1998 Teaming Agreement had come into force were admissible as an aid to construction. Professor Ann gave evidence that the justification for the rule was that the way in which the parties gave effect to an agreement or how it “was lived” might cast light on its meaning. However, when Mr Hall cross-examined him, he accepted that the Court would be cautious in attributing weight to documents such as the 2014 Teaming Agreement which were created during the course of litigation:

“Q. I just want to ask you about one separate topic, and this is that both you and Professor Metzger agree that evidence that post-dates the agreement can be relied upon to inform what the agreement actually meant? A. Yes. That is correct. Q. And Professor Metzger has highlighted the 2014 Teaming Agreement, or it has been highlighted somewhere, and you've addressed it in your report. I don't think we need to take you there, but what you say is that the court would approach the 2014 Teaming Agreement with caution because at that time Lufthansa was already involved in litigation against Astronics. A. Yes. That's what I said and that's what I still think. Q. So you also refer to two other items of potential evidence. You refer to a letter from KID to Astronics' predecessor, General Dynamics, in May 2002, and you refer to a settlement agreement between KID and General Dynamics from 2003. Now, I don't know if you are aware of this, but General Dynamics had written to KID in April 2002, so before those two documents, accusing KID of patent infringement. So at the time those two documents from May 2002 and 2003, at the time those documents were produced, KID was actively involved in a patent infringement dispute with Astronics' predecessor. So, for the same reasons that you say the court would be cautious about the 2014 Teaming Agreement, the court would also be cautious about the 2002 letter and about the 2003 Settlement Agreement. A. That is a question, whether I think that? Q. Yes. A. I mean that was much -- time-wise there was sort of some connection, because obviously the letters would cover -- would cover events that had happened before them. In other words, we're getting closer and closer to the 1998 Teaming Agreement, whereas, I mean -- and in 2014, 16 years after the Teaming Agreement -- it was 2014, wasn't it? Q. Yes it was, yes. A. -- that was much later, and so 16 years is half a generation, whereas 2002 or '3 is four or five years. That's -- Q. The agreement -- the 1998 Teaming Agreement was still in place in 2014. A. I know, I know, and you are asking me whether that can be used to interpret the Teaming Agreement, and the idea is that how an agreement was lived, as we say, that's a literal translation from German, I don't know whether

that makes a lot of sense in English, I hope it does, how -- that that can point to what was meant in the agreement, because that's all we are always trying to find out, the parties' intent.”

(v) The transfer purpose rule

659. The experts were also agreed that there is a rule of last resort under German law called “the transfer purpose rule” which applies where there is doubt or uncertainty about the interpretation of an agreement. There was initially a dispute between them when it should be applied and also whether it applied to patent licensing agreements. Professor Ann conceded in cross-examination that it applied to patent licences. It was also his evidence (which I accept) that if all of the principles of interpretation have been exhausted and there remains a doubt whether a true exclusive licence or sole exclusive licence or, indeed, a non-exclusive licence, is intended by the parties, then it should be construed as only conferring rights which were necessary to give effect to its purpose:

“Q. I understand that you say -- the basis for which you say this rule is limited to copyright law, I understand that, but I have shown you the decision of the Karlsruhe Court in Appeal applying the transfer purpose rule to a Patent Licence Agreement, and the Mannheim Court did it as well in Appeal 2. We looked at that. There's a dispute between us about -- sorry -- not in Appeal 2, in the Mannheim Court's decision on the damages case. There is a dispute between us about the second Karlsruhe appeal decision -- put that to one side. I'm now showing you an excerpt from Mr Thomas' text about 80 years of patent law where he is saying in case of doubt you assume a non-exclusive right of use. So, the proposition that I want to put to you is that as a matter of principle the transfer purpose rule applies in the case of Patent Licence Agreements when there is doubt about what has been transferred. Do you agree with that? A. Could you say -- that was a long sentence. Could you say again? That the -- you said that the transfer of purpose rule is applicable in -- if there was doubt? Q. If there is doubt about -- A. -- otherwise could not be resolved. Yes. I agree with that. I agree to that. Q. And in such a case where there is doubt, what is assumed is that only that which is absolutely necessary to achieve the purpose is transferred. A. That is what the transfer of purpose rule says, yes. Q. And what Mr Thomas is here saying is that when there is doubt about whether the license is exclusive or non-exclusive, in a case of doubt a non-exclusive right is to be assumed; yes? A. Yes. That's what he says. Q. And so the same principle applies when there is doubt about whether an exclusive license is a true exclusive licence or a sole exclusive license. A. If -- well, "doubt" means -- I mean, then we have to talk about what constitutes sort of "doubt" in that sense. "Doubt" here just means that -- does not mean that when -- sort of looking at a licencing agreement, one says "oh, you can -- like, read it this way or that way", "doubt" means that once -- that even if all principles of interpretation determining the parties' intent have been

exhausted, there is still unresolved doubt. That is a last resort, and then, indeed, one can say, in my opinion, even in patent law because of the lack of dis-balance not even there, but that is what Judge Thomas is saying, that he says that they would have -- the transfer of purpose rule should be applicable, yes. Q. I think you are agreeing with me that where there is doubt about whether it is a true exclusive licence or a sole exclusive license it is to be assumed that it is a sole exclusive license. A. Yes. I do.”

(vi) Lara’s Daughter

660. Professor Metzger gave evidence that there was also a principle of German copyright law under which a licensee could sue for injunctive relief and damages against an infringer even if the licence was limited in scope and the acts of infringement extended beyond the scope of the licence. The principle is derived from a case involving a sequel to Dr Zhivago called "Lara’s Daughter” which the infringer had published without a licence. The Court permitted the licensee of the original work to recover damages even though it only had a licence to publish the original work and not a sequel. Professor Metzger gave evidence that the principle underlying the rule was that it was necessary to ensure effective protection of the rights under the licence.
661. It was common ground between Professor Metzger and Professor Ann that the Oberlandesgericht had applied the Lara’s Daughter principle in Appeal II although there was a significant disagreement both about the extent of the principle and the Court’s reasoning. Professor Ann explained the principle most clearly in Ann 2, ¶26 where he cited the legal textbook Dreier/Schulze Urheberrechtsgesetz 7th ed (2022) as follows (original emphasis):

“**Legal nature of the exclusive right of use.** If the user is granted the exclusive right of use, only the user is authorised to use the work in the agreed form. This right is therefore also referred to as an **exclusive right**. The author or other previous rights holder (licensor) is neither in a position to grant third parties this right of use simply or exclusively for the period of exclusivity (succession protection), nor may he himself use the work in this way. Within the scope of the right of use granted, the owner is not only entitled to a **positive right of use** (as is also the case for the simple licence holder), but also the **negative prohibition right**, namely to prevent actions that could impair the undisturbed use of the work in the agreed form. The negative prohibition right can therefore go further than the positive right of use. If, for example, the owner is not permitted to modify or adapt the work in question, he can take action against third parties who use the work in a modified or adapted version if this impairs its exploitation (see BGH GRUR 1957, 614, 616 - Ferien vom Ich, on remakes; BGH ZUM 1999,

644, 645 - Laras Tochter, on the continuation of a novel; Ulmer 368)."

(3) *The German decisions*

(i) Mannheim I

662. Professor Metzger's evidence was that in the German proceedings Astronics asserted that there was no patent infringement with respect to any shipments to Airbus because KID had obtained an exclusive licence to the Patent under the 1998 Teaming Agreement which it had in turn sublicensed to GD by section 3e) of the 2003 Settlement Agreement. It was also his evidence that in Mannheim 1 the Landgericht left open the question whether KID was an exclusive licensee entitled to grant a sub-licence under the 1998 Teaming Agreement but held that Lufthansa was not bound by the covenant not to sue in the 2003 Settlement Agreement. Professor Ann accepted that his evidence was correct.

(ii) Appeal I

663. It was also Professor Metzger's evidence that the Oberlandesgericht decided that KID had been unable to grant a license to GD under the 2003 Settlement Agreement because KID's rights under the 1998 Teaming Agreement were limited to the technical concept of the "Advanced System" and it was therefore unable to grant a wider sub-licence without Lufthansa's prior consent. Professor Ann did not challenge this evidence.

664. Professor Metzger's evidence was that the Oberlandesgericht explained that the authorization to grant a sublicense was not clearly established and that the 1998 Teaming Agreement did not address this issue, but that it was more complex than a regular sole or exclusive license and he cited the following passages from the decision:

"It is not disputed that the Advanced System covered by the agreement requires the use of the patent in suit. The parties also rightly do not dispute that KID is therefore granted a license to the patent-in-suit for the term of the Teaming Agreement for the acts of use specified in the contract in Art. 6. In any case, the wording "LHT grants to KID an exclusive user's right" means that the plaintiff as licensor has undertaken not to grant any further licenses within the scope of KID's exclusive right of use (so-called exclusive license, see Bartenbach, Patentlizenz- und Know-how-Vertrag, 7th ed., para. 78 f.). The exclusive license is predominantly regarded as sufficient - at least in principle - for the licensee to be entitled to assert claims for infringement of property rights (see - also on the restrictions - OLG Düsseldorf, IPRB 2016, 32 = Mitt 2016, 126 juris para. 5 with further references; Kühnen, Handbuch der Patentverletzung, 8th ed, Chapter D.

para. 113); whether the sole license is also sufficient to apply the above-mentioned presumption rule in favour of the licensee's authority to sublicense has - as far as can be seen - not been clarified. The parties are in dispute as to whether the license granted to KID is exclusive in such a way that it excludes use by the licensor itself. The license agreement does not directly address this question either; however, the provisions show that the teaming agreement is in any case not limited to a (sole or exclusive) license.”

“In the Teaming Agreement, the contracting parties agreed and regulated a cooperation for the development, production and marketing of the "Advanced System" designed by the plaintiff (see preamble: "LHT has developed a technical concept. ... "). However, Art. 1 "Scope" stipulates that the market launch of the Advanced System, including development, production, marketing and after-sales support, is the sole responsibility of KID. On the other hand, the plaintiff's contribution is not limited to the granting of the license; rather, it is obliged to provide the best possible support to KID (Art. 2) and, as a rule (if the respective customer agrees), should take over the installation of the systems in the respective aircraft (Art. 3), i.e. be involved in placing patent-protected systems on the market; furthermore, it should be entitled to carry out its own advertising activities and thus to offer the devices covered by the patent in suit (Art. 4). This differentiated license-cooperation relationship does not give KID the authority to grant the sublicense at issue here to the defendant.”

665. Professor Ann did not dispute this analysis except in one respect. His evidence was that the last sentence of the second passage had not been translated properly and that it should have read: “From this differentiated license-cooperation relationship, it cannot be inferred that KID is authorised to grant the sublicense at issue here to the defendant.” In my judgment, nothing turns on this dispute and I am prepared to accept Professor Ann’s evidence that the conclusion was expressed to be a matter of inference.

666. Professor Metzger then dealt with the transfer purpose rule and gave evidence that the Oberlandesgericht explained that the purpose of the 1998 Teaming Agreement and KID’s interest were limited to the “Advanced System” and that it did not obtain rights beyond this technical concept because such rights were not necessary in the light of the purpose of the agreement. He cited the following passage:

“In ascertaining the scope of the authorization granted to the licensee, the principle of transfer of purpose, which is in effect for all intellectual property rights and is derived from § 31 para. 5 of the German Copyright Act (UrhG) is to be taken into account. According to this, in case of doubt, the holder of the protective rights will not grant any more extensive authorization than that absolutely necessary to achieve the contractually established purpose (cf. BGH GRUR 2000, 788 juris – margin no. 23 –

DC control circuit; Ullmann/Deichfuss, loc. cit., § 15, margin no. 26). In case of dispute, the purpose of granting a license is clearly formulated in the Teaming Agreement. It is intended to cover the marketing of the “Advanced System” which is a technical concept by plaintiff that is to be developed to market maturity and produced by KID. To this end, plaintiff grants a license to the protective rights affected by the “Advanced System” (Article 6: Intellectual property rights concerning the Advanced System). According to the style of writing used throughout the Agreement, which is clear to this extent, the grant of the license thus relates to the use of the technical teaching for marketing of the “Advanced System” according to plaintiff’s concept, not, for example, to use of the protective rights (not specified in detail in the Agreement) for any other systems. The crucial issue here is not the grammatical question of what is referenced by this relative clause: for which LHT grants to KID an exclusive right of use (i.e., whether it refers to the Advanced System or – which is correct from a legal standpoint – to intellectual property rights). The decisive point is instead that the protective rights for which a license is granted are not mentioned but instead are paraphrased by reference to the “Advanced System”: the license applies to plaintiff’s protective rights, which are required for production and marketing of the Advanced System. This is consistent with the purpose of the Agreement, which is to complete the development of the Advanced System and to produce the corresponding components and market them within the context of the cooperative agreement as presented. In view of this purpose, which is evident from the contract itself, and in view of the obvious importance of the person of the licensee and cooperation partner in the highly safety-sensitive technical field of aircraft on-board electrics and, finally, in view of the absence of any provisions on billing and license payments for uses by the sublicensee, there is much to suggest that KID impliedly excluded sublicensing. Even if such an exclusion were not assumed, at least an implied reservation of the plaintiff’s consent to such sublicensing would have to be assumed (for this possibility see BGH GRUR 1987, 37 juris-Rn. 24 - Videolizenzvertrag). Due to the exclusive purpose of the license granted for the marketing of the “Advanced System”, it cannot be assumed that the licensee KID was authorized to allow a competitor to use the patent in suit by way of sublicensing without the prior consent of the plaintiff. In doing so, it would grant the sub-licensee more extensive powers than it has itself.”

667. It was also Professor Metzger’s evidence that the Oberlandesgericht noted that KID was not entitled to use its rights in co-operation with other providers in the market for systems other than the “Advanced System” and that it was not a right which KID could exercise independently of Lufthansa. He then gave the following summary (which Professor Ann did not challenge):

- The scope of KID’s license is limited to Lufthansa’s technical concept and the cooperation with Lufthansa;
- Within this scope, Lufthansa is obliged to provide the best possible

support for KID and is generally responsible for installation of the systems in the respective airplanes as supplier and therefore to bring the patented systems onto the market and into circulation on its own and is also still entitled to its own advertising activities and thus to offer products covered by the German Patent;

– KID on the other hand is not allowed to grant sublicenses without Lufthansa's consent to third parties or for other systems outside the cooperation with Lufthansa because such a license would be beyond the rights that KID received under the Teaming Agreement.

– The decision however leaves undecided whether KID is a sole licensee or an exclusive licensee (cf. definitions in the introductions above) in respect of the licence it did have to the Advanced System.”

668. When Mr Copeland cross-examined Professor Metzger, he did not challenge any of the evidence which I have set out above. In cross-examination Professor Metzger confirmed that in Mannheim I the Landesgericht held that the 2003 Settlement Agreement did not contain a sub-licence in favour of Astronics. He also confirmed that in Appeal I the Oberlandesgericht held that the 1998 Teaming Agreement did not confer a right to grant a sub-licence to GD and that in the 2003 Settlement Agreement KID did not purport to grant a sub-licence to GD but only gave a covenant not to sue. When he was asked about the first point immediately above, he accepted that this involved two separate concepts:

“Q. Could you turn forward, please, to {C2/1/22}? This is you, as I understand it at 73, summarising Appeal 1, and I just want to look at the first bullet there, the first indent. You say: "The scope of KID's license is limited to Lufthansa's technical concept and the co-operation with Lufthansa". Now there are two concepts there I just want to separate out and be clear about, okay? The first is what we've been talking about, which is the scope of KID's license being limited to Lufthansa's technical concept? A. The Advanced System, right? Q. The Advanced System, and I'm going to call that "the Advanced System issue"; okay? A. Okay. Q. And the second is that the scope of KID's license is limited to the co-operation with Lufthansa? A. Yes. Q. And if we need to, I'll call that "the co-operation issue", okay? A. Okay.”

(iii) Mannheim II

669. Professor Metzger then went on to describe the effect of the decision of Landgericht in Mannheim II which Professor Ann accepted was correct (although he pointed out that it was not fully upheld on appeal):

“76. The Landgericht decided on Lufthansa's claims in its judgment dated 6 December 2019 and awarded Lufthansa 50% of Astronics's



profits as damages. In these proceedings, Astronics raised the argument that KID was also entitled to at least some of the damages. 77. The Landgericht dismissed that argument, reiterating the Appeal I decision to the effect that KID's rights were limited to the purpose for which the 1998 Teaming Agreement was signed – i.e., Lufthansa's technical concept of the 'Advanced System':... 79. The Landgericht therefore decided that Lufthansa was entitled to all damages in respect of Astronics's acts of infringement (and that KID was not entitled to any damages in that respect) because KID's licence under the 1998 Teaming Agreement was limited to Lufthansa's technical concept in collaboration with Lufthansa. Given the Landgericht decided that KID was not entitled to any right extending to third-party systems, including Astronics's system, it did not have to decide whether the Teaming Agreement granted KID a sole license or an exclusive license."

670. The Landgericht also considered the application of the Lara's Daughter principle but decided that it did not extend to give KID any right to recover damages against Astronics for infringement. It is unnecessary to consider this aspect of the decision further because the Oberlandesgericht departed from the lower court on this issue. Indeed, it is that aspect of the reasoning in Appeal II which is most problematic.

(iv) Appeal II

671. Mr Copeland cross-examined Professor Metzger at some length about Appeal II. Before I consider his evidence, it is necessary to say something about the presentation of German decisions. As Professor Metzger explained, they are presented in what is called "judgment style":

"Q. Okay, and for his Lordship, just in order to understand how to read these judgments, the way it works I think I have now worked out is that you have an overall conclusion -- the top sentence, as it were -- and then below that you have the reasoning. So, for example, here (a) is one reason for the conclusion at 2, and (b) is another reason, and aa) is a subset of b). That's the structure of how to read it? A. Yes. That's what we call "judgment style". You start with the conclusion and then afterwards explanation follows."

672. The key passage about which Mr Copeland cross-examined Professor Metzger begins on page 34 of the agreed translation under the heading "Scope of the portion of damage attributable to the plaintiff". Immediately below that heading the Court recorded that it was departing from Mannheim II in the following respect (although it does not appear to have affected the ultimate outcome of the appeal):

“However, at the outset, the Regional Court did not assume without legal error that the plaintiff could claim the entire damage without restriction. The defendant's appeal attack against this is successful. In fact, the plaintiff did not conclusively demonstrate this with regard to its licensee KID's own standing to sue and this was also not legally established in the earlier main proceedings. Although the plaintiff subsequently also failed to conclusively demonstrate a portion of the damage attributable to it, it is nevertheless possible for the Senate to estimate the minimum portion of the total damage attributable to the plaintiff itself on the basis of the undisputed submissions of the parties. Only to this extent is the plaintiff to be regarded as having standing to sue. For the rest, the action must be dismissed in this respect.”

673. The first reason which the Court gave for this conclusion was that the question whether Lufthansa was entitled to claim for the entire damage had not been determined in the earlier proceedings and in Appeal I the Court had assumed that Lufthansa had standing to claim damages. The second reason which the Court gave was that on the true construction of the 1998 Teaming Agreement KID also had standing to bring its own claim for damages. The agreed translation uses the phrase “redone interpretation” but Professor Metzger explained that what the Court meant by this was that it had also undertaken its own interpretation exercise.

674. The Court's first sub-reason (a) for its second reason (above) was that in Appeal I the Court had assumed (without deciding) that in Article 6 Lufthansa had undertaken not to grant any further licences within the scope of KID's exclusive right of use and that this enabled KID to assert claims for infringement. The Court's second sub-reason was that having now undertaken the exercise of construing the document, it was satisfied that this was correct and that the parties had at least agreed to a sole licence. However, the Court still left open the question whether the 1998 Teaming Agreement was an exclusive licence or a sole licence:

“b) Also a redone interpretation shows that the plaintiff and KID - as the Regional Court left open - in view of the wording “exclusive user's right“ and in view of the cooperation with regard to the “Advanced System” in the Teaming Agreement 1998, which as a contract between two German companies is subject to German substantive law despite being drafted in English in the absence of any other choice of law (Art. 28 para. 2 EGBGB old version), have at least agreed a sole licence. Whether, in addition, not only a sole licence but also an exclusive licence not limited by this standard was granted can be left open here.”

675. There then follow nine sub-sub-reasons (aa) to (ii) in which the Court explained its

reasons for concluding that KID had (at the least) a sole licence which entitled it to bring a separate claim. They are quite lengthy but Professor Metzger was not asked about all of them and I only set out those paragraphs about which he was asked (and to reduce the length of these extracts I have removed most of the citations and references):

“aa) The Senate has already recognised in the main proceedings that the wording “LHT grants to KID an exclusive user's right” at least means that the plaintiff as licensor has undertaken not to grant any further licences within the scope of KID's exclusive right of use, but at most to use the property right itself. This result of the interpretation is consistent with the fact that the exclusive licence, of which the sole licence is a subtype, is particularly common for establishing a market for new products with a high investment rate and for articles with a small and special user group. The Teaming Agreement 1998 is also not only aimed at a distribution cooperation, even if such a cooperation was additionally agreed. Rather, KID alone was exclusively authorised to commercially exploit the technology of the patent in suit with 110 V in-seat power supply systems vis-à-vis third parties. Accordingly, it was not just a mere operating licence in favour of KID, which would not have had to be described as “exclusive”. This is also consistent with the statements made by KID itself confirming this interpretation, which considered itself to be entitled to act on the basis of an exclusive licence both in 2002 in a letter to the defendant (Annex HL 29, in which it even allegedly agreed with the plaintiff) and in the Settlement Agreement (Annex HL 11). The prohibition of sub-licensing – which was legally established by the Senate in the main proceedings – does not conflict with the legal nature of the granted licence as an exclusive licence. Consequently, this applies accordingly to the sole licence. As a result of this interpretation, the witness evidence offered by the defendant that the contracting parties had assumed when concluding the Teaming Agreement that KID was entitled to an exclusive licence right and that it should be entitled to take action in the event of patent infringements, and the question of whether this submission, made for the first time in the appeal instance, should be admitted pursuant to Section 531 ZPO, is also irrelevant.”

676. Professor Metzger accepted that in Appeal II the Court had construed Article 6 to mean that Lufthansa had undertaken not to grant further licences within the scope of KID's exclusive rights, and that it had not decided that Lufthansa had definitely retained the right to use the property right itself (but only that it might have done). He also accepted that the Court characterised a sole licence as “subtype” of an exclusive licence. Mr Copeland then moved on to sub-sub-reason (bb):

“bb) However, the District Court correctly assumes that the license granted by the plaintiff to KID is limited to the “Advanced System” when applying the so-called purpose transfer principle. The Senate has already stated in

the main proceedings that the purpose of granting the license is clearly formulated in the Teaming Agreement 1998: The purpose is the marketing of the “Advanced System” technically designed by the plaintiff and to be developed and manufactured by KID ready for the market. For this purpose, the plaintiff grants a license to the property rights affected by the “Advanced System” (Art. 6: intellectual property rights concerning the Advanced System). According to the clear wording that pervades the entire contract, the license granted relates to the use of the technical teaching for the marketing of the “Advanced System” designed by the plaintiff, and not to the use of the property rights (not specified in the contract) for any other systems. The decisive factor here is not the grammatical question of what the relative clause for which LHT grants to KID an exclusive user's right refers to (to the Advanced System or - legally correct - to intellectual property rights); rather, the decisive factor is that the property rights for which a license is granted are not named, but are described by reference to the “Advanced System”: The industrial property rights of the plaintiff that are required for the manufacture and marketing of the “Advanced System” are licensed. This is in line with the purpose of the contract, which is to finalise the development of the “Advanced System” and to manufacture the corresponding components and market them within the framework of the cooperation described. The purpose of the license was therefore to market the “Advanced System”.”

677. Mr Copeland accepted that the Court had applied the transfer purpose rule to limit the rights granted to KID as those necessary to commercialise the Advanced System and Professor Metzger agreed. The following exchange then took place:

“Q. So this is Appeal 2 determining that in light of the purpose of the Teaming Agreement Article 6 grants a license to the intellectual property rights required for the manufacture and commercialization of the Advanced System; yes? You see that in the -- A. Yes. Q. It is the sentence: "Licensed are the property rights of the plaintiff that are required for the manufacture and commercialization of the Advanced System". It is absolutely clear, isn't it, that what is being licensed are the necessary intellectual property rights. A. Yes. Q. And there's no discussion thus far about what is meant by the Advanced System, is there? A. Yes, there isn't a definition in the contract and this is referred to, yes. Q. But so far in this judgment there is not yet any discussion of what is meant by the Advanced System. A. Yeah, I mean -- Q. Certainly not in the passages I have taken you to. A. Yes. Q. Okay. Thank you.”

678. Mr Copeland then put sub-sub-reasons (cc) and (dd) to Professor Metzger. In the first paragraph, as Mr Copeland conceded, the Court accepted that KID was not entitled to manufacture and commercialise any product independently of Lufthansa. In the second paragraph the Court dealt with the Lara's daughter principle, and for this reason, I include the citation and references:

“cc) As the Senate further established in the main proceedings (*loc. cit.* para. 69) and the Regional Court also correctly noted in the starting point that this has the consequence that KID itself would not have been entitled under the Teaming Agreement 1998 to use the invention for the manufacture and commercialization of any product independently of the cooperation with the plaintiff or to authorise third parties to do so. The exclusive licensee’s right of action in cases of merely limited transfer of rights is also subject to the condition that its own right of use is affected.

dd) However, this restriction of the at least granted sole licence does not mean, as the Regional Court assumes, that KID would not have standing to sue for any damages caused by an infringer by undertaking acts of use infringing the patent which KID alone would have been permitted to do in accordance with the scope of the sole licence granted to it. This fails to recognise that the prohibition rights, even based on exclusive rights of use, can go further than the scope of one's own right of use if the infringer interferes with the legal position gained or has a negative economic impact on the exploitation possibilities. In this case, this includes the right to prohibit those acts of use that are necessary to ensure effective protection of the right (see BGH NJW 1953, 1258, 1259 – Lied der Wildbahn; BGHZ 141, 267, GRUR 1999, 984, 985 – Laras Tochter; BGHZ 118, 394, 398, GRUR 1992, 697 – ALF; OLG Munich, ZUM-RD 2013, 183; OLG Cologne, ZUM-RD 2014, 162; GRUR-RR 2015, 202 para. 5 each on copyright; GRUR 1998, 379, 381 – Lunette on design right). This more extensive prohibition right is not only limited to injunctive relief, but also entitles to corresponding damages (see BGHZ 141, 267, GRUR 1999, 984, 985 – Laras Tochter).

The Regional Court cannot be followed in that these principles could not be applied because KID's economic exploitation right was limited to the specific joint contractual purpose. According to the Teaming Agreement 1998, KID Systeme GmbH itself would not be authorised to use the invention for the manufacture and commercialization of any product independently of the cooperation with the plaintiff. However, even the plaintiff would not have been entitled to develop a product equivalent to the “Advanced System” in cooperation with a third party or to licence this to a third party when applying an appropriate interpretation of Art. 6 of the Teaming Agreement 1998 in accordance with the interests of the parties, because the “exclusive user's right” granted to KID would have precluded this. Rather, the plaintiff has thus licensed its property rights in relation to 110 V power supply systems conclusively to KID in accordance with the definition of an “Advanced System” (see above) and would have, in this respect, at most been entitled to own acts of use. Conversely, KID would therefore in any case have been authorised to develop and distribute the “EmPower” embodiments in cooperation with the plaintiff (with regard to the property right in question here). Accordingly, during the period in question, only KID next to the plaintiff was exclusively authorised to commercially exploit the technology of the patent in suit with 110 V in-seat power supply systems.”

rights as limited by the Advanced Systems point and the cooperation point, the Court found a basis upon which to find that KID had standing to sue. When Mr Copeland put the last sentence of the last paragraph above to him, Professor Metzger accepted that the Court was referring to a positive right of use rather than a negative prohibition right. But he also qualified that evidence as follows:

“Q. Okay. Thank you. It is absolutely clear, isn't it professor, that Appeal 2 found that the name "Advanced System" is irrelevant and that what it is saying is that the scope of the license covered the systems falling within intellectual property required to manufacture and commercialise the Advanced System; yes? A. I agree. Q. Could you just -- remember, we saw the sentence on the end of the previous page about KID would have been able to -- it would have been authorised to develop and distribute the EmPower embodiments in co-operation with the plaintiff. Just to be clear, we're talking about not prohibition rights here, but about authorisation -- rights of use; yes? A. Yes. Q. Appeal 2 did not find that the limitation to the Advanced System meant that KID could not have developed and distributed the EmPower system within the framework of the co-operation of Lufthansa, did it? A. Can you repeat the question, please? Q. Appeal 2 did not find that the limitation to the Advanced System meant that KID could not have developed and distributed the EmPower system with co-operation of Lufthansa. A. Yeah, this is what Appeal 2 says. Yes. Q. Okay. I think we're agreed. Let me put it another way. If KID developed and distributed the EmPower system within the framework of the co-operation required under the Teaming Agreement, it was entitled to do exactly that; yes? A. This is what Appeal 2 says, yes. Q. Yes. Sorry, that's what Appeal 2 says. Yes. So the limitation of the license to the rights of use necessary to manufacture and commercialise the Advanced System does not exclude from that license the rights of use needed to develop and distribute the EmPower system. A. Well, I mean, let me say some more sentence about this. So, to my understanding, Appeal 2 in this regard is not very stringent, I would say. Either you say the EmPower system is within the scope of the license -- if this is the theory then you would not have to apply the Lara's Daughter principle and give a right to stand in court even beyond the usage right, though that could be one reading, sore you say, and the passages we're just reading now seek to go in this direction, you say the EmPower system would have been in some sort covered by the license, and I understand your question going in this direction, but then you wouldn't have to apply the Lara's Daughter principle. My understanding of the overall reading of this decision is that they thought it is outside the usage right, but still coming from Lara's Daughter there may be a prohibition right which goes beyond under certain conditions.”

680. Mr Copeland then moved on to sub-sub-reason (ee) in which the Court stated that the infringing acts of Astronics were covered by the scope of the licence. Again, this is a long provision but I must set it out in its entirety:

“ee) The patent-infringing acts of use at issue in the proceedings are also acts which, according to this provision, are covered by the scope of the licence in favour of KID. The fact that the patent-infringing acts of use by the defendant took place without co-operation with the plaintiff is ultimately irrelevant. It is a mere linguistic matter of course that the “marketing of the Advanced System” agreed in the Teaming Agreement does not linguistically encompass the infringing embodiment advertised under the designation “EmPowered System”. However, the same would apply to the systems of KID itself, which indisputably markets its embodiments under the name “SKYPower”. Of course, the designations of the embodiments are irrelevant. What is decisive is the scope of the licence granted. In the main proceedings, the Senate found, as explained above, that those property rights of the plaintiff were licensed, which were required for the manufacture and commercialization of the “Advanced System”. This is in line with the purpose of the contract, namely to complete the development of the “Advanced System” and to manufacture the corresponding components and market them within the framework of the cooperation described.

In its preamble, the Teaming Agreement 1998 defines the "Advanced System" as a "technical concept for a 110 VAC in-seat power supply system", in contrast to the "Classic System" previously available on the market with "only a low 15 VDC output voltage". On the basis of this, it was KID's responsibility to develop, manufacture, offer and sell the "Advanced System" in accordance with Art. 1 of the Teaming Agreement 1998 - irrespective of the plaintiff's cooperation obligations described above. The plaintiff in turn was to benefit from this through licence payments from KID.”

681. Mr Copeland relied on sub-sub-reason (ee) to challenge Professor Metzger’s view that the Court in Appeal II was applying Lara’s daughter but was construing the 1998 Teaming Agreement as conferring an express right upon KID to exploit the Patent irrespective of the cooperation point:

“Q. And I think, professor, in order to put forward that opinion you have said that the passage at ee), where they refer to the patent-infringing acts of use at issue in the proceedings are acts which, according to this provision, are covered by the scope of the license in favour of KID, you are suggesting that that is talking about the extension of the scopes of the prohibition right as opposed to the use right. A. Yeah. That's my reading of the decision altogether, although I admit that if you just take this passage as it stands here, it seemed open for an interpretation where even the use right could cover it. Q. Right, and the previous sentence, if the screen could perhaps just flick forward to the previous page {H/7/39} where it says: "KID would therefore have been authorised to develop and distribute the EmPower systems in co-operation with the plaintiff" -- the screen is getting there I hope, just the previous page, please, at the very bottom -- that is plainly talking about the right of use not the prohibition right; yes? A. Yes.

Also I may qualify here what I said. I mean, to my understanding, the Teaming Agreement does not really encompass co-operation beyond the Advanced System. Now, the question whether the parties, by way of supplementary interpretation, could have a right in co-operation to develop and market systems which are similar to the Advanced System, this is a question you may ask, but still, I mean, I don't see the relevancy here since it didn't happen in co-operation, if I see it correctly. Q. Could you just look at the bottom of page {H/7/39}, please, and the passage beginning "In its preamble..."? Just read that to yourself, please. (Pause) A. Okay. I have read it. Q. Appeal 2 is finding here that it is KID's responsibility to develop, manufacture, offer and sell the Advanced System in accordance with Article 1 of the Teaming Agreement, irrespective of Lufthansa's co-operation obligations; yes? A. This is what is written in the decision, yes. Q. So what it is holding is that although there needs to be co-operation, irrespective of that co-operation the acts listed in this paragraph are acts which are KID's sole responsibility; yes? A. This is what is written here, yes. Q. Right, and that's the reasoning behind the statement at the top of the page that the fact that the patent-infringing acts of use by the defendant took place without co-operation with the plaintiff is ultimately irrelevant; yes? A. Could you repeat the question? Q. Yes. The reasons that we've just seen -- A. Yes? Q. -- that it was KID's responsibility to develop, manufacture, offer and sell irrespective of the plaintiff's co-operation obligations, that is the reasoning behind the conclusion in the top sentence at ee), that the fact that the patent-infringing acts of use by the defendant took place without co-operation with the plaintiff is ultimately irrelevant, isn't it? A. I must confess, I'm not sure that I really got all the context here -- Q. Okay. A. -- even though I admit that you guided me through the line of arguments and the reason for this is that the court decision is not very stringent, I must say, but it may also be my mistake. Q. I'll ask you one more question: it is irrelevant whether the acts of the defendant took place without the co-operation of the plaintiff because although there are obligations on the parties to co-operate, there are also acts which are, nonetheless, reserved to KID; yes? That's the logic here. A. Yes. That sentence I can agree with, yes. Q. The point is that irrespective of the co-operation obligations, it was, as between Lufthansa and KID, KID's sole responsibility to develop, manufacture, offer and sell the Advanced System; yes? A. Yes."

682. Mr Copeland then put sub-sub-reason (ff) to Professor Metzger in which the Court referred to the 2014 Teaming Agreement and, in particular, the references to litigation and his evidence was that the Court should treat it with care. Mr Copeland then suggested to Professor Metzger that in Appeal II the Court had held that the Advanced System point placed no restriction on KID's ability to develop and distribute the EmPower system. Professor Metzger did not agree with this:

"In the first sentence of paragraph 95, professor, you said: "The German Decisions ... agreed that KID's license did not extend beyond the co-



operation with Lufthansa or Lufthansa's technical concept". We've seen, haven't we, that Appeal 2 explicitly held that KID would have been authorised to develop and distribute EmPower embodiments in co-operation with Lufthansa. We've seen that; yes? A. Yes, but as I told you, that's the interpretation of Appeal 2. Q. Sure. Under the interpretation of Appeal 2, the Advanced System point doesn't place any restriction on KID's ability to develop and distribute EmPower systems -- EmPower embodiments, does it? A. Can you repeat the question, sorry? Q. The Advanced System point doesn't place any restriction on KID's ability to develop and distribute EmPower embodiments according to the interpretation of Appeal 2. A. I guess I cannot agree to that statement as you mention it, since as I said, I think the court, to my understanding, in Appeal 2 mixes up to a certain extent the use right and the right to prohibit under Lara's Daughter, so I think the statement, as you put it, I wouldn't agree."

683. Finally, Mr Copeland suggested to Professor Metzger that Lufthansa's participation under the 1998 Teaming Agreement was limited to the receipt of royalties. Professor Metzger did not accept this proposition. Moreover, in the course of his cross-examination Mr Copeland put it to him that KID would be selling and supplying the components to Lufthansa or the airlines directly:

"Q. So a reasonable interpretation is that KID will -- sorry -- that Lufthansa is going to participate in those activities by receiving royalties; yes? A. Yes. Again, if you just read this line, the conclusion is correct. However, I mean, Lufthansa is in the business of providing services to aircraft, so, I mean, they are not just a licensing entity and therefore I guess it would be a misconception to say their only interest is revenues. Q. Okay. Article 2 is about Lufthansa being responsible for assisting KID in getting certification. You see that -- you will have to turn to the next page, yes -- Article 2, "Team Work" {C4/2/5}. It is about Lufthansa being responsible for assisting KID in getting certification; yes? A. Yes. Q. Could you turn over to Article 3, please, so page {C4/2/6}? Under Article 3 KID has the responsibility to recommend Lufthansa as a partner for installation. That's the first sentence; yes? A. Yes. Q. And "Within this context", it continues, Lufthansa can offer certain services; yes? A. Yes. Q. It can offer complete installation of the systems including certification and complete documentation, installation kits and it can offer certification support, and it can place an offer for those services in its own name, yes? A. Yes. Q. So I think the point you were making to me earlier is that what this means is that in addition to receiving royalties from KID for the sales of the systems, Lufthansa is commercially exploiting the technology of the patent by carrying out those installation services and presumably charging for them. A. Exactly. Q. Yes, and if it supplies those services, it will buy the components from KID and KID will supply them to Lufthansa. A. That's my understanding, yes. Q. And Article 4 is further down the page. Under Article 4, both can promote the product, albeit KID will, in principle, take

charge. A. Yes. Q. Over the page, Article 5 is the commercial conditions, and just remind yourself of what that paragraph -- I think I'm not allowed to read it out. I'm not going to read it out just in case, but just remind yourself of the paragraphs under "Commercial Conditions". (Pause) A. Yes. I have read it. Q. It envisages that for every system sold by KID Lufthansa will receive a fixed amount; yes? A. Yes. Q. And it envisages that KID is doing the selling and the supply. A. It speaks about sales, supply -- I don't see at first reading -- well, it's not the first time I read it, but where is supply? Q. The scheme of the agreement is that KID is going to be doing the selling and supplying either to Lufthansa or directly to the customers; yes? A. Yes. If you read it in context which I like, I agree. Q. Article 6 is over the page {C4/2/8}. That's the grant of the license. We've seen that a number of times, and so that's the grant of the license necessary for the different responsibilities that have been attributed to KID in the earlier paragraphs; yes? A. Yes. Q. You see there that the exclusive user's right, in the first paragraph, is contrasted with the non-exclusive license in the next paragraph, yes? A. Yes. Q. There's nothing else in this agreement that is relevant to the issues today, is there? A. So if your question means whether we have gone through the main parts of this agreement -- Q. Yes. A. -- I agree.

(4) *The experts*

684. Both experts expressed a view about the construction of Article 6. Professor Metzger expressed the view that it should be characterised as a sole licence and Professor Ann expressed the view that it should be characterised as an exclusive licence. I attribute some weight to these views. But neither expert had considered the factual matrix in any detail and neither expert had seen the 1998 Purchase Agreement. In cross-examination Professor Ann also accepted that he did not have any specific knowledge about the ISPSS industry. Finally, he accepted that a sole licence under which Lufthansa would retain its own rights would achieve the purpose of the agreement:

“Q. And then in 15.9.2 at the top of page {D2/2/27} you explain the Karlsruhe Court found that the purpose of the agreement was to agree on a collaboration. A. Yes. Q. Yes, and do you agree that that was the purpose of this agreement? A. Well, I'm basically saying -- I'm answering the question that -- whether the Teaming Agreement did not give KID the interaction it needs and so on, and then I'm saying what the original court, Karlsruhe, found, that the purpose that they said was to agree on a collaboration regarding the Advanced System, and KID -- and I see what I wrote here, but ... Q. What I'm asking you is whether you agree with that, in particular whether you agree with the Karlsruhe Court, that the purpose of this agreement was to agree on a collaboration regarding the advance system and hence KID was only allowed to use it in co-operation with Lufthansa? A. I mean, what -- I must say that I am not as convinced as I was at the time that this is the right way to describe the finding of the

Karlsruhe Court. However, what was right and remains right is correct, was correct and remains correct, is that KID could only use LHT's patents for the Advanced System. Q. Okay. A. That's probably what I meant here. Q. Let's put the use of the patent to one side for a moment. Do you agree with me that from the perspective of German law, when looking at this agreement, it is establishing a detailed collaborative relationship between Lufthansa and KID with a view to commercialising the 110 volt system? A. Yes, there are -- yes. Yes. I agree. Q. And the agreement anticipates both parties being involved all the way through the end-to-end process. A. No. With that I do not agree. What I do agree with is that there were scenarios in which both parties would co-operate, but that there also could be scenarios, depending on the airlines, the customers, both parties' customers' preferences where, for example, Lufthansa would be left out, so yes, KID tried to get -- to win customers for Lufthansa, but if these customers did not want that, then KID would co-operate with somebody else. Q. I think we may be at crossed purposes. There are obviously situations in which -- as you just correctly identified -- Lufthansa won't be involved, but the agreement anticipates that in some situations both parties will be involved all the way through the end-to-end process. A. That can happen, yes. Q. And so insofar as the patent covers aspects of that end-to-end process, both KID and Lufthansa need to have rights under the patent. A. Not necessarily. I mean, KID certainly -- I mean, Lufthansa was the -- Lufthansa was the right-holder, but it had given KID, granted KID an exclusive user's right. Now KID, of course, as the exclusive true (Inaudible) or exclusive licensee also, of course, could have granted Lufthansa -- granted Lufthansa the right to do certain things. That is one solution, so it's not necessarily the way you've just described it. That is a possibility, but it's not the only one, I'm afraid. Q. It's not the only one, okay. You agreed with me that the agreement anticipates that sometimes both parties are involved in the end-to-end process? A. Yes I do agree. Q. If they are involved, each involved in the end-to-end process and aspects of that end-to-end process are covered by the patent, then both Lufthansa and KID need to have rights in the patent for that purpose. A. Yes. Q. And so under German law a sole license to KID under which Lufthansa retained its own rights would achieve the purpose of this agreement? A. Could you say that again? Q. Under German law a sole license to KID under which Lufthansa retained its own rights, would achieve that -- sole license to KID -- would achieve the purpose of this agreement. A. Yes, a sole license would achieve that purpose. Well, it doesn't -- it doesn't mean that's the only way, but it's -- yes."

(5) *Analysis*

685. In my judgment, the 1998 Teaming Agreement conferred a sole exclusive licence upon KID to the exclusion of all third parties apart from Lufthansa rather than a true exclusive licence for the following reasons:

- (1) The underlying purpose of the 1998 Teaming Agreement was a collaboration

between Lufthansa and KID to promote and sell the Advanced System. Professor Ann accepted both that this was the purpose of the agreement and that the Court had found this to be the case in Appeal I.

- (2) Article 6 must be read in that context. In my judgment, it was not intended to confer unlimited intellectual property rights upon KID which it could exploit for purposes outside the agreement. I accept that Article 6 granted the “exclusive user’s right” in return for the payment of royalties. But those royalties were limited to an amount payable for each of the components in the Advanced System: see Article 5. If KID had been permitted to exploit the intellectual property rights for other purposes, the agreement would have provided for the payment of further royalties.
- (3) Moreover, the agreement was terminable upon six months’ notice and after termination KID was only entitled to a non-exclusive user’s right: see Article 6, second paragraph and Article 8. If the parties had intended that KID would be entitled to exercise the rights conferred by Article 6 outside the collaboration with Lufthansa or for the promotion of the Advanced System, it is likely that it would have run for a fixed term or extended those rights beyond the termination of the agreement.
- (4) Article 1 imposed an obligation upon KID to introduce the Advanced System to the market and this obligation required KID to develop, manufacture and market the Advanced System. It also required KID to provide after-sales support. Professor Ann accepted that it was unnecessary for Lufthansa to grant KID a true exclusive licence to perform this obligation but only a sole exclusive licence.
- (5) Article 1 uses the word “sole” in that context and Professor Ann accepted that the word had been used intentionally. It is fair to say that the word is used in the context of KID’s obligations under the agreement not its rights. But the parties could just as easily have used the word “exclusive” in that context. The word “sole” provides some insight, therefore, into their intentions.
- (6) Article 3 also imposed an obligation upon KID to promote Lufthansa’s services to any potential buyer. Those services expressly include “complete installation of the systems including certification (STC) and complete documentation (full turnkey package”. Although the parties used the words “the systems” and not the words

“Advanced System” they must have been referring to the Advanced System. Article 1 refers to “Advanced Systems” in the plural and Article 2 refers to the “said systems”.

- (7) The parties must have contemplated, therefore, that Lufthansa would need to exercise its rights under the Patent to provide those services and, in particular, to assemble them together into the SkyPower System. I would probably have been prepared to draw that inference without resort to any other materials or the evidence of customary practice which Lufthansa adduced. But it is clear from the 1998 Purchase Agreement which was signed the same day that KID had agreed to supply the individual components to Lufthansa and not the assembled system.
- (8) Article 2 of the 1998 Purchase Agreement contemplated that KID would supply the components either to Lufthansa or to seat manufacturers. However, it clearly contemplated that Lufthansa would assemble some SkyPower Systems because of the terms of the warranty under which KID agreed to pay a fixed price for in-house repairs which Lufthansa carried out.
- (9) Furthermore, the parties must have had it in mind that Lufthansa would be carrying out retrofit installations of the SkyPower System for which it would be required to exercise its rights as patentee. Lufthansa’s core business was providing MRO services to the airline market globally, it was offering turnkey packages and for retrofit installations, it was far less likely that a seat manufacturer would be involved.
- (10) If Lufthansa had granted KID a true exclusive licence, then Lufthansa would not have been able to provide the services in Article 3 without KID granting a sub-licence. The 1998 Teaming Agreement did not contain a sub-licence to that effect. Professor Ann had no real answer to this point when Mr Hall put it to him in the passage immediately above. But in any event, there is no reason why the parties would have entered into such a complex arrangement when a sole exclusive licence would have given both parties the rights which they needed. Indeed, Professor Ann accepted that a sole exclusive licence would give effect to the purpose of the Agreement.
- (11) This conclusion is consistent with the customary practices upon which Lufthansa

relied. I accept that the ISPSS industry often ships components “ex-works” so that they would be assembled and installed by an installer and systems integrator like Lufthansa. I also accept that the parties to the 1998 Teaming Agreement would have contemplated that a “turnkey package” would include the assembly and installation of ISPSS and IFE systems.

686. In reaching this conclusion I have had regard to the German decisions. In my judgment, it is consistent with Mannheim I, Appeal I and Mannheim II. In particular, it is consistent with the findings of the Oberlandesgericht in Appeal I in relation to the purpose of the agreement and, in particular, the Court’s finding that it did not confer a right upon KID to grant sub-licences to third parties or for other systems without Lufthansa’s consent because such a licence would have been beyond the rights that KID received under the Teaming Agreement.

687. In my judgment, the conclusion which I have reached is also consistent with Appeal II when properly understood. But even if my understanding of Appeal II is wrong, I consider Appeal II to be problematic and I attach little weight to it. I express these views for the following reasons:

- (1) The issue for the Court in Appeal II was whether the 1998 Teaming Agreement entitled KID to sue under German law to recover damage for Astronics’ infringement of the German designation of the Patent or, put another way, whether the Defendants were only liable to Lufthansa. The Court was only concerned with the construction of the 1998 Teaming Agreement to the extent that it provided an answer to that question.
- (2) The Court expressly left open the question whether Article 6 of the 1998 Teaming Agreement conferred a true exclusive licence or a sole exclusive licence upon KID. All of the detailed reasoning of the Court which Mr Copeland put to Professor Metzger must, therefore, be understood in that context. The Court was not answering the question which I am required to answer and expressly said so.
- (3) The Court expressly approved the reasoning in Appeal I that “the license granted by the plaintiff to KID is limited to the “Advanced System” when applying the so-called purpose transfer principle” and stated that “the license granted relates to the use of the technical teaching for the marketing of the “Advanced System” designed

by the plaintiff, and not to the use of the property rights (not specified in the contract) for any other systems”: see sub-sub-reason (bb) (above).

- (4) The Court also approved the reasoning in Appeal I that “KID itself would not have been entitled under the 1998 Teaming Agreement to use the invention for the manufacture and commercialization of any product independently of the cooperation with the plaintiff or to authorise third parties to do so”: see (dd).
- (5) The specific issue for the Court, therefore, was whether KID was still entitled to bring a claim for damages for infringement against Astronics despite those limitations. The Court held that KID had the right to claim damages because Astronics had infringed those rights which Article 6 had conferred on KID to enable KID to carry out the obligations which fell within Article 1.
- (6) There was a dispute between Mr Copeland and Professor Metzger about whether the Court arrived at this result by construing the 1998 Teaming Agreement itself as conferring a positive right of use or a negative prohibition right by application of the rule in *Lara’s Daughter*. However, I do not consider that it is necessary to decide this dispute for reasons which I will attempt to explain as briefly as possible.
- (7) In my judgment, all that the Court decided in Appeal II was that the limited purposes for which KID was entitled to exercise its Article 6 rights did not prevent it from bringing a claim for damages for infringement against Astronics, because Astronics was infringing the very rights which had been conferred on KID to comply with its Article 1 obligations to manufacture and promote the SkyPower System.
- (8) Furthermore, it is quite clear from the decision in Appeal II that the Court did not decide that KID was entitled to exercise the rights of the Patent other than for the purpose of cooperation with Lufthansa or for the purpose of promoting the Advanced System. Indeed, Mr Copeland was careful not to suggest to Professor Metzger otherwise. He came close to suggesting that Appeal II went much wider than this when he dealt with the EmPower system. But, in my judgment, he put the effect of the decision in Appeal II correctly to Professor Metzger in the very last passage which I have quoted (above).

(9) With great respect, the decision which the Court reached in Appeal II seems to me to be an eminently reasonable one. But if it is necessary for me to decide as a matter of German law what the basis of that decision was and, if it was correct, then I agree with Professor Metzger that the decision is probably best regarded as an application of the rule in *Lara's Daughter*. The Court cited the decision itself in sub-sub-reason (dd). The Defendants relied on sub-sub-reason (ee) for the proposition that Astronics' infringing acts fell within the scope of the licence. But that was the point. The acts infringed the rights which Lufthansa had granted to KID for the purpose of their collaboration and it was necessary to ensure effective protection of those rights that it should have the right to claim damages.

688. Finally, even if I am wrong about the construction of the 1998 Teaming Agreement and on their true construction the words "exclusive user's right" does not mean a "sole exclusive user's right" either because my reasoning is wrong or because I have relied on inadmissible or unpleaded material, I would have held that these words were ambiguous and applied the transfer purpose rule. I would also have followed the German decisions and held that the 1998 Teaming Agreement gave rise to a sole exclusive licence rather than a true exclusive licence on the basis of Professor Ann's evidence that it was only necessary for Lufthansa to grant a sole exclusive licence to give effect to the purpose of the agreement.

(6) *Conclusion*

689. I, therefore, reject Astronics' defence based on the 2003 Settlement Agreement and decline to deduct from the profits which I have awarded against it any sum to which KID would have been entitled under section 67. Given my conclusion that the 1998 Teaming Agreement conferred a sole exclusive licence upon KID, I am satisfied that it was not an exclusive licence within the meaning of section 130 of the PA 1977 and that KID had no right to bring a claim under section 67.

690. Given this conclusion, none of the other issues arise. In particular, I leave open the question whether the right of an exclusive licensee to bring a claim for an account of profits under section 67 has any effect on the right of the patentee to bring a claim under section 61(1)(d). In my judgment, that issue is better left for decision when or if it actually arises. Finally, Lufthansa advanced in its statements of case and in opening a number of



arguments based on estoppels said to arise from the German decisions. I record that it did not pursue any of them in closing argument and I dismiss them.

## **X. Disposition**

691. I hold that Astronics derived profits of US \$4.42 million from the infringement of the Patent for the Relevant Period between 29 December 2011 and 22 May 2018. I also hold that Panasonic derived profits of US \$7.384 million (i.e. 13% of US \$56.8 million) from the infringement of the Patent for the Relevant Period from 13 May 2013 to 22 May 2018. Finally, I hold that Safran derived profits of US \$81,800 from the infringement of the Patent for the Relevant Period between 29 December 2011 and 22 May 2018. I hold that all three Defendants are liable to account to Lufthansa for those sums under section 61 of the PA 1977 and I will make an order for them to pay those sums.

692. I dispose of the Account in this way subject to a number of issues which remain outstanding and on which I will hear further argument at the consequential hearing. Those issues are as follows:

- (1) I have made it clear that my finding in relation to the implied apportionment percentage in relation to all three Defendants is provisional and that I will hear further argument on the question whether all overheads or incremental overheads should be deducted from their profits in arriving at the implied apportionment percentage.
- (2) In their Opening Skeleton Argument the Defendants submitted that there was a risk of double-recovery given the concurrent claim which Lufthansa was bringing in France and Germany. They submitted that the Account should not be concluded unless Lufthansa amended the Points of Claim to make it clear that it was not pursuing multiple claims in different jurisdictions for the same profit. I will hear further argument on this issue if it still arises when the parties have considered my findings.
- (3) The Defendants also submitted that in Germany the sums paid by Astronics should be reduced by the amount of any indemnity owed or paid to Panasonic. No time was devoted to this issue at trial and I also leave it over for consideration when the parties have considered my findings.

693. Finally, the parties agreed a List of Issues for trial which was used for the PTR. The parties did not address me by reference to the List of Issues either in writing or orally. But given the number of issues which I was ultimately required to determine in this judgment, I consider it a useful discipline to give my answers to those issues so that the parties can be satisfied that I have dealt with all of the issues which arose for determination. I set out the List of Issues and my answers to them in Appendix 1 (below).

## APPENDIX 1

### **Unresolved issues regarding Panasonic's liability**

*1. Is Panasonic liable: (a) under s60(2) based on its knowledge as set out in its Amended PPD served in the liability trial (b) for disposal of a "kit of parts" (c) for disposal under the doctrine of equivalents?*

(a) Yes. Panasonic is liable under section 60(2). (b) I have not determined this issue. (c) No. Panasonic is not liable under the doctrine of equivalents.

### **Causation: What is the correct legal approach to assessing profits?**

*2. What is the correct legal approach to an account of profits? What is the correct application of the applicable legal approach to causation to the facts of this case?*

The correct legal approach to causation is set out in section V. I find that but for the infringement of the patent, the Defendants would not have made the profits in issue. But I also find that the infringement was not either the legal or proximate cause of those profits and for this reason it is appropriate to apportion those profits.

### **Ds' counterfactual activities**

*3. What would have been the features of 1171M and would 1171Ms have been 'non-infringing'?*

The features of the 1171M would have included the insertion, remoteness and timing features of the Patent and would not have been a Non-Infringing Alternative.

*4. In respect of 'full insertion', is it an abuse of process for the Defendants to contend that 1171Ms would fall outside the scope of protection of Claim 1 of the Patent?*

No.

*5. Is there an issue estoppel preventing the Claimant from contending in the account for a construction of Claim 1 that would place the 1171M product within the scope of Claim 1 of the Patent?*

No.

*6. Would 1171M Systems have been certified and approved and would they have been technically and/or commercially inferior to EmPower Systems?*

I have found that Astronics could and would have manufactured the 1171M cheaply. I have not specifically decided whether the 1171M would have been certified and approved

or whether it would have been technically and/or commercially inferior than the EmPower Fusion. The parties did not directly address these issues and it was not necessary for me to decide them because I have found in any event that the 1171M would have infringed the Patent and was not an NIA.

7. *What profit would each D have made from such counterfactual transactions?*

None.

### **Causation**

8. *Were the Infringing Dealings the cause (factual and legal) of the profit on Relevant Transactions?*

The Infringing Dealings were the factual cause of the profit on Relevant Transactions but not the legal cause.

9. *For each D were the following caused by Infringing Dealings? (a) Profits made on the sale and supply of Primary Components (b) Profits made on the sale and supply of Secondary Components (c) Profits made on the sale and supply of Ancillary Goods and Services (d) Additional payments made in response to any failures to meet minimum order quantities*

I have found that for each of the Defendants none of the profits in (a), (b), (c) or (d) were legally caused by the Infringing Dealings. If my decision on legal causation is wrong, then I have also found that the profits made on the sale and supply of Ancillary Goods and Services (i.e. item (c) above) were not legally caused by the Infringing Dealings.

10. *Did the act of shipment in the US trigger the contractual right for payment such that profits earned from those payments were not caused by an Infringing Dealing?*

No. I have dismissed the timing argument.

### **Apportionment: How should Ds' profits be apportioned to their use of the invention?**

11. *Is it appropriate to apportion Ds' profits and if so on what basis?*

(i) Astronics/Panasonic

Yes. I have held that it is appropriate to apportion Ds' profits. I have also held that it is appropriate to apportion the profits of Astronics and Panasonic by reference to the implied apportionment percentage derived from the 2014 Teaming Agreement. I have found that the implied apportionment percentage is either 13% (after deduction of incremental overheads) or 21% (after deduction of all relevant overheads). I have also found on a provisional basis that it is appropriate to arrive at the implied apportionment percentage after deduction of incremental costs only and, therefore, that 13% of the

profits in issue of Astronics and Panasonic should be apportioned to the use of the invention. Assuming that my provisional conclusion is correct, I have held that Astronics derived profits of US \$4.42 million from the infringement of the Patent for the Relevant Period and Panasonic derived profits of US \$7.384 million from the infringement of the Patent for the Relevant Period.

(ii) Safran

I have held that it is appropriate to apportion Safran's profits by reference to the ratio between its labour costs associated with the EmPower system and its total labour costs. I have also held on a provisional basis that Safran made a net profit of US \$81,800 on its additional labour costs from installing EmPower systems after deducting all overheads and a net profit of US \$567,800 after deducting only variable overheads. Finally, I found on a provisional basis that it is appropriate to deduct all overheads and that Safran derived profits of US \$81,800 from the infringement of the Patent for the Relevant Period.

**Remoteness: Are Ds' profits too remote?**

12. *Are all the Defendants' profits too remote?*

I have found that the infringement was not the legal or proximate cause of the profits in issue. They were, therefore, too remote in the wide sense used to denote legal causation. However, I have not held that the profits in issue were too remote in the narrow sense. The Defendants did not argue that even if their infringement of the Patent was held to be the legal cause of the profits in issue, then those profits were still too remote. Accordingly, I have not determined that issue separately and held that they were.

**What are the relevant revenues and costs for each Defendant?**

13. *What are the relevant revenues for each Defendant: (a) from the sale/supply of Primary Components in the UK in the Relevant Period (Astronics and Safran: 29 December 2011-22 May 2018; Panasonic: 13 May 2013-22 May 2018); (b) from the sale/supply of Secondary Components in the Relevant Period; (c) from the sale/supply of Ancillary Goods & Services in the Relevant Period; (d) from the sale/supply of Secondary Components outside the UK and/or outside the Relevant Period; (e) from the sale/supply of Ancillary Goods & Services outside the UK and/or outside the Relevant Period?*

14. *What are the relevant costs for each Defendant?*

I answer issues 13 and 14 together below. The experts did not split out the revenues from the Primary Components, the Secondary Components, the Ancillary Goods and Services (whether inside or outside the UK) in the Joint Statement and I considered it unnecessary to decide each issue separately because of my decision to apportion the total profits. In the course of that exercise, however, I have determined the profits from FAL Components outside the UK.

(i) Astronics

I have found that Astronics' IRAD costs were [REDACTED], the net profits of the sale of FAL Components ex UK were [REDACTED] and that the appropriate deduction for tax was [REDACTED]. All other figures were agreed and on that basis I have found that Astronics made net profits of US \$34.0 million from the Infringing Dealings.

(ii) Panasonic

I have found that Panasonic was entitled to deduct sales credits of [REDACTED], it incurred fixed expenses of [REDACTED] but no deduction should be made for variable expenses, that the net profits of the sale of FAL Components ex UK were [REDACTED] and that the appropriate deduction for tax was [REDACTED]. All other figures were agreed and on that basis I have found that Panasonic made net profits of US \$56.8 million from the Infringing Dealings.

(iii) Safran

I have held that Safran made net profits of US \$168.5 million after adopting Mr Bezant's figures and deducting incremental overheads only.

**Should there be an apportionment of profits between Lufthansa and KID?**

15. *Should there be an apportionment of profits between Lufthansa and KID?*

No. Although I have held that the benefit of the 2003 Settlement Agreement was assigned to Astronics, I have held that the 1998 Teaming Agreement did not confer a true exclusive licence upon KID but a sole exclusive licence. In the premises, KID had no right to bring a claim for an account of profits under section 67 of the PA 1977.

**Other points**

16. *Is there any double recovery to take into account?*

I have not determined this issue but adjourn it for further argument at the consequential hearing if the parties consider that it still arises on the findings which I have made.