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Paper 46
Entered: December 20, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

THE BOEING COMPANY,
Petitioner,

v.

SEYMOUR LEVINE,
Patent Owner.

Case IPR2015-01341
Patent RE39,618

Before MICHAEL W. KIM, TRENTON A. WARD, and DANIEL N. FISHMAN, *Administrative Patent Judges*.

WARD, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

We have authority to hear this *inter partes* review under 35 U.S.C. § 6(b), and this Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 4, 5, 8, 9, 10, 14, and 16 ("the challenged claims") of U.S. Patent No. RE39,618 (Ex. 1001, "the '618 patent") are unpatentable.

A. Background

The Boeing Company ("Petitioner") filed a Petition seeking to institute an *inter partes* review of the challenged claims of the '618 patent pursuant to 35 U.S.C. §§ 311–319. Paper 2 ("Pet."). Petitioner relies upon the Declaration of Dr. Albert Helfrick in support of its Petition. Ex. 1002. Seymour Levine ("Patent Owner") filed a Preliminary Response. Paper 7 ("Prelim. Resp."). Pursuant to 35 U.S.C. § 314(a), we instituted an *inter partes* review on the following grounds:

Claims	References	Basis
4, 5, 14, and 16	Ward[1] in view of ARINC 624-1[2]	§ 103
8, 9, and 10	Ward in view of ARINC 624-1 in further view of Monroe[3]	§ 103
4, 5, 14, and 16	Dyson[4] in view of Chetail	§ 103

[1] M J Ward, "*Power Plant Health Monitoring – The Human Factor*," Feb. 1992 (Ex. 1015) ("Ward").

[2] "*Design Guidance for Onboard Maintenance System*," ARINC Report 624-1, Aug. 1993 (Ex. 1014) ("ARINC 624-1").

[3] US Patent No. 5,798,458, filed Oct. 28, 1996 (Ex. 1017) ("Monroe").

[4] R.J.E. Dyson, "*Commercial Engine Monitoring Status at GE Aircraft Engines*," Oct. 1988 (Ex. 1019) ("Dyson").

Claims	References	Basis
8, 9, and 10	Dyson in view of Chetail[5] in further view of Monroe	§ 103
4, 5, 14, and 16	Dowling[6] in view of ARINC 624-1	§ 103
8, 9, and 10	Dowling in view of ARINC 624-1 in further view of Monroe	§ 103
8, 9, and 10	Ward in view of ARINC 624-1, ARINC 702-6,[7] and FAA, Increased FDR Parameters[8]	§ 103
8, 9, and 10	Ward in view of ARINC 624-1, FAA, Increased FDR Parameters and Farmakis[9]	§ 103

See Decision on Institution, Paper 10 ("Dec."), 36.

On January 27, 2016, Petitioner filed a Motion to Submit Supplemental Information pursuant to 37 C.F.R. § 42.123(a) (Paper 21), as previously authorized by the Board (Paper 20), seeking to submit a Supplemental Declaration of Dr. Albert Helfrick (Ex. 1042) and Exhibits A–C to his supplemental declaration. Patent Owner opposed the Motion to Submit Supplemental Information. Paper 23. On April 15, 2016, the Board granted Petitioner's Motion to Submit Supplemental Information and

[5] P. Chetail, "*LE CFM 56-5 SUR A320 A Air France,*" Oct. 1988 (Ex. 1018) ("Chetail").

[6] Drew Dowling and Richard A. Lancaster, "*Remote Maintenance Monitoring Using a Digital Link,*" Dec. 1984 (Ex. 1013) ("Dowling").

[7] "*Flight Management Computer System,*" ARINC Characteristic 702-6, Jun. 10, 1994 (Ex. 1016) ("ARINC 702-6").

[8] "*Increased Flight Data Recorder Parameters,*" 60 Fed. Reg. 13,862, Mar. 14, 1995 (Ex. 1011) ("FAA, Increased FDR Parameters").

[9] US Patent No. 5,714,948, filed Apr. 16, 1996 (Ex. 1021) ("Farmakis").

entered Exhibit 1042, and associated Exhibits A–C, into the record. Paper 30, 5.

After institution of trial, Patent Owner then filed a Patent Owner Response (Paper 28, "PO Resp."), to which Petitioner filed a Reply (Paper 33, "Pet. Reply"). Among other evidence, Patent Owner relies upon the Declaration of John F. Grabowsky in support of Patent Owner's Response. Ex. 2011.

An oral argument was held on September 14, 2016. A transcript of the oral argument is included in the record. Paper 45 ("Tr.").

B. Additional Proceedings

The parties indicated the '618 patent is the subject of the following district court action: *Levine v. The Boeing Company*, No. 14-cv-1991 (W.D. Wash.). Pet. 1; Paper 4, 1.

C. The '618 Patent

The '618 patent is titled "Remote, Aircraft, Global, Paperless Maintenance System" and generally relates to a system that monitors performance parameters and aircraft operational parameters, and broadcasts this information along with aircraft identification, audio, video, global positioning, and altitude data, to a worldwide two-way RF network. Ex. 1001, Abstract. The '618 patent discloses that the information is monitored and recorded at a remote, centralized location and analysis of this information allows identification of problems and generation of advisories. *Id*.

Figure 1 of the ’618 patent, reproduced below, illustrates an embodiment of the system described:

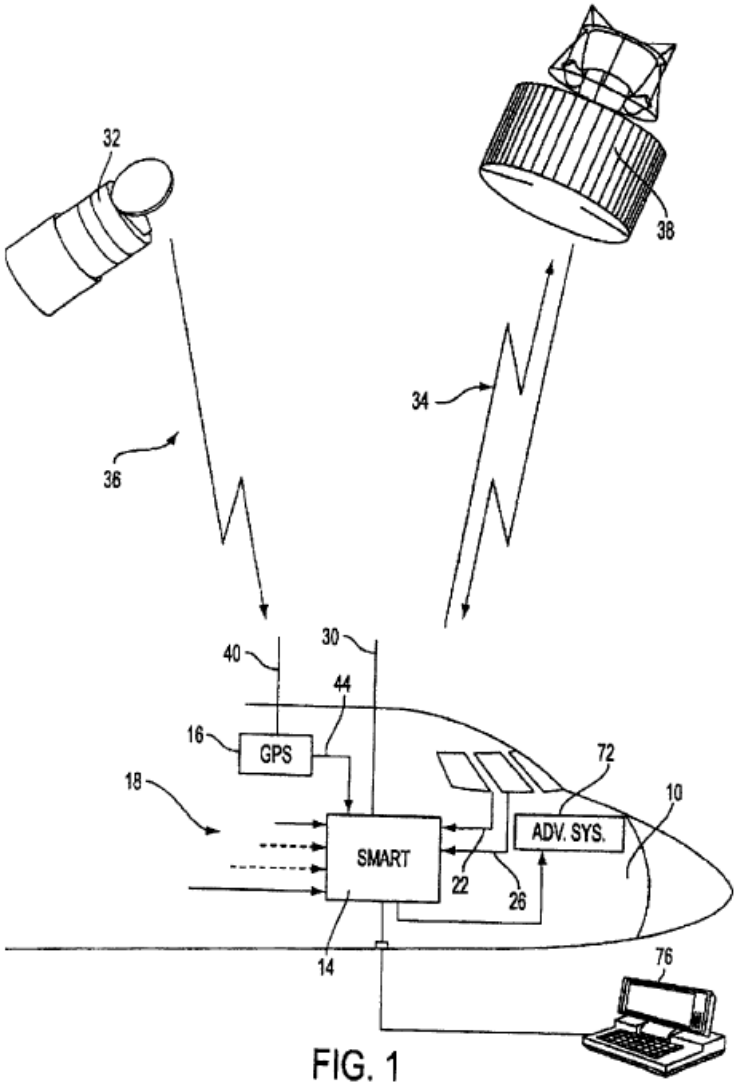


FIG. 1

As shown above in Figure 1, the ’618 patent discloses aircraft 10 with Sensor Multiplexer Receiver & Transmitter (“SMART”) 14, which can receive aircraft performance and control data 18, acoustic data 22, video data 26, and information from GPS receiver system 16. *Id*. at 4:57–65. SMART 14 periodically samples sensor signals 18, 22, 26, 44 and adds to each signal a sensor identification label, an aircraft identification label, and a configuration label. *Id*. at 5:1–5. Aircraft 10 equipped with SMART 14

transmits the sensor data over a UHF radio to communication satellite 38, which relays the data to Central Ground Based Processing Station ("CGBS") 42 (shown in Figure 2). *Id*. at 5:21–28. CGBS 42 includes processing station 62 for data analysis and problem simulation and advisory module 70 for generating aircraft advisories. *Id*. at 5:49–53.

D. Illustrative Claims

Claims 4 and 8 are illustrative of the claimed subject matter and are reproduced below.

> 4. An aircraft maintenance system for use on an aircraft having a flight data recorder, the maintenance system comprising:
>
> a transmitter portable to be placed on an aircraft, said transmitter configured for transmission of digital aircraft performance data across a communication network while said aircraft is in flight; and
>
> a central station connected to said communication network configured to receive and analyze said digital aircraft performance data to generate maintenance advice for said aircraft while said aircraft is in flight,
>
> wherein said digital aircraft performance data includes an identifier unique to a particular aircraft and a configuration label, and at least a portion of said digital aircraft performance data comprises data directed to the flight data recorder.
>
> 8. The aircraft maintenance system of claim 4 wherein said digital aircraft performance data includes aircraft position data directed to said flight data recorder.

II. ANALYSIS

A. Claim Construction

The Board will interpret claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent. 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard as the claim interpretation standard to be applied in *inter partes* reviews). Claim terms also generally are given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Also, we must be careful not to read a particular embodiment appearing in the written description into the claim if the claim language is broader than the embodiment. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993) ("limitations are not to be read into the claims from the specification").

1. "maintenance advice"

Claim 4 recites "a central station connected to said communication network configured to receive and analyze said digital aircraft performance data to generate maintenance advice." Petitioner proposes that the term "maintenance advice" be construed as "problem-specific maintenance information, such as trends, alerts, or isolation of faults." Pet. 12. Petitioner argues that the term "maintenance advice" does not appear in the specification outside of the claims, but that the specification describes the presumably synonymous term of "maintenance advisories." Pet. 10–11 (citing Ex. 1001, 7:1–2). Petitioner argues that the specification discloses that, in one embodiment, these "advisories" "represent the latest diagnostic

procedures and *problem specific maintenance information*.'" Pet. 11 (quoting Ex. 1001, 7:1–2) (emphasis added).

Patent Owner agrees with the first portion of Petitioner's proposed construction, but argues that the term "maintenance advice" be construed to further include "problem-specific maintenance information, *including recommended maintenance actions*." PO Resp. 31–32 (emphasis added). More specifically, Patent Owner argues that the claimed "maintenance advice" must not only be information that could be used to assess or diagnose a problem, but must be actual advice, which recommends that certain maintenance activity be undertaken. *Id*. Patent Owner agrees with Petitioner that the term "maintenance advice" is synonymous with the term "maintenance advisories" used in the specification, but argues that the "maintenance advisories" rely upon the latest diagnostic procedures and problem specific maintenance information and, thus, must include some recommendation for an appropriate maintenance action. *Id*. at 32 (citing Ex. 1001, 7:1–2). Generally, we agree with Petitioner, although we see no need to include the examples set forth in Petitioner's proffered construction.

The specification of the '618 patent broadly describes various maintenance advisories, including those that "can be requested and viewed via a plug-in terminal 76" while "the aircraft is on the ground." Ex. 1001, 5:17–19. Additionally, the specification describes that a "preferred maintenance advisory" can be based "on an expert system for fault isolation." Ex. 1001, 3:36–37. Petitioner's Declarant Dr. Albert Helfrick provides that a person of ordinary skill in the art would understand that the terms "maintenance advice" and "maintenance advisories" could encompass a wide variety of computer-generated information useful for performing

maintenance. Ex. 1002 ¶ 63. None of this evidence requires "maintenance advice" to include "recommended maintenance actions."

The definition of "advice" is "information or notice given." Ex. 3001 (Webster's Third New International Dictionary 32 (1971), 3.). Thus, the plain and ordinary meaning of "maintenance advice" is consistent with the aforementioned evidence, in that "maintenance advice" can include maintenance information, but does not require "recommended maintenance actions." Patent Owner argues that this dictionary definition cited by the Board includes an alternative definition of "advice" as a "recommendation regarding a decision or course of conduct." PO Resp. 33 (citing Ex. 3001, 3). Patent Owner further argues that this alternative definition of "advice" is most consistent with specification. PO Resp. 33. Patent Owner fails, however, to cite to any portions of the specification to support this argument (*see id*.) and fails to explain why we should not be guided by the more general statements in the specification, such as the description in the specification that a "preferred maintenance advisory" can be based "on an expert system for fault isolation," which is in no way "recommended maintenance actions." Ex. 1001, 3:36–37.

We are not persuaded by Patent Owner's argument that "maintenance advice" must include recommended maintenance actions. Accordingly, we adopt the portion of the proposed definitions on which the parties agree and determine that the term "maintenance advice" means "problem-specific maintenance information." *See also* Dec. 7–8.

2. "configuration label"

Claim 4 also recites "wherein said digital aircraft performance data includes an identifier unique to a particular aircraft and a configuration

label." Petitioner proposes that the term "configuration label" be construed to mean "an indicator identifying or describing equipment onboard an aircraft." Pet. 15. In the Patent Owner Response, Patent Owner did not expressly propose a construction of "configuration label."

Outside of the claims, the '618 patent specification only uses the term "configuration label" once, in the following description:

> SMART 14 periodically samples the sensor signals 18, 22, 26, 44 converts all non-digital sensor signals 18, 22, 26, 44 into digital format, adds a sensor identification label to each signal 18, 22, 26, 44 plus an aircraft identification and *configuration label*.

Ex. 1001, 5:1–5 (emphasis added). In the prosecution history for the reissue application, Patent Owner addressed the term "configuration label" and stated that "even identical models of aircraft are likely configured differently" and that the "present invention circumvents this issue by transmitting the aircraft configuration along with the aircraft ID." Ex. 1004, 123–124. Patent Owner further stated that this configuration information could include "[n]avigational equipment, radios, avionics, instrumentation . . . hydraulic systems, electrical systems, flight controls, etc." *Id*. at 123. "[T]he prosecution history . . . is to be consulted even in determining a claim's broadest reasonable interpretation." *Straight Path IP Group, Inc. v. Sipnet EU S.R.O.*, 806 F.3d 1356, 1362 (Fed. Cir. 2015) (citing *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015)). Petitioner argues that the statements in the specification and the prosecution history require the broadest reasonable interpretation of "configuration label" to mean an indicator identifying or describing equipment onboard an aircraft, including the make, model, position, or version of an onboard system. Pet. 15.

For the reasons set forth by Petitioner, we agree with Petitioner's proposed construction. Accordingly, we construe the term "configuration label" to mean "an indicator identifying or describing equipment onboard an aircraft."

B. Principles of Law

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

In that regard, an obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418; *see also Translogic Tech.*, 504 F.3d at 1259. "If a person of ordinary skill [in the art] can implement a predictable variation, [and would see the benefit of doing so,] § 103 likely bars its patentability." *KSR*, 550 U.S. at 417. "[A] court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions." *Id*. After *KSR*, the Federal Circuit has recognized that obviousness is not subject to a "rigid

formula," and that "common sense of those skilled in the art demonstrates why some combinations would have been obvious where others would not." *Leapfrog Enters. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1161 (Fed. Cir. 2007).

> *KSR* expanded the sources of information for a properly flexible obviousness inquiry to include market forces; design incentives; the "interrelated teachings of multiple patents"; "any need or problem known in the field of endeavor at the time of invention and addressed by the patent"; and the background knowledge, creativity, and common sense of the person of ordinary skill.

Perfect Web Techs., Inc. v. InfoUSA, Inc., 587 F.3d 1324, 1329 (Fed. Cir. 2009) (quoting *KSR*, 550 U.S. at 418–21).

The level of ordinary skill in the art is reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

We analyze the asserted grounds of unpatentability in accordance with the above-stated principles.

C. Level of Ordinary Skill in the Art

According to Petitioner's Declarant, Dr. Helfrick, a person of ordinary skill in the art relevant to the '618 patent would have a "B.S. degree in electrical, systems, or computer engineering, or an FAA Mechanic Certificate with an airframe rating in accordance with 14 CFR part 65.71 and 65.85." Ex. 1002 ¶ 15. According to Patent Owner's Declarant, Mr. Grabowsky, a person of ordinary skill in the art relevant to the '618 patent would have "at least a B.S. degree in electrical, systems, or computer engineering, or an FAA Mechanic Certificate with an airframe rating in

accordance with 14 CFR part 65.71 and 65.85; as well as either an M.S. or equivalent work experience, such as 3-5 years of experience in avionics." Ex. 2011 ¶ 8. Thus, both declarants generally agree on the level of skill, although Mr. Grabowsky suggests experience is required in addition to the B.S. degree or the FAA Mechanic Certificate. *See id*.

Based on our review of the '618 patent, the types of problems and solutions described in the '618 patent and cited prior art, and the testimony of Petitioner's Declarant and Patent Owner's Declarant, we adopt Petitioner's definition of a person of ordinary skill in the art at the time of the claimed invention. We are not persuaded that the additional experience of an M.S. or equivalent work experience, such as 3-5 years of experience in avionics, is required, as suggested by Mr. Grabowsky, as we are unclear as to why the claimed subject matter is beyond the abilities of someone who otherwise meets applicable federal regulatory standards. Based on the stated qualifications of Dr. Helfrick (Ex. 1002 ¶¶ 5–9) and the stated qualifications of Mr. Grabowsky (Ex. 2011 ¶¶ 6–7), Petitioner's Declarant and Patent Owner's Declarant both meet the requirements of this definition. We note that the applied prior art also reflects the appropriate level of skill at the time of the claimed invention. *See Okajima*, 261 F.3d at 1355.

D. Alleged Non-Functional Descriptive Material and Intended Use Limitations

Petitioner argues that certain limitations in the challenged claims are non-functional descriptive material entitled to no patentable weight. Pet. 17. Petitioner argues that limitations in the challenged claims are analogous to limitations found to be non-functional descriptive material in the Board's decision in *Ex parte Nehls*, 88 USPQ2d 1883 (2008) (precedential). Pet. 17.

In *Ex parte Nehls*, the Board stated that "the nature of the information being manipulated does not lend patentability to an otherwise unpatentable computer-implemented product or process." 88 USPQ2d at 1889.

Here, Petitioner argues that claim 4 indicates that "digital aircraft performance data" is analyzed for the purpose of generating "maintenance advice," but nothing in the claims at issue specifies which types of "digital aircraft performance data" are used to generate such advice. Pet. 16–17 (quoting claim 4). Additionally, Petitioner argues that neither the specification nor the claims describe the use of configuration information or aircraft position information to generate maintenance advice. Pet. 18. Patent Owner counters that the '618 patent "specification expressly describes how various flight parameters are transmitted and subsequently 'analyzed in conjunction with [various data] to allow identification of maintenance problems, on-ground safety advisories and in-flight safety advisories,' including 'maintenance actions.'" PO Resp. 8 (quoting Ex. 1001, 2:30–38).

We are not persuaded by Petitioner that the limitations on the claimed "digital aircraft performance data" should be construed as non-functional descriptive material. In *Ex parte Nehls*, the Board stated that "'functional descriptive material' consists of data structures and computer programs which impart functionality when employed as a computer component." 88 USPQ2d at 1889. As discussed in the specification of the '618 patent and set forth in claim 4, the identifier unique to a particular aircraft and configuration label is explicitly considered by, and, thus, may alter the functionality of, the claimed "central station" that is "to receive and analyze said digital aircraft performance data to generate maintenance advice for

said aircraft." *See* Ex. 1001, 5:1–5, claim 4. We are unpersuaded by Petitioner's implication that a lack of express disclosure of how the identifier is used in generating the maintenance advice, or that in some cases the identifiers may not alter the generated maintenance advice, is sufficient to render such identifiers as non-functional descriptive material.

In addition to arguing that the claims contain limitations constituting non-functional descriptive material, Petitioner argues that these limitations amount to statements of intended use and should be not be afforded patentable weight. Pet. 19–21. More particularly, Petitioner argues that claim recitations of a transmitter "configured for transmission of digital aircraft performance data" and a central station "configured to receive and analyze said digital aircraft performance data" are merely statements of intended use. Pet. 20. We are not persuaded by Petitioner, however, that these limitations are merely statements of the intended use of the "transmitter" and "central station," but instead determine that they comprise structural limitations for these components of the claimed "aircraft maintenance system." For similar reasons as to why we are not persuaded by Petitioner's arguments with respect to non-functional descriptive material, we are not persuaded that these claim limitations are statements of intended use.

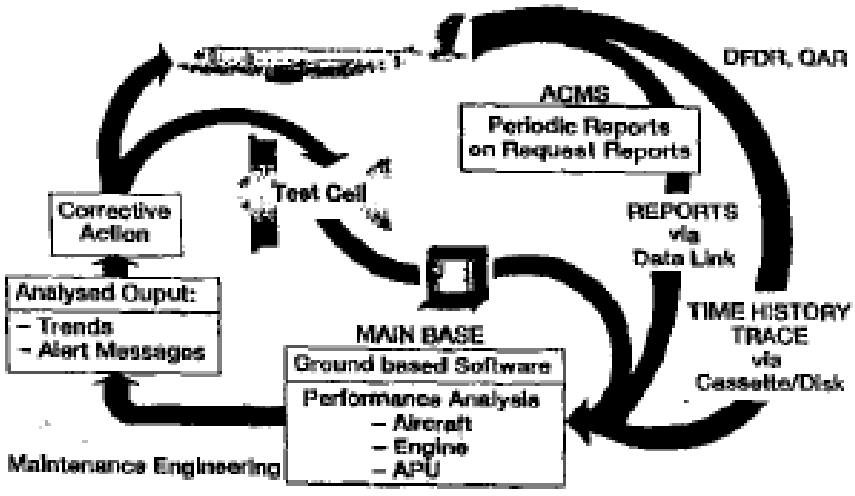
E. Asserted Obviousness of Claims 4, 5, 14, and 16 Based on Ward and ARINC 624-1

Petitioner argues that claims 4, 5, 14, and 16 would have been obvious in view of Ward and ARINC 624-1. Pet. 26–38; Pet. Reply 2–5. Patent Owner disputes Petitioner's position, arguing the proposed combination fails to render the challenged claims obvious. PO Resp. 26–29. We have

reviewed the Petition, Patent Owner's Response, Petitioner's Reply, and the relevant evidence discussed in those papers and other record papers. As described in further detail below, we determine that the record supports Petitioner's contentions for claims 4, 5, 14, and 16 challenged as obvious in view of Ward and ARINC 624-1, and we adopt Petitioner's contentions discussed below as our own. For reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 4, 5, 14, and 16 would have been obvious in view of Ward and ARINC 624-1.

1. Overview of Ward

Ward is titled "Power Plant Health Monitoring – The Human Factor" and provides a discussion of condition monitoring systems and particularly, various types of Engine Condition Monitoring ("ECM") systems that have been employed in gas turbine aero engines. Ex. 1015, 1. Figure 7 from Ward illustrates a condition monitoring system overview, and is reproduced below:

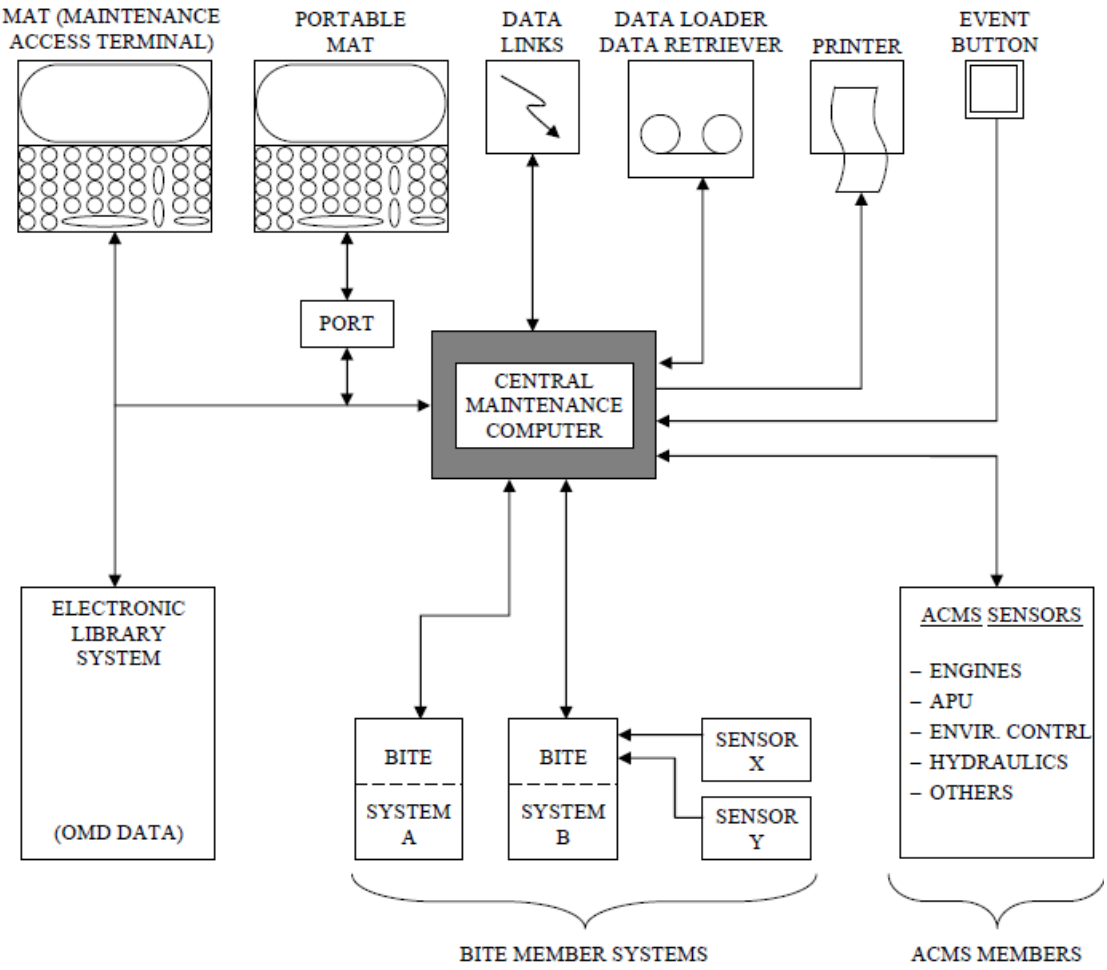


As shown above in Figure 7 from Ward, the system includes an airplane with an onboard Aircraft Condition Monitoring System ("ACMS") which can continually monitor the Aeronautical Radio, Inc. ("ARINC") databases.

Id. at 7. Ward discloses that the onboard ACMS system can send reports via near "real time" data links, such as an Aircraft Communications Addressing and Reporting System ("ACARS"). *Id*. Ward discloses that the ACARS system provides data links that allow a multitude of messages/data to be sent between an aircraft and the airline ground base using VHF communication satellites or ground network systems. *Id*.

2. Overview of ARINC 624-1

ARINC 624-1 is titled "Design Guidance for Onboard Maintenance System" and provides a discussion of an ACMS, which "monitors and records selected airplane data related to airplane maintenance, performance, troubleshooting, and trend monitoring," thereby "allowing the user to plan timely maintenance actions." The figure below from ARINC 624-1 illustrates an onboard maintenance system:



Ex. 1014, 57. The On-board Maintenance System ("OMS"), shown in the figure from ARINC 624-1 above, discloses a Central Maintenance Computer ("CMC") that collects fault and failure data aircraft systems. "Member systems fault detection and [Built-In Test Equipment] BITE will be the primary source of data used by the OMS for detection and isolation of internal LRU faults, internal system faults and external interface faults." *Id.* at 6. ARINC 624-1 discloses that the failures reported to the CMC should include a "[f]ailed LRU, part number or serial number, or interface." *Id.* at 9.

3. Analysis

Petitioner argues that claims 4, 5, 14, and 16 would have been obvious in view of Ward and ARINC 624-1. Pet. 26–38. In support of these asserted grounds of unpatentability, Petitioner provides its arguments and proffers a Declaration of Dr. Helfrick to support its contentions. Pet. 26–38; Ex. 1002.

a. Claim 4

Claim 4 recites a "transmitter configured for transmission of digital aircraft performance data across a communication network while said aircraft is in flight." With respect to this limitation in claim 4, Petitioner argues that Ward discloses an ECM system including an aircraft with an onboard ACMS, which collects data from "engine mounted units" and "other engine/flight/aircraft data" and transmits it to the ground via a data link, such as an ACARS system. Pet. 26–27 (quoting Ex. 1015, 7). Claim 4 also recites "a central station connected to said communication network configured to receive and analyze said digital aircraft performance data." With respect to this limitation in claim 4, Petitioner argues that Ward discloses that ACMS reports are provided to "ground based software" that performs a "performance analysis" and outputs "trends" and "alert messages" so that the airline can take "corrective action." Pet. 27 (citing Ex. 1015, 7). With respect to the claim 4 recitation of generating maintenance advice for the aircraft, Petitioner argues that Ward discloses a variety of maintenance advice is generated by the ground-based software by disclosing that an "expert system" uses condition monitoring data to automatically diagnose engine problems and direct the user to "maintenance manuals" that "complement the diagnosis." Pet. 27 (citing Ex. 1015, 11). In

fact, Ward discloses that its ECM system is capable of "*giving recommended maintenance action*" and Figure 12 discloses "Maintenance Engineering" including "Alert summaries (auto)," "engine trends," and "module trends." Ex. 1015, 11, Fig. 12 (emphasis added).

Petitioner admits that Ward does not expressly discuss the "configuration label," recited in claim 4. Pet. 27. Petitioner argues that ARINC 624-1 teaches the "configuration label" by disclosing a Central Maintenance Computer ("CMC") that integrates ACMS function and teaches reporting failures on an aircraft to a CMC, including the "part number or serial number" of a failed Line-Replaceable Unit ("LRU"). Pet. 28–29 (quoting Ex. 1014 §§ 3.3.1.1, 3.2.2.2.7). Petitioner also argues that ARINC 624-1 discloses in-flight transmission of "airplane data related to airplane maintenance, performance, troubleshooting and trend monitoring" to the ground for maintenance purposes. Pet. 28 (citing Ex. 1014 §§ 2.2.4, 3.4.1 ("The OMS should be designed to provide the capability to transmit data to the ground for advance initiation and preparation for maintenance actions. . . .")). Petitioner argues that ARINC 624-1 teaches a data link configured to transmit all of this fault information and associated configuration information, as well as ACMS reports, to the ground. Pet. 29 (Ex. 1014 § 2.2.4).

Petitioner further argues that it would have been obvious to one of skill in the art to combine Ward and ARINC 624-1 in the manner set forth the Petition, as both references disclose using ACMS to collect aircraft performance data and the use of an ACARS system to transmit the data to a ground station. Pet. 30 (citing Ex. 1002 ¶¶ 75, 76 (Dr. Helfrick states that he believes "it would have been obvious to a skilled artisan to combine Ward

and ARINC 624-1 because ARINC 624-1 is a standard directed to the very types of on-board systems discussed in Ward.")). Additionally, Petitioner contends that ARINC publishes standards for the aviation industry, developed by committees that include aircraft manufacturers, avionics manufacturers, and airlines, and that the ACARS transmitter disclosed in Ward is based on, and, thus, would follow, an ARINC standard. Pet. 30 (citing Ex. 1002 ¶¶ 23, 75). Also, Petitioner contends that both Ward and ARINC 624-1 discuss utilizing (1) onboard maintenance systems including ACMS to collect aircraft performance data and (2) an ACARS transmitter to transmit such data to a ground station. Pet. 30. Petitioner adds that ARINC 624-1 provides an explicit motivation to utilize Ward's ground based maintenance analysis software in implementing its maintenance system, because ARINC 624-1 states that "if known in advance of an airplane's arrival at a terminal, selected information held in the OMS central maintenance computer's memory could be useful to line maintenance personnel in planning timely corrective action." Pet. 30–31 (quoting Ex. 1014 § 2.2.4). We agree, for the reasons stated by Petitioner, that, given the similarity and overlap in disclosures, and applicability of the ARINC standard to the ACARS transmitter of Ward, a person of skill in the art would have been motivated to improve the system in Ward with the teachings in ARINC 624-1.

In view of the foregoing, we determine Petitioner has presented and sufficiently established an "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness" with respect to claim 4 for this ground, and we adopt its contentions as our own. *KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

Patent Owner argues that Petitioner's challenge based on Ward and ARINC 624-1 is deficient because Petitioner fails to identify a transmitter in either reference that is "portable," as set forth in claim 4. PO Resp. 26. Patent Owner provides that the parties agreed in the related District Court action that "transmitter portable" and "transmitter positionable" be construed to mean "a removable device for generating radio frequency signals." PO Resp. 27 (quoting Ex. 2001 (Joint Claim Construction and Prehearing Statement), 1). As discussed in our Decision on Institution, the plain and ordinary meaning of "removable" is "capable of being removed, displaced, transferred, dismissed or eradicated." Dec. 15 (citing Ex. 3002, Webster's Third New International Dictionary 1971, 3). Thus, in order for the transmitter device to be "removable" or "positionable," a person of ordinary skill in the art would simply need to be able to change the location of the transmitter. Patent Owner stated in its Response that it "does not challenge" this construction. PO Resp. 27.

Petitioner argues that "Ward discloses a transmitter portable to be placed on an aircraft." Pet. 33 (citing Ex. 1015, 7) (emphasis removed). More particularly, Ward discloses that the data link to the ground systems is an ACARS system, a system that includes a transmitter. Ex. 1015, 7. Furthermore, Petitioner offers Dr. Helfrick's statement that the general ACARS standard, provided in ARINC 618–1 (Ex. 1020), discloses that a standards-compliant ACARS system provides an ACARS Management Unit, which could be connected to a (1) VHF transceiver to access the VHF ACARS air-ground network, (2) an HF transceiver to access the HF data network, or (3) a Satellite Data Unit ("SDU") to access the SATCOM ACARS air-ground network. Ex. 1002 ¶ 25 (citing Ex. 1020 § 1.5.2).

Dr. Helfrick states that each of the industry standards for the VHF, HF, and SDU transmitters, used in conjunction with ACARS, requires that these transmitters be Line Replaceable Units ("LRUs"). Ex. 1042 ¶ 4 (citing Ex. 1020 § 1.8). For example, Dr. Helfrick cites to the standard for the Aviation Satellite Communication System, ARINC 741P17, which states "satellite system avionics suite comprises sub-systems made up of *multiple line replaceable units (LRUs)*" each of which must be "designed to be autonomous for installation purposes." *Id.* ¶ 4 (citing Exhibit A § 1.7) (emphasis added). Dr. Helfrick states that a Line Replaceable Unit ("LRU") is a piece of hardware that can be exchanged for a replacement part in a relatively short time, typically at the gate, by only opening and closing fasteners and connectors. *Id*. ¶ 1.

Significantly, the '618 patent specification expressly discloses that the transmitter in an embodiment of the claimed invention in the '618 patent is a Line Replaceable Unit ("LRU"). Ex. 1001, 4:57–59 ("FIG. 1 shows an aircraft 10 equipped with a Sensor Multiplexer Receiver & *Transmitter (SMART) 14 which is a line replaceable unit*." (emphasis added)). Accordingly, we are persuaded that a person of ordinary skill in the art would have understood that the transmitters in an ACARS systems were LRUs and, thus, removable and capable of changing location. *See* Pet. Reply 4–5; Ex. 1002 ¶ 25; Ex. 1042 ¶¶ 1, 4.

Patent Owner argues that the VHF and HF transceivers for the ACARS system could have been built into a specific location in the aircraft that would prevent them from being removable or capable of changing location. PO Resp. 28. We are not persuaded by Patent Owner's argument because such a configuration of the components of an ACARS system would

go against the requirements of the ACARS system standards that the transmitters used in conjunction with ACARS must be Line Replaceable Units. *See* Pet. Reply 3–4 (citing Ex. 1042 ¶¶ 3, 4 (citing Ex. 1020 § 1.8)). We determine the record supports Petitioner's contention that it would have been obvious to a person of ordinary skill in the art that the ACARS system disclosed in each of Ward and ARINC 624-1 would have been portable/positionable.

For these reasons, we are persuaded that the record supports Petitioner's contention that claim 4 would have been obvious over Ward in view of ARINC 624-1.

b. Claims 5, 14, and 16

Claim 5 depends from claim 4 and further recites a "sensor multiplexer" having inputs for "receiving aircraft performance and control parameters from existing aircraft sensors" and an output for providing "digital aircraft performance data" to the transmitter. With respect to claim 5, Petitioner argues that Ward discloses an ACMS that records all instruments and data sources and receives data from engine mounted units. Pet. 35 (citing Ex. 1015, 5, Fig. 8). More particularly, Ward discloses that its system provides for the "integrated recording of all instruments and data sources (some of which have been fitted specifically for monitoring) on all pieces of equipment in use." Ex. 1015, 5. Figure 8 of Ward is reproduced below.

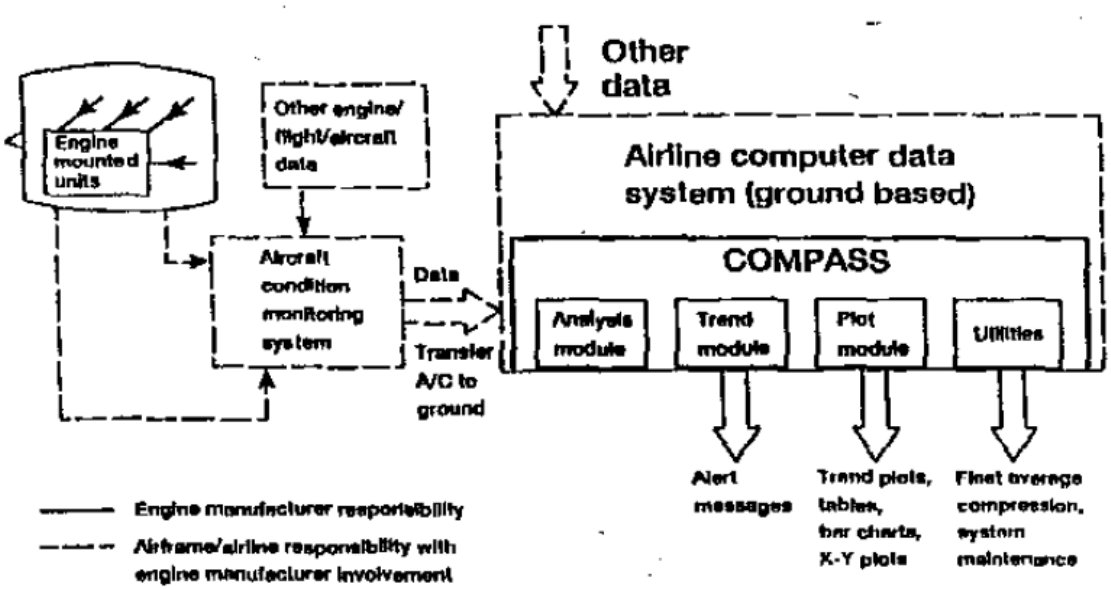


Fig. 8 Schematic of Aircraft/COMPASS interface

Ex. 1015, Fig. 8. As shown in Figure 8 above, Ward discloses that the inputs can include data from "engine mounted units" and "other engine/flight/aircraft data." *Id*. Petitioner also argues that Ward discloses that the ACMS is connected to an ACARS transmitter or other datalink. Pet. 36 (citing Ex. 1015, 7). Petitioner further argues that ARINC 624-1 discloses the limitations of claim 5 by disclosing that the ACMS had the capability to provide reports with programmable parameters to be recorded and supply those reports to an output device. Pet. 36 (citing Ex. 1014, §§ 8.2.6, 8.3). We determine the record supports Petitioner's contention that the "sensor multiplexer" in claim 5 would have been obvious over Ward in view of ARINC 624-1.

Independent claim 14 recites limitations similar to those recited in claims 4 and 5. Petitioner's arguments with respect to claim 14 rely upon

the same arguments set forth in claims 4 and 5. Pet. 37–38. For the reasons explained above in connection with claims 4 and 5, we are persuaded that the record supports Petitioner's contentions that claim 14 would have been obvious over Ward in view of ARINC 624-1.

Claim 16 depends from claim 14 and requires that the "ground based station" include "a storage system for archiving said aircraft performance and control parameters." With respect to claim 16, Petitioner argues that Ward discloses a COMPASS system that performs "data management and storage." Pet. 38 (citing Ex. 1015, 9). Additionally, Petitioner argues that Ward's system stores and processes data from an operator's equipment in order to assist in making decisions. *Id*. (citing Ex. 1015, 4). We determine the record supports Petitioner's contention that the "storage system" in claim 16 would have been obvious over Ward in view of ARINC 624-1.

c. Conclusion

We have reviewed the parties' arguments and supporting evidence regarding the ground of obviousness based on Ward in view of ARINC 624-1. We are persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence, that claims 4, 5, 14, and 16 would have been obvious over Ward in view of ARINC 624-1.

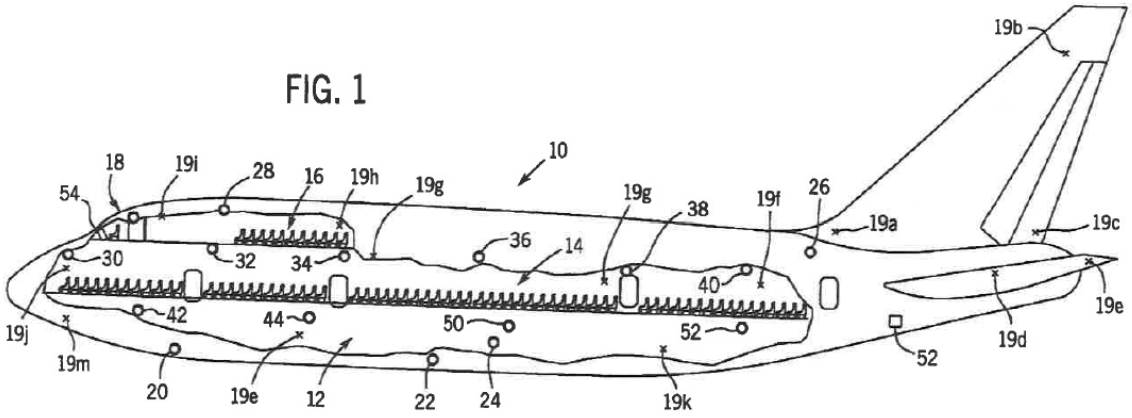
F. Asserted Obviousness of Claims 8, 9, and 10 Based on Ward, ARINC 624-1, and Monroe

Petitioner argues that claims 8, 9, and 10 of the '618 patent would have been obvious in view of Ward, ARINC 624-1, and Monroe. Pet. 31–38; Pet. Reply 2–5. Patent Owner responds that Petitioner's challenge fails because it can swear behind the Monroe reference. PO Resp. 13–24. We have reviewed the Petition, Patent Owner's Response, Petitioner's Reply,

and the relevant evidence discussed in those papers and other record papers. As described in further detail below, we determine that the record supports Petitioner's contentions that claims 8, 9, and 10 of the '618 patent would have been obvious in view of Ward, ARINC 624-1, and Monroe, and we adopt Petitioner's contentions discussed below as our own. For reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 8, 9, and 10 of the '618 patent would have been obvious in view of Ward, ARINC 624-1, and Monroe.

1. Overview of Monroe

Monroe is titled "Acoustic Catastrophic Event Detection And Data Capture And Retrieval System For Aircraft" and discloses an acoustic sensor system for detecting failures or terrorist events in commercial aviation and is adapted for assisting in the detection and post event analysis of such events. Ex. 1017, Abstract. Figure 1 from Monroe illustrates a portion of this system and is reproduced below:



Ex. 1017, Fig. 1. As shown above in Figure 1 from Monroe, aircraft fuselage 10 is provided with multiple audio sensor devices 19a–19m, "for detecting acoustic energy and transmitting a signal which may be

transmitted to [the] ground, recorded in a 'black box' recorder, monitored on board, and[] analyzed for action." *Id.* at 4:66–5:8. Monroe further discloses that other signals can be collected for recording, transmission, and monitoring, including "global positioning" data. *Id.* at 8:1–17.

2. Analysis

Petitioner argues that claims 8, 9, and 10 would have been obvious in view of Ward, ARINC 624-1, and Monroe. Pet. 31–38.

a. Status of Monroe as Prior Art

Patent Owner argues that Monroe does not qualify as prior art because Patent Owner can swear behind Monroe. PO Resp. 13–21. Patent Owner argues that Monroe has an effective filing date no earlier than October 11, 1996. *Id*. at 13. Patent Owner states that Mr. Levine, the named inventor of the '618 patent, conceived of his invention as early as May of 1996, prior to the earliest effective date of Monroe. *Id*. at 14–15 (citing Ex. 2009 ¶ 2; Ex. 2002). Furthermore, Patent Owner argues that reasonable diligence was exercised from before Monroe's earliest effective date, October 11, 1996, until Patent Owner's alleged constructive reduction to practice on December 17, 1996. *Id*. at 20. Petitioner disagrees in almost every respect, asserting that Patent Owner has not provided sufficient corroboration of conception, and that even if conception was shown, that Patent Owner was not reasonably diligent in reducing that conception to practice. Pet. Reply 10–21.

An inventor may swear behind a reference if he was the first to conceive of a patentable invention, and then connects the conception of his invention with its reduction to practice by reasonable diligence on his part, such that conception and diligence are substantially one continuous act.

Mahurkar v. C.R. Bard, Inc., 79 F.3d 1572, 1577 (Fed. Cir. 1996). An inventor's testimony, standing alone, is insufficient to prove conception and diligence, as some form of corroboration is required. *Mahurkar*, 79 F.3d at 1577; *Price v. Symsek*, 988 F.2d 1187, 1194 (Fed. Cir. 1993). A rule of reason applies to determine whether the inventor's testimony has been corroborated. *Price*, 988 F.2d at 1194. "A patent owner . . . must show there was *reasonably continuous* diligence." *Perfect Surgical Techniques, Inc. v. Olympus Am., Inc.*, 841 F.3d 1004, 1009 (Fed. Cir. 2016) (citations omitted) (vacating and remanding the Board's decision finding Patent Owner had not proven the inventor was reasonably diligent in reducing his invention to practice).

A party alleging diligence must provide corroboration with evidence that is specific both as to facts and dates. *Gould v. Schawlow*, 363 F.2d 908, 920 (CCPA 1966); *Kendall v. Searles*, 173 F.2d 986, 993 (CCPA 1949). The rule of reason does not dispense with the need for corroboration of diligence that is specific as to dates and facts. *Gould*, 363 F.2d at 920; *Kendall*, 173 F.2d at 993; *see also Coleman v. Dines*, 754 F.2d 353, 360 (Fed. Cir. 1985) ("The rule of reason . . . does not dispense with the requirement for some evidence of independent corroboration.").

The inventor of the '618 patent, Seymour Levine, submitted a Declaration (Ex. 2009) testifying that he conceived of the inventions disclosed in the '618 patent on or before May 18, 1996, and that he recorded the details of his invention in handwritten notes contained in Ex. 2002. Ex. 2009 ¶ 2. Mr. Levine also testifies that sometime prior to the September 27, 1996, he contacted patent attorney Norton Townsley to obtain a patent. *Id.* ¶ 3. Mr. Levine states that prior to contacting Mr. Townsley, he

converted his original notes into a draft invention disclosure. *Id*. ¶ 4. Mr. Levine testifies that a "true and correct copy of one version of the invention disclosure is contained in Exhibit 2003," but that he "provided an earlier version of this draft invention disclosure to Mr. Townsley." *Id*. Mr. Levine testifies that the draft invention disclosures were recorded by him at or near the time indicated on Exhibit 2003 (October 9, 1996) ("October 9, 1996 Invention Disclosure"). *Id*.; *see* Ex. 2003.

Conception is defined as "the complete performance of the mental part of the inventive act" and it is "the formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention as it is thereafter to be applied in practice." *Townsend v. Smith*, 36 F.2d 292, 295 (CCPA 1929). "Conception requires an idea to be so 'definite and permanent' that 'all that remains to be accomplished . . . belongs to the department of construction.'" *Dawson v. Dawson*, 710 F.3d 1347, 1355 (Fed. Cir. 2013) (citation omitted). "Conception exists when a definite and permanent idea of an operative invention, including *every feature of the subject matter sought to be patented*, is known." *Sewall v. Walters*, 21 F.3d 411, 415 (Fed. Cir. 1994) (emphasis added). Furthermore, "[t]he conception analysis necessarily turns on the inventor's ability to describe his invention with particularity. Until he can do so, he cannot prove possession of the complete mental picture of the invention." *Burroughs Wellcome Co. v. Barr Labs., Inc.*, 40 F.3d 1223, 1228 (Fed. Cir. 1994) .

Petitioner identifies that independent claim 4 of the '618 patent, and the claims depending on it, require "[a]n aircraft maintenance system for use

on an aircraft having a flight data recorder." Pet. Reply 15.[10] Furthermore, Petitioner identifies that claims 8–10 all require "aircraft position data directed to said flight data recorder." *Id*. Petitioner argues that Mr. Levine's October 9, 1996 Invention Disclosure is insufficient, because it does not reflect the conception of the invention that Patent Owner ultimately claimed, which requires two data recorders—one onboard the aircraft and a second, remote recorder on the ground. *Id*. We do not agree with Petitioner's argument that claims 4 and 8–10 require a flight data recorder on the ground, as claim 4 merely recites a "central station" "configured to receive and analyze said digital aircraft performance." We do agree, however, with Petitioner's argument that the express language of independent claim 4 requires "an *aircraft having a flight data recorder*." Furthermore, claim 4 requires that the "digital aircraft performance data," which the "central station" is configured to receive and analyze, is "data directed to the flight data recorder." Thus, the invention recited in independent claim 4, and its dependent claims, must include a flight data recorder onboard the aircraft and, separately, a central station configured to receive and analyze data directed to the onboard flight data recorder.

[10] The recitation "[a]n aircraft maintenance system for use on an aircraft having a flight data recorder" appears in the preamble of claim 4. "In general, a preamble limits the invention if it recites essential structure or steps, or if it is 'necessary to give life, meaning, and vitality' to the claim." *Catalina Marketing Int'l., Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002) (quoting *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999)). Here, the body of claim 4 refers to "the flight data recorder" as an active limitation in the claim. Therefore, we determine that the preamble is limiting for claim 4.

Patent Owner argues that the October 9, 1996 Invention Disclosure contains evidence that Mr. Levine had a "definite and permanent" idea of each concept claimed in the '618 patent prior to the earliest date of Monroe. PO Resp. 16. Specifically, Patent Owner argues that claim 4's recitation of "an aircraft having a flight data recorder" is set forth by disclosure of transmission signals "presently sent to the *existing flight crash recorders aboard the aircraft*" in the October 9, 1996 Invention Disclosure. *Id*. (citing Ex. 2003, 6) (emphasis added). Petitioner disagrees. Pet. Reply 15. We agree with Petitioner.

Contrary to Patent Owner's arguments, we are not persuaded that the above-cited portion of the October 9, 1996 Invention Disclosure discloses "an aircraft having a flight data recorder," as required by claim 4. In fact the October 9, 1996 Invention Disclosure describes how its system, which relies upon a "ground based recorder," is superior to the prior art systems with "flight crash recorders aboard the aircraft." Ex. 2003, 1, 6. The cited paragraph of the October 9, 1996 Invention Disclosure provides the following:

> Referring to Figure 1, the aircraft is fitted with a device, named Sensor Multiplexer Receiver & Transmitter (SMRT) module, that accepts sensor signals that depict the performance of many of the flight safety critical assemblies. It converts any of the analog sensor data into a digital format. *These signals are the same as those that are presently sent to the existing flight crash recorders aboard aircraft* which records vital flight information such as air speed, height, attitude, landing gear status as well as the position of the aircraft controls. *Unlike the existing crash recorder that must be recovered from a crash site* to obtain an understanding of the cause of the aircraft, the system depicted in Figure 1 has a telemetry system to radio the these signals to a

> world wide communication system and to a final destination known as the Central Ground Based Processing Station (CGBS).

Ex. 2003, 6 (emphasis added). Therefore, the October 9, 1996 Invention Disclosure describes that its ground based recorder system uses the same signals "that *are presently sent* to the existing flight crash recorders aboard aircraft," but that the ground based recorder system is superior because it is not onboard and does not have to be "recovered from a crash site." *Id*. (emphasis added). To overcome the alleged disadvantages of onboard flight data recorders, the October 9, 1996 Invention Disclosure discloses "a *remote located flight crash recorder* and a real time aircraft pilot crash avoidance safety advisory system," which continuously monitors aircraft sensors with a SMRT module and sends the parameters via satellite communication links to a "central ground monitoring station." Ex. 2003, 1. The October 9, 1996 Invention Disclosure further discloses that an additional advantage of the ground based recorder system is that because it is "on the ground [its] temperature environment, humidity and air can be controlled so that the archive storage of the aircraft's sensor data is very reliable." *Id*. at 8. We find that, in the October 9, 1996 Invention Disclosure, Mr. Levine did not consider "an aircraft having a flight data recorder" as part of the invention set forth in that document as the disclosure illustrates that Mr. Levine perceived his ground-based system to be a replacement to the prior art onboard flight data recorder.

In addition to the failure of Patent Owner to identify any disclosure in the October 9, 1996 Invention Disclosure that the invention includes an onboard flight data recorder, there is evidence directly on-point that Mr. Levine expressly conceded that the October 9, 1996 Invention

Disclosure did not require "an aircraft having a flight data recorder." *See* Ex. 1043, 76:13–17. At deposition, Mr. Levine stated the following:

> Q. Okay. But your invention, as you can see at least at this time, October 9th, 19[96], it didn't require that there also be a flight data recorder on the aircraft. Correct?
> A. *No. It didn't require it.*

Ex. 1043, 76:13–17 (emphasis added). Again, here, we have an unambiguous concession, from Mr. Levine himself, that the invention set forth at the time of the October 9, 1996 Invention Disclosure did not require an "aircraft having a flight data recorder," as required by independent claim 4 and its dependent claims. Therefore, we are not persuaded that the October 9, 1996 Invention Disclosure sufficiently corroborates Mr. Levine's testimony that he had a "definite and permanent" idea of each concept claimed in the challenged claims of the '618 patent prior to the earliest effective date of Monroe.). *See Sewall v. Walters*, 21 F.3d 411, 415 (Fed. Cir. 1994) ("Conception exists when a definite and permanent idea of an operative invention, including *every feature of the subject matter sought to be patented*, is known.") (emphasis added).

Other than Exhibit 2003, Patent Owner's Response does not provide an analysis of any other potentially corroborating evidence, such as an invention disclosure, other document, or testimony, that Mr. Levine had a "definite and permanent" idea of each concept claimed in the '618 patent prior to the earliest effective date of Monroe. *See* PO Resp. 16. In Patent Owner's Opposition to Petitioner's Motion to Exclude Exhibits 2002–2004, Patent Owner provides a table comparing Exhibit 2002 to claims 4–10 of the '618 patent. Paper 41 ("Opp."), 10–13. For purposes of completeness, we consider this table. With respect to the recitation of an "aircraft having a

flight data recorder" recited in claim 4, Patent Owner cites the statement in Exhibit 2002 that "since the equipment need not survive/function after a crash, the equipment can be designed to be more compact, more reliable and more cost effective than the present day crash recorders." *Id*. at 11 (citing Ex. 2002, 4233). Patent Owner fails to explain sufficiently how these statements provide a definite and permanent idea that Mr. Levine's invention as of these May 18, 1996 notes included an "aircraft having a flight data recorder," as recited in claim 4. In fact, the disclosure that "*since the equipment need not survive/function after a crash*, the equipment can be designed to be more compact, more reliable and more cost effective than the present day crash recorders" (Ex. 2002, 4233 (emphasis added)) implies that a flight data recorder is not present aboard the aircraft, but some other set of less durable equipment that need not survive the crash. Patent Owner also argues that Exhibit 2002 discloses a system that "provides world-wide telemetry of the aircraft sensors including those that go to the flight recorders." Opp. 10 (quoting Ex. 2002, 4231). This statement from Exhibit 2002 implies that the new system handles data from all aircraft sensors, even data that previously went to the flight recorders, but makes no statement about whether the new system must include a flight data recorder onboard the aircraft. *See* Ex. 2002, 4231. Furthermore, Exhibit 2002 states that the new system "eliminates the deficiencies in the present day aircraft flight recorders" by sending the data to a central data processing and analysis station where ground processing can perform extensive real time analysis. Ex. 2002, 4231. Thus, even considering this table, which was not relied upon in Patent Owner's conception arguments set forth in the Patent Owner Response but presented Patent Owner's Opposition to Petitioner's Motion to

Exclude, we are not persuaded that Exhibit 2002 provides a definite and permanent idea of an "aircraft maintenance system for use on an aircraft having a flight data recorder." *See, e.g.*, *Mycogen Plant Science, Inc. v. Monsanto Co.*, 252 F.3d 1306, 1314 (Fed. Cir. 2001) ("Conception requires contemporaneous recognition and appreciation of the limitations of the claimed invention, not merely fortuitous inherency."). Furthermore, we are not persuaded that anything in Exhibit 2002 overcomes the unambiguous concession, from Mr. Levine himself, that the invention did not require an "aircraft having a flight data recorder." Ex. 1043, 76:13–17.

Upon reviewing the record as a whole under the "rule of reason," we determine that the evidence does not establish that Mr. Levine conceived the invention of the challenged claims prior to the earliest date of Monroe. We, therefore, find that Petitioner has met its burden of proving that Monroe is prior art to the challenged claims..

b. Analysis of Alleged Obviousness Based on Ward, ARINC 624-1, and Monroe

Claim 8 depends from claim 1 and recites that "digital aircraft performance data includes *aircraft position data* directed to said flight data recorder" (emphasis added). Petitioner argues that claim 8 would have been obvious in view of Ward, ARINC624-1, and Monroe, because Monroe discloses an aircraft monitoring system that collects sensor data, including "global positioning" data, records it in a flight recorder, and transmits it to the ground during flight for analysis. Pet. 31 (citing Ex. 1017, 8:1–17, Fig. 12). Figure 12 of Monroe is reproduced below.

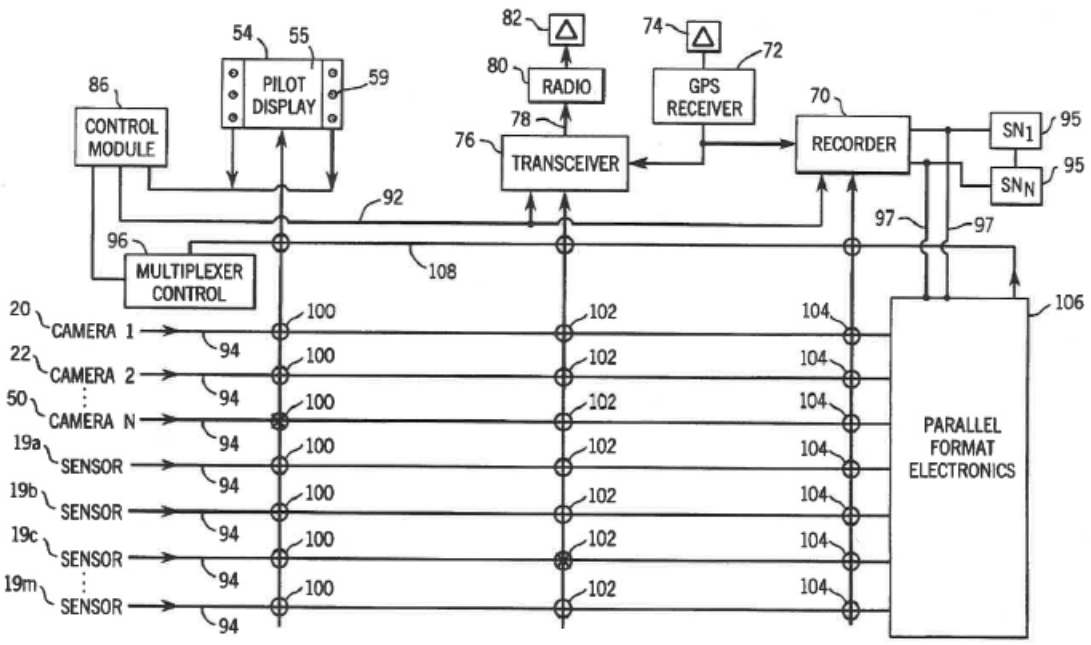


FIG. 12

Ex. 1017, Fig. 12. Petitioner argues that Figure 12 of Monroe illustrates how data from GPS receiver 72 and other sensor data 95 is provided to recorder 70 and to transceiver/radio 76/80 for transmission to the ground. Pet. 36 (citing Ex. 1017, 7:4–29, 8:1–17, Fig. 2). Furthermore, Petitioner argues that it would have been obvious to one of ordinary skill in the art to combine Monroe with Ward and ARINC 624-1, because each discloses a system for transmitting data collected and recorded onboard the aircraft during flight to the ground for analysis. Pet. 32; Ex. 1002 ¶ 77. Additionally, Petitioner argues that Monroe provides a motivation to combine position data with other sensor data that is transmitted to the ground, because it teaches that such data is of "great value" when reconstructing in-air incidents. Pet. 32 (citing Ex. 1017, 6:54–55); Ex. 1002 ¶ 77. We agree that a person of ordinary skill in the art would have been motivated to combine Monroe with Ward and ARINC 624-1 to improve the combined system for the reasons articulated by Petitioner.

Other than arguing that Monroe is not prior art, Patent Owner's Response does not present additional arguments for claim 8 with respect to this challenge. *See generally* PO Resp. 13–21. We determine the record adequately supports Petitioner's contentions that claim 8 would have been obvious in view of Ward, ARINC624-1, and Monroe, and we adopt Petitioner's contentions as our own.

Claim 9 depends from claim 8, and recites that "information provided by a GPS receiver is used in the calculation of said aircraft position data." With respect to claim 9, Petitioner argues that Monroe discloses that a GPS receiver is used in the calculation of position data that is transmitted to a recorder and to the ground. Pet. 36–37 (citing Ex. 1017, 2:53–56, 3:33–39, 6:55–60, 8:52–56, Figs. 8, 12). Monroe discloses that

> the system is adapted for incorporating the data signal generated by the aircraft navigational data such as that provided by a global positioning system (GPS) for tracking the altitude, latitude and longitude coordinates synchronized with the collected data in order to provide accurate information of where the aircraft is in its flight plan when an incident occurs.

Ex. 1017, 3:33–39. Other than arguing that Monroe is not prior art, Patent Owner's Response does not present additional arguments for claim 9 with respect to this challenge. *See generally* PO Resp. 13–21. We determine the record adequately supports Petitioner's contentions that claim 9 would have been obvious in view of Ward, ARINC624-1, and Monroe, and we adopt Petitioner's contentions as our own.

Claim 10 depends from claim 9, and recites that "information provided by an inertial navigation system is used in the calculation of said aircraft position data." With respect to claim 10, Petitioner argues that Monroe discloses using information provided by an inertial navigation

system in calculation of the aircraft position. Pet. 37 (citing Ex. 1017, 4:18–22). Monroe discloses "a system for linking recorded acoustic data with an inertial navigation system or other navigational data source such as, by way of example, a global positioning system for archival purposes." Ex. 1017, 4:18–22. Furthermore, Dr. Helfrick testifies that "commercial INS systems in 1991 already used GPS input to correct INS positional information." Ex. 1002 ¶ 79. Other than arguing that Monroe is not prior art, Patent Owner's Response does not present additional arguments for claim 10 with respect to this challenge. *See generally* PO Resp. 13–21. We determine the record adequately supports Petitioner's contentions that claim 10 would have been obvious in view of Ward, ARINC624-1, and Monroe, and we adopt Petitioner's contentions as our own.

We have reviewed the parties' arguments and supporting evidence regarding the proposed ground of obviousness based on Ward, ARINC 624-1, and Monroe. On the record before us, we are persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence, that claims 8, 9, and 10 of the '618 patent would have been obvious in view of Ward, ARINC 624-1, and Monroe.

G. Asserted Obviousness of Claims 4, 5, 14, and 16 Based on Dyson in view of Chetail

Petitioner argues that claims 4, 5, 14, and 16 would have been obvious over Dyson in view of Chetail. Pet. 38–47; Pet. Reply 2–5, 23–26. Patent Owner disputes Petitioner's position, arguing the proposed combination fails to render the challenged claims obvious. PO Resp. 29–36. We have reviewed the Petition, Patent Owner's Response, Petitioner's Reply, and the relevant evidence discussed in those papers and other record papers. As

described in further detail below, we determine that the record supports Petitioner's contentions for claims 4, 5, 14, and 16 would have been obvious over Dyson in view of Chetail, and we adopt Petitioner's contentions discussed below as our own. For reasons that follow, we determine that Petitioner has met its burden of showing, by a preponderance of the evidence, that claims 4, 5, 14, and 16 would have been obvious over Dyson in view of Chetail.

1. Overview of Dyson

Dyson is titled "Commercial Engine Monitoring Status at GE Aircraft Engines" and provides a discussion of the design and development of commercial engine monitoring systems at GE Aircraft Engines. Ex. 1019, 22-1. Dyson discloses Aircraft Integrated Monitoring System ("AIMS") enabled to tag acquired data with the appropriate serial number. *Id*. at 22-4. Figure 4 from Dyson illustrates the flow of engine monitoring data and is reproduced below:

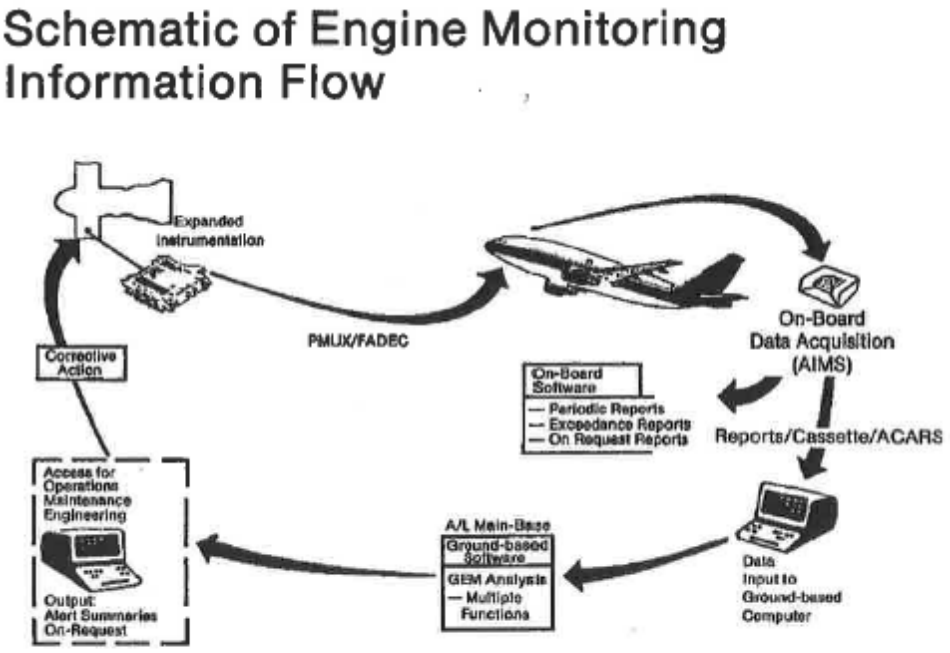


Figure 4

As shown above in Figure 4 from Dyson, the system includes onboard data acquisition (AIMS) and the capability to transmit that data via an ACARS system to Ground-based computer. *Id*. at 22-4 to 22-5. Dyson discloses that a Ground-based Engine Monitoring ("GEM") system can provide the capability to analyze and monitor a wide range of engine thermodynamic and mechanical functions. *Id*.

2. Overview of Chetail

Chetail is titled "LE CFM 56-5 SUR A320 A Air France" and provides a description of Air France's ground-based monitoring of jet-engine cruising data. Ex. 1018, 15-1. Chetail describes that GEM Processing can be used to process data in real time and to recognize commonplace errors as soon as they appear. *Id*. at 15-3. Chetail further describes that messages regarding errors and alarms can be sent to the main maintenance base at the Charles de Gaulle airport. *Id*.

3. Analysis

Petitioner argues that claims 4, 5, 14, and 16 would have been obvious over Dyson in view of Chetail. Pet. 39–47.

a. Claim 4

With respect to claim 4, Petitioner argues that Dyson discloses a commercial engine monitoring system for GE Aircraft engines for use on aircraft having a flight data recorder. Pet. 39–42 (citing Ex. 1019, 22-1, Fig. 8). With respect to the "transmitter" recited in claim 4, Petitioner argues that Dyson discloses an ACARS system that includes a transmitter that provides digital aircraft performance data to the Aircraft Integrated Monitoring System ("AIDS"). Pet. 42 (citing Ex. 1019, 22-3 to 22-4). Regarding the "central station" to "generate maintenance advice" recited in claim 4, Petitioner argues that Dyson discloses "Ground-Based Engine Monitoring" including the generation of alert messages based on trend analysis. Pet. 43 (citing Ex. 1019, 22-4 to 22-7). Dyson discloses that advances in engine monitoring include "[d]evelopment of software analysis techniques and availability of computer facilities to guide troubleshooting, maintenance, logistic support, and planning." Ex. 1019, 22-10. With respect to the claim 4 requirement that the "digital aircraft performance data" includes "an identifier unique to a particular aircraft and a configuration label," Petitioner argues that Dyson references ACARS, which requires messages to identify the aircraft. Pet. 43 (citing Ex. 1019, Fig. 4). Dr. Helfrick testifies that ARINC 618-1 requires that messages sent by ACARS must include an aircraft registration mark, which identifies the aircraft. Ex. 1002 ¶ 33 (citing Ex. 1020 § 2.2.3 ("The MU should not transmit any downlink messages unless it has a valid aircraft registration mark.")).

Petitioner argues that Dyson discloses all elements of claim 4, except that it does not expressly discuss "maintenance advice" being generated "while said aircraft is in flight," as recited in claim 4. Pet. 40. Therefore, Petitioner relies upon Chetail's disclosure of real time processing of engine monitoring data. Pet. 40 (citing Ex. 1018, 15-3). Petitioner argues that Chetail discloses Air France's operational experience with "ground-based monitoring of jet-engine cruising data" where data is sent to the ground by an ACARS system. *Id.* (citing Ex. 1018, 15-2). Chetail discloses that "data is processed in real time using the GEM program (version 10.0), and automatic monitoring is programmed which seeks to recognize commonplace errors as soon as they appear." Ex. 1018, 15-3.

Petitioner further argues that it would have been obvious to one of skill in the art to combine Dyson and Chetail, because they were published in the same volume of conference proceedings and describe the very same commercially-available system for ground-based analysis. Pet. 41. Specifically, Petitioner argues that both references describe the GEM software system from General Electric. *Id*. Therefore, as both references discuss the GEM system, Petitioner argues that a person of ordinary skill in the art would have readily understood the "real time" analysis disclosed in Chetail is merely an application of the GEM system described in Dyson. *Id.* (citing Ex. 1018, 15-3). We agree that given the related disclosure of GEM systems, a person of ordinary skill in the art would have been motivated to improve the Dyson system with the disclosures in Chetail in the proffered manner.

In view of the foregoing, we determine Petitioner has presented and sufficiently established an "articulated reasoning with some rational

underpinning to support the legal conclusion of obviousness" with respect to claim 4 for this ground, and we adopt its contentions as our own. *KSR*, 550 U.S. at 418 (citation omitted).

Patent Owner argues that Petitioner's challenge based on Dyson and Chetail is deficient because neither Dyson nor Chetail discloses the generation of the claimed "maintenance advice." PO Resp. 34. Patent Owner argues that the "alert messages and trend plots" disclosed in Dyson tell a user what is happening, but do not provide any information about what to do in response to the alert or what maintenance might be suggested by the plotted trends. *Id*. Patent Owner argues that Dyson's alert messages and trend plot are not the claimed "maintenance advice" because they do not recommend any specific action. *Id*. Similarly, Patent Owner argues that Chetail discloses alerting the maintenance personnel that some engine parameter has reached or exceeded some threshold but does not "provide any advice as to what the maintenance personnel should do to correct it." *Id*. at 35.

We determine that Patent Owner's arguments are not commensurate with the scope of the claims, as the claim term "maintenance advice" does not require a recommendation for a maintenance action as argued by Patent Owner. As discussed above, we construe "maintenance advice" to be "problem-specific maintenance information." We are persuaded that the fault information disclosed in Dyson and Chetail is such "problem-specific maintenance information." Accordingly, we are not persuaded by Patent Owner's argument that each of Dyson and Chetail fails to teach the claimed "maintenance advice."

Similar to Patent Owner's arguments against the challenge based on Ward and ARINC 624-1, Patent Owner argues that Petitioner's challenge based on Dyson and Chetail is deficient because Petitioner fails to identify a transmitter in the relied upon prior art that is "portable," as set forth in claim 4. PO Resp. 29. Patent Owner argues that Figure 4 of Dyson cited by Petitioner as illustrating a transmitter portable to be placed on aircraft (*see* Pet. 42 (citing Ex. 1019, Fig. 4)), is only a high-level diagram and does not mention the configuration of the transmitter. PO Resp. 29 (citing Pet. 42; Ex. 1019, 22-4). Furthermore, Patent Owner argues that Petitioner relies on Chetail's mention of ACARS but that Chetail does not suggest the physical characteristics of the transmitter. PO Resp. 29 (citing Pet. 42; Ex. 1002 ¶ 25).

As discussed above, the parties agreed in District Court that "transmitter portable" and "transmitter positionable" be construed to mean "a removable device for generating radio frequency signals." PO Resp. 27 (quoting Joint Claim Construction and Prehearing Statement, Ex. 2001, 1). For the reasons explained above in Section II.E.3.a. and as discussed in our Decision to Institute, with which we maintain after consideration of the full record, we discern that in order for the transmitter device to be "removable" or "positionable," a person of ordinary skill in the art would simply need to be able to change the location of the transmitter. *See* Dec. 15–16. Patent Owner stated in its Response that it "does not challenge" this construction. PO Resp. 27.

Petitioner argues that Dyson discloses a transmitter portable to be placed on aircraft as shown in Figure 4 of Dyson. Pet. 42 (citing Ex. 1019, Fig. 4). More particularly, Figure 4 of Dyson illustrates a system including

onboard data acquisition (AIMS) and the capability to transmit that data via an ACARS system to ground-based computer. Ex. 1019, 22-4 to 22-5. Furthermore, Petitioner offers Dr. Helfrick's statement that the general ACARS standard, provided in ARINC 618–1 (Ex. 1020), discloses that a standards-compliant ACARS system provides an ACARS Management Unit, which could be connected to a (1) VHF transceiver to access the VHF ACARS air-ground network, (2) an HF transceiver to access the HF data network, or (3) a Satellite Data Unit ("SDU") to access the SATCOM ACARS air-ground network. Ex. 1002 ¶ 25 (citing Ex. 1020 § 1.5.2). Dr. Helfrick states that the industry standards for the VHF, HF, and SDU transmitters used in conjunction with ACARS require that these transmitters be Line Replaceable Units ("LRUs"). Ex. 1042 ¶ 4 (citing Ex. 1020 § 1.8). As discussed above, Patent Owner expressly discloses that the transmitter in the claimed invention of the '618 patent is a Line Replaceable Unit ("LRU"). Ex. 1001, 4:57–59 ("FIG. 1 shows an aircraft 10 equipped with a Sensor Multiplexer Receiver & *Transmitter (SMART) 14 which is a line replaceable unit*." (emphasis added)). Accordingly, we are persuaded that a person of ordinary skill in the art would have understood that the transmitters in an ACARS systems were LRUs and, thus, removable and capable of changing location. *See* Pet. Reply 4–5; Ex. 1002 ¶ 25; Ex. 1042 ¶¶ 1, 4. We determine the record supports Petitioner's contention that it would have been obvious to a person of ordinary skill in the art to have a portable/positionable transmitter in the ACARS system disclosed in both Dyson and Chetail.

We have reviewed the parties' arguments and supporting evidence regarding the proposed ground of obviousness of claim 4 over Dyson in

view of Chetail. We persuaded that the record supports Petitioner's contention that claim 4 would have been obvious over Dyson in view of Chetail.

b. Claims 5, 14, and 16

Claim 5 depends from claim 4 and further recites a "sensor multiplexer" having inputs for "receiving aircraft performance and control parameters from existing aircraft sensors" and an output for providing "digital aircraft performance data" to the transmitter. With respect to claim 5, Petitioner argues that Dyson discloses a "Propulsion Multiplexer" ("PMUX") for receiving input from the aircraft sensors and an output via the AIMS to an ACARS transmitter. Pet. 44 (citing Ex. 1019, 22-1 to 22-4, Fig. 4). Dyson discloses that the PMUX was developed to provide consistent accurate data and provides an extensive list of signals routed through the PMUX, including Throttle Lever Angle, Fuel Flow, LP Turbine Inlet Temperature, and Fan Discharge Static Pressure. Ex. 1019, 22-2 to 22-3. Petitioner also argues that Chetail discloses the limitations of claim 5 by disclosing an AIDS for collecting and recording aircraft parameters that is a sensor multiplexer and where the AIDS is connected to an ACARS transmitter. Pet. 44 (citing Ex. 1018, 15-2). We determine the record supports Petitioner's contention that the "sensor multiplexer" in claim 5 would have been obvious over Dyson in view of Chetail.

Independent claim 14 recites limitations similar to those recited in claim 4 and claim 5. Petitioner's arguments with respect to claim 14 rely upon the same arguments set forth claims 4 and 5. As with claims 4 and 5, we are similarly persuaded that the record supports Petitioner's contention that claim 14 would have been obvious over Dyson in view of Chetail.

Claim 16 depends from claim 14 and requires that the "ground based station" include "a storage system for archiving said aircraft performance and control parameters." With respect to claim 16, Petitioner argues that Dyson discloses that the GEM ground-based software architecture includes an "engine history file." Pet. 46–47 (citing Ex. 1019, Fig. 6). Furthermore, Petitioner argues that Chetail also discloses a storage system for archiving performance and control parameters. Pet. 47 (citing Ex. 1018, 15-3). We determine the record supports Petitioner's contention that the "storage system" in claim 16 would have been obvious over Dyson in view of Chetail for the reasons articulated by Petitioner.

c. Conclusion

We have reviewed the parties' arguments and supporting evidence regarding the proposed ground of obviousness based on Dyson in view of Chetail. We are persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence, that claims 4, 5, 14, and 16 would have been obvious in view of Dyson and Chetail.

H. Asserted Obviousness of Claims 8, 9, and 10 in view of Dyson, Chetail, and Monroe

Petitioner argues that claims 8, 9, and 10 would have been obvious in view of Dyson, Chetail, and Monroe. Pet. 41–47. Similar to the previously discussed challenge based on Ward in view of ARINC 624-1, Petitioner relies upon the combination of Monroe with Dyson and Chetail for Monroe's disclosure of an aircraft monitoring system that collects and transmits aircraft data, including "global positioning" data. Pet. 44–45 (citing Ex. 1017, 7:4–29, 8:1–17, Fig. 12). Furthermore, Petitioner argues that it would have been obvious to one of ordinary skill in the art to combine

Monroe with Dyson and Chetail, because each discloses a system for transmitting data collected and recorded onboard the aircraft during flight for the ground for analysis and Monroe teaches that position data is of "great value." Pet. 41 (citing Ex. 1017, 6:54–55).

Similar to the challenge based on Ward, ARINC 624-1, and Monroe, other than arguing that Monroe is not prior art, Patent Owner's Response does not present additional arguments for claims, 8, 9, and 10 with respect to the combination of Dyson, Chetail, and Monroe. *See generally* PO Resp. 13–21. Petitioner's citations to Monroe in combination with Dyson and Chetail for claims 8, 9, and 10 are identical to the citations to Monroe previously analyzed above with respect to Monroe in combination with Ward and ARINC 624-1. *Compare* Pet. 36–37, *with* Pet. 44–45. As above, we are similarly persuaded that the record supports Petitioner's contentions with respect to Monroe in combination with Dyson and Chetail.

We have reviewed the parties' arguments and supporting evidence regarding the proposed ground of obviousness based on Dyson, Chetail, and Monroe. On the record before us, for the reasons articulated by Petitioner, we are persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence, that claims 8, 9, and 10 of the '618 patent would have been obvious in view of Dyson, Chetail, and Monroe.

I. Asserted Obviousness of Claims 4, 5, 14, and 16 Based on Dowling and ARINC 624-1

1. Overview of Dowling

Dowling is titled "Remote Maintenance Monitoring Using a Digital Data Link" and provides a discussion of an Avionics Interconnected Maintenance System. Ex. 1013, 504. Dowling discloses a system that uses

ACARS to transmit avionics fault information derived from Built-In-Test ("BIT") data. *Id*. at 503. Dowling identifies a system that formats Built-In Test Equipment ("BITE") results into an ACARS message, and transmits the message to ground maintenance control when a system failure occurs. *Id*. Ground maintenance analyzes the data with an "expert system," which schedules the "appropriate maintenance activity." *Id*. at 504.

2. Status of Dowling as Prior Art

In the Preliminary Response, Patent Owner argued that Dowling had not been shown by Petitioner to qualify as prior art. Prelim. Resp. 30. In the Decision on Institution, in view of the evidence provided by Petitioner, we determined that Petitioner had shown sufficiently that Dowling was "publicly accessible" prior to the priority date of the '618 patent. Dec. 26–29 (citing *In re Klopfenstein*, 380 F.3d 1345, 1348 (Fed. Cir. 2004)). Patent Owner did not assert this argument against Dowling in its Patent Owner Response. We have reevaluated anew all the pertinent evidence and arguments, and find no reason to disturb our previous determination that Dowling has been shown to be prior art. *See* Dec. 29.

3. Analysis

Petitioner argues that claims 4, 5, 14, and 16 would have been obvious in view of Dowling and ARINC 624-1. Pet. 47–55.

a. Claim 4

With respect to claim 4, Petitioner argues that Dowling discloses the existing state of maintenance monitoring by U.S. commercial airlines, including the downlinking of ACMS data over ACARS for maintenance analysis. Pet. 47 (citing Ex. 1013, 503–04). Petitioner argues that Dowling documents ARINC's proposal for "using ACARS to transmit avionics fault

information derived from BIT [built-in-test] data." Pet. 47 (citing Ex. 1013, 504). With respect to the "transmitter" recited in claim 4, Petitioner argues that Dowling discloses the transmission of monitoring data by ACARS. Pet. 50 (citing Ex. 1013, 503). Additionally, Dowling discloses that "[i]mmediate action is taken to have the part dispatched to the base where the flight will terminate so that the faulty SRA can be replaced and the avionics restored to full operational capability." Ex. 1013, 506. Regarding the "central station" to "generate maintenance advice" recited in claim 4, Petitioner argues that Dowling discloses ground maintenance control with an ACARS receiver that "emulates the diagnostic logic of the maintenance engineers to diagnose faults." Pet. 50 (citing Ex. 1013, 504). Regarding the claim 4 requirement that maintenance advice is generated while the aircraft is in flight, Petitioner cites to Dowling's disclosure that "[i]mmediate action is taken to have the part dispatched to the base where the flight will terminate," indicating that the aircraft is in flight when the part is dispatched. Pet. 51 (citing Ex. 1013, 503, 506, 507). With respect to the claim 4 requirement that the "digital aircraft performance data" includes "an identifier unique to a particular aircraft," Petitioner argues that Dowling requires transmission of data by ACARS, which requires messages to identify the aircraft. Pet. 43 (citing Ex. 1013, 503–04; Ex. 1002 ¶ 33). Dr. Helfrick testifies that ARINC 618-1 requires that messages sent by ACARS must include an aircraft registration mark, which identifies the aircraft. Ex. 1002 ¶ 33 (citing Ex. 1020 § 2.2.3 ("The MU should not transmit any downlink messages unless it has a valid aircraft registration mark.")).

Petitioner argues that Dowling discloses all elements of claim 4, except for the transmission of a "configuration label" and some of the "digital aircraft performance data" being transmitted to a flight data recorder, both of which Petitioner argues are disclosed in ARINC 624-1. Pet. 48. First, with respect to the claimed "configuration label," Petitioner cites to ARINC 624-1 as disclosing that the transmitted data includes a configuration label, as the CMC collects configuration information that it makes available over the data link. Pet. 52 (citing Ex. 1014 §§ 3.1, 3.2.2.2.7, 3.3.1). Second, Petitioner argues that ARINC 624-1 discloses transmitting data across a communication network while the aircraft is in flight. Pet. 50 (citing Ex. 1014 § 3.4.1). Specifically, ARINC 624-1 discloses that "OMS should be designed to provide the capability to transmit data to the ground for advance initiation and preparation for maintenance actions when required." Ex. 1014 § 3.4.1.

Petitioner further argues that it would have been obvious to one of skill in the art to combine Dowling and ARINC 624-1, because Dowling was written by ARINC engineers, and both publications relate to aircraft maintenance systems. Pet. 41; Ex. 1002 ¶ 97. Specifically, Petitioner argues that both references describe the collection of BITE data and the transmission of BITE data to a ground station. *Id.* Dr. Helfrick testifies that ARINC 624-1 itself expressly provides a motivation to combine its "onboard maintenance system" with the ground-based maintenance analysis software of Dowling, because ARINC 624-1 states expressly that "if known in advance of an airplane's arrival at a terminal, selected information held in the OMS central maintenance computer's memory could be useful to line maintenance personnel in planning timely corrective action." Ex. 1002 ¶ 97

(citing Ex. 1014 § 2.2.4). We agree a person of ordinary skill in the art would have been motivated to improve the system in Dowling with related disclosures in ARINC 624-1, in the manner proffered by Petitioner.

In view of the foregoing, we determine Petitioner has presented and sufficiently established an "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness" as to claim 4 for this ground, and we adopt its contentions as our own. *KSR*, 550 U.S. at 418 (citation omitted).

Similar to Patent Owner's arguments against the challenge based on Ward and ARINC 624-1, Patent Owner argues that Petitioner's challenge based on Dowling and ARINC 624-1 is deficient because Petitioner fails to identify a transmitter in the relied upon prior art that is "portable," as set forth in claim 4. PO Resp. 29–30. Patent Owner argues Dowling discloses the transmission of data via ACARS, but provides no further information about the characteristics of any such transmitter, and whether it is removable or capable of changing location. PO Resp. 29–30 (citing Pet. 50; Ex. 1013, 503–04).

As discussed above, the parties agreed in District Court that "transmitter portable" and "transmitter positionable" be construed to mean "a removable device for generating radio frequency signals." PO Resp. 27 (quoting Joint Claim Construction and Prehearing Statement, Ex. 2001, 1). For the reasons explained above in Section II.E.3.a. and as discussed in our Decision to Institute, with which we maintain after consideration of the full record, we discern that in order for the transmitter device to be "removable" or "positionable," a person of ordinary skill in the art would simply need to be able to change the location of the transmitter. Dec. 15–16. Patent Owner

stated in its Response that it "does not challenge" this construction. PO Resp. 27.

Petitioner argues that Dowling discloses a transmitter portable to be placed on aircraft and that Dowling also discloses transmission of monitoring data by ACARS. Pet. 50 (citing Ex. 1013, 503–04). Furthermore, Petitioner offers Dr. Helfrick's statement that the general ACARS standard, provided in ARINC 618–1 (Ex. 1020), discloses that a standards-compliant ACARS system provides an ACARS Management Unit, which could be connected to a (1) VHF transceiver to access the VHF ACARS air-ground network, (2) an HF transceiver to access the HF data network, or (3) a Satellite Data Unit ("SDU") to access the SATCOM ACARS air-ground network. Ex. 1002 ¶ 25 (citing Ex. 1020 § 1.5.2). Dr. Helfrick states that the industry standards for the VHF, HF, and SDU transmitters used in conjunction with ACARS require that these transmitters be Line Replaceable Units ("LRUs"). Ex. 1042 ¶ 4 (citing Ex. 1020 § 1.8). As discussed above, Patent Owner expressly discloses that the transmitter in the claimed invention of the '618 patent is a Line Replaceable Unit ("LRU"). Ex. 1001, 4:57–59 ("FIG. 1 shows an aircraft 10 equipped with a Sensor Multiplexer Receiver & *Transmitter (SMART) 14 which is a line replaceable unit*." (emphasis added)). Accordingly, we are persuaded that a person of ordinary skill in the art would have understood that the transmitters in an ACARS systems were LRUs and, thus, removable and capable of changing location. *See* Pet. Reply 4–5; Ex. 1002 ¶ 25; Ex. 1042 ¶¶ 1, 4. We determine the record supports Petitioner's contention that it would have been obvious to a person of ordinary skill in the art to have a

portable/positionable transmitter in the ACARS system disclosed in both Dowling and ARINC 624-1.

We have reviewed the parties' arguments and supporting evidence regarding the proposed ground of obviousness of claim 4 over Dowling in view of ARINC 624-1. We persuaded that the record supports Petitioner's contention that claim 4 would have been obvious over Dowling in view of ARINC 624-1 for the reasons articulated by Petitioner.

b. Claims 5, 14, and 16

Claim 5 depends from claim 4 and further recites a "sensor multiplexer" having inputs for "receiving aircraft performance and control parameters from existing aircraft sensors" and an output for providing "digital aircraft performance data" to the transmitter. With respect to claim 5, Petitioner argues that Dowling discloses that AIDS obtains data from multiple sensors and that the AIDS data, as well as BITE data, is supplied to ACARS for transmission to the ground. Pet. 52 (citing Ex. 1013, 503–04; Ex. 1002 ¶ 92). Petitioner also argues that ARINC 624-1 discloses the limitations of claim 5 by disclosing the ACMS and the CMC are each a sensor multiplexer, and that the ACMS has the capability to provide reports with programmable parameters to be recorded and supply those reports to an output device. Pet. 52–53 (citing Ex. 1014 §§ 3.1, 8.2.6, 8.3, 8.5). We determine the record supports Petitioner's contention that the "sensor multiplexer" in claim 5 would have been obvious over Dowling in view of ARINC 624-1.

Independent claim 14 recites limitations similar to those recited in claim 4 and claim 5. Petitioner's arguments with respect to claim 14 rely upon the same arguments set forth claims 4 and 5. Pet. 53–55. As with

claims 4 and 5, we are similarly persuaded that the record supports Petitioner's contention that claim 14 would have been obvious over Dowling in view of ARINC 624-1.

Claim 16 depends from claim 14 and requires that the "ground based station" include "a storage system for archiving said aircraft performance and control parameters." With respect to claim 16, Petitioner argues that Dowling discloses that AIMS includes an "expert system" and a "database of maintenance activity." Pet. 55 (citing Ex. 1013, 504–05). Furthermore, Petitioner argues that Dowling also discloses that the military on-condition monitoring system was used with the C-5A aircraft, and an extensive database of recorded performance information was established. *Id*. We determine the record supports Petitioner's contention that the "storage system" in claim 16 would have been obvious over Dowling in view of ARINC 624-1.

c. Conclusion

We have reviewed the parties' arguments and supporting evidence regarding the proposed ground of obviousness based on Dowling in view of ARINC 624-1. We are persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence, that claims 4, 5, 14, and 16 would have been obvious in view of Dowling and ARINC 624-1.

J. Asserted Obviousness of Claims 8, 9, and 10 in view of Dowling, ARINC 624-1, and Monroe

Petitioner argues that claims 8, 9, and 10 would have been obvious in view of Dowling, ARINC 624-1, and Monroe. Pet. 49–53. Similar to the previously discussed challenge based on Ward in view of ARINC 624-1, Petitioner relies upon the combination of Monroe with Dowling and

ARINC 624-1 for Monroe's disclosure of an aircraft monitoring system that collects and transmits aircraft data, including "global positioning" data. Pet. 53 (citing Ex. 1017, 7:4–29, 8:1–17, Fig. 12). Furthermore, Petitioner argues that it would have been obvious to one of ordinary skill in the art to combine Monroe with Dowling and ARINC 624-1, because each discloses a system for transmitting data collected and recorded onboard the aircraft during flight for the ground for analysis and Monroe teaches that position data is of "great value." Pet. 49 (citing Ex. 1017, 6:54–55).

Similar to the previous challenge, other than arguing that Monroe is not prior art, Patent Owner's Response does not present additional arguments for claims, 8, 9, and 10 with respect to the combination of Dowling, ARINC 624-1, and Monroe. *See generally* PO Resp. 13–21. Petitioner's citations to Monroe in combination with Dowling and ARINC 624-1 for claims 8, 9, and 10 are identical to the citations to Monroe previously analyzed above with respect to Monroe in combination with Ward and ARINC 624-1. *Compare* Pet. 36–37, *with* Pet. 53. As above, we are similarly persuaded that the record supports Petitioner's contentions with respect to Monroe in combination with Dowling and ARINC 624-1.

We have reviewed the parties' arguments and supporting evidence regarding the proposed ground of obviousness based on Dowling, ARINC 624-1, and Monroe. We are persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence, that claims 8, 9, and 10 of the '618 patent would have been obvious in view of Dowling, ARINC 624-1, and Monroe.

K. Asserted Obviousness of Claims 8, 9, and 10 in view of Ward, ARINC 624-1, ARINC 702-6, and FAA, Increased FDR Parameters

Petitioner argues that claims 8, 9, and 10 would have been obvious in view of Ward, ARINC 624-1, ARINC 702-6, and FAA, Increased FDR Parameters. Pet. 55–58.

1. Overview of ARINC 702-6

ARINC 702-6 is titled "Flight Management Computer System" and provides a description of the characteristics of a Flight Management Computer System designed for commercial transport aircraft. Ex. 1016, 1. ARINC 702-6 discloses that the Flight Management Computer ("FMC") System has an interface with an ACARS data link that functions in accordance with ARINC Specification 619. *Id*. at 17. Furthermore, ARINC 702-6 discloses that the format for the FMC includes transmitting position data, including "Right GPS Position." *Id*. at 68, 110.

2. Overview of FAA, Increased FDR Parameters

FAA, Increased FDR Parameters is a Federal Register notice published on March 14, 1995, that states that the "FAA is soliciting comments from the public, aircraft manufacturers and operators, and manufacturers of flight data recorders (FDR's) . . . on increased FDR parameters." Ex. 1011, 60 Fed. Reg. at 13862. The reference notes that "GPS position data" is one of the "Proposed FDR Enhancements for Newly Manufactured Airplanes." *Id*. at 13864.

3. Analysis

Petitioner's challenge against claims 8, 9, and 10 based on Ward, ARINC 624-1, ARINC 702-6, and FAA, Increased FDR Parameters is similar to the challenge based on Ward, ARINC 624-1, and Monroe above,

except that Petitioner relies upon ARINC 702-6 and FAA, Increased FDR Parameters for the teachings regarding position data rather than Monroe. *See* Pet. 56–57. Specifically, Petitioner cites to FAA, Increased FDR Parameters as disclosing that the FAA proposed rules expand the list of flight data recorder parameters to include position data, including GPS data. Pet. 56 (Ex. 1011, 13864). Additionally, Petitioner cites to ARINC 702-6 for its disclosure of a "flight management computer system" that has an ACARS interface to facilitate transmission of data from the flight management computer to the ground and that this data includes position data. *Id.* (citing Ex. 1016 §§ 1.2, 4.5; Ex. 1016, Attachment B, 68, 110). Additionally, Petitioner argues that it would have been obvious to combine these references because skilled artisans understood that aircraft, particularly large commercial aircraft, would have been likely to have both maintenance systems and flight management computers, and large commercial aircraft would likely have implemented these two ARINC standards and many other ARINC standards. Pet. 57 (citing Ex. 1002 ¶ 103). Therefore, Petitioner argues that it would have been obvious for a person of ordinary skill in the art to combine the maintenance system disclosed in Ward and ARINC 624-1 with a standards compliant flight management computer described in ARINC 702-6. Pet. 57–58.

Patent Owner states in its Response that it does not challenge the combination of FAA, Increased FDR Parameters with Ward and ARINC 624-1, but challenges the combination of ARINC 702-6 with these references. PO Resp. 22. Patent Owner argues that ARINC 702-6 discloses a "Flight Management Computer System" ("FMC") that helps the pilot fly the plane, but plays no role in the maintenance of the aircraft. *Id.* at 23

(citing Ex. 1016 §§ 1.1, 1.4). Patent Owner further argues that the fact that aircraft operations system might have messages related to position, including GPS data, would not have suggested to one of ordinary skill in the art to combine these teachings with the claimed aircraft maintenance systems. *Id.* (citing Ex. 2011 ¶ 19).

Petitioner counters that both the FMC in ARINC 702-6 and the maintenance system described Ward in used the ACARS communications system to transmit information from an aircraft to the ground during flight. Pet. Reply 21 (citing Ex. 1015, 7; Ex. 1014 § 8.2.6; Ex. 1016 § 4.2.2.8). Dr. Helfrick testified that most large commercial aircraft had both a flight management computer system and an onboard maintenance system. Ex. 1002 ¶ 103. Therefore, Petitioner argues that the same airborne and ground-based communication equipment were used to transmit both the maintenance information described in ARINC 624-1 and Ward and the aircraft position data described in ARINC 702-6. Pet. Reply 22. We agree that a person of skill in the art would have been motivated to improve the combination of Ward and ARINC 624-1 to include the communication of position data, as taught in ARINC 702-6, for the reasons articulated by Petitioner.

In view of the foregoing, we determine Petitioner has presented and sufficiently established an "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness" as to claim 8, 9, and 10 for this ground, and we adopt its contentions as our own. *KSR*, 550 U.S. at 418 (citation omitted).

We have reviewed the parties' arguments and supporting evidence regarding the proposed ground of obviousness based on Ward, ARINC 624-

1, ARINC 702-6, and FAA, Increased FDR Parameters. We are persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence, that claims 8, 9, and 10 of the '618 patent would have been obvious in view of Ward, ARINC 624-1, ARINC 702-6, and FAA, Increased FDR Parameters.

L. Asserted Obviousness of Claims 8, 9, and 10 in view of Ward, ARINC 624-1, FAA, Increased FDR Parameters, and Farmakis

Petitioner argues that claims 8, 9, and 10 would have been obvious in view of Ward, ARINC 624-1, FAA, Increased FDR Parameters, and Farmakis.

1. Overview of Farmakis

Farmakis is titled "Satellite Based Aircraft Traffic Control System" and discloses satellite based air traffic control in which an aircraft transmits aircraft identification information, including GPS data, aircraft status information, and a transmit detect code, to an air traffic control center. Ex. 1021, Abstract. Furthermore, Farmakis discloses that "GPS may be used for aircraft in the air and on the ground." *Id*.

2. Analysis

Petitioner's challenge against claims 8, 9, and 10 based on Ward, ARINC 624-1, FAA, Increased FDR Parameters, and Farmakis is similar to the challenge based on Ward, ARINC 624-1, ARINC 702-6, and FAA, Increased FDR Parameters above, except that Petitioner relies upon Farmakis instead of ARINC 702-6. *See* Pet. 56–57. Petitioner relies upon Farmakis for its teachings describing a system to monitor and track aircraft in which the aircraft transmits its position and an identifier, including information provided by a GPS receiver, rather than by tracking aircraft

position using radar. Pet. 58–59 (citing Ex. 1021, 4:9–44, 5:43–47). Petitioner argues that Farmakis discloses transmitting position data along with other aircraft performance data such as airspeed to a ground station (an air traffic control or "ATC" facility). Pet. 59 (citing Ex. 1021, 4:9–36; Ex. 1022, 20).

Patent Owner argues that Petitioner's reliance upon Farmakis is insufficient, because Farmakis is directed to an improved air traffic control system, and Farmakis does not disclose an aircraft maintenance system or a system concerned with monitoring aircraft data. PO Resp. 24–25. Therefore, according to Patent Owner, a person of ordinary skill in the art looking to improve an aircraft maintenance system would not have looked to Farmakis. *Id*. at 25. We are not persuaded by Patent Owner's arguments against the proposed combination. Petitioner states, and we agree, that all of the proposed references are concerned with transmitting in-flight aircraft data to a ground station. Pet. 60. Furthermore, Farmakis discloses the utility of transmitting position data to a ground station while the aircraft is in flight; thus, Petitioner argues, and we agree, that it would have been obvious to a person or ordinary skill in the art to include the data in Ward's data collection. *Id*. Furthermore, in view of FAA, Increased FDR Parameters, Petitioner argues, and we agree, that it would have been obvious to a person of ordinary skill in the art to direct such data to be recorded on a flight recorder to comply with the FAA requirements. *Id*. We agree that a person of skill in the art would have been motivated to improve the combination of Ward and ARINC 624-1 to include the communication of position data, as taught in Farmakis.

In view of the foregoing, we determine Petitioner has presented and sufficiently established an "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness" as to claims 8, 9, and 10 on this ground, and we adopt its contentions as our own. *KSR*, 550 U.S. at 418 (citation omitted).

We have reviewed the parties' arguments and supporting evidence regarding the proposed ground of obviousness based on Ward, ARINC 624-1, FAA, Increased FDR Parameters, and Farmakis. We are persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence, that claims 8, 9, and 10 of the '618 patent would have been obvious in view of Ward, ARINC 624-1, FAA, Increased FDR Parameters, and Farmakis.

M. Petitioner's Motion to Exclude

Petitioner filed a Motion to Exclude Patent Owner's Exhibits 2002–2004 on the basis that they were not properly authenticated. Paper 39 ("Mot."), 1. Patent Owner filed an opposition to the Motion (Paper 41 ("Opp.")) and Petitioner replied (Paper 42, "Reply to Mot.").

Petitioner argues that Exhibits 2002–2004 it should be excluded based on inadequate authentication under Federal Rule of Evidence 901. Mot. 1. More particularly, Petitioner argues that Exhibits 2002–2004 lack the independent corroboration that is required to authenticate evidence of prior conception. Mot. 1–2. Petitioner agrees that Mr. Levine submitted a declaration in which he testifies that Exhibits 2002–2004 are "true and correct copies" of notes and "invention disclosures" that he created at various times in 1996. Mot. 2 (citing Ex. 2009, 1). Petitioner argues,

however, that Patent Owner's testimony needs to be corroborated with independent evidence, but that evidence, to be admissible, must be authenticated by someone other than the inventor. Mot. 3 (citations omitted).

Patent Owner responds that Exhibits 2002–2004 are admissible because Mr. Levine is not relying on his own testimony to establish his date of conception. Opp. 1. Patent Owner argues "that Levine's date of conception is established by the documents themselves, which required no independent corroboration." *Id*.

Nevertheless, even when we consider Exhibits 2002–2004 (*see supra* Section II.B.3), we determine that they do not provide sufficient corroboration of conception. Accordingly, because we are in agreement with Petitioner's position on this issue for the reasons set forth above, even when considering the evidence that Petitioner seeks to exclude, Petitioner's Motion to Exclude is *dismissed as moot*.[11]

[11] Petitioner argues in an abundance of caution that Exhibit 2013 should be excluded as untimely to the extent it is entered into the record. Mot. 5–6. Petitioner argues that Patent Owner raised Exhibit 2013 on re-direct during the deposition of Mr. Levine but took no steps to introduce it into the record or seek leave to rely on it, and Exhibit 2013 has never been filed. *Id*. at 6. The Board first learned of Exhibit 2013 in the oral argument (Tr. 48–49), during which it is improper to submit new evidence or arguments. *See Dell Inc. v. Acceleron, LLC*, 818 F.3d 1293, 1301 (Fed. Cir. 2016) ("No new evidence or arguments may be presented at oral argument) (citations omitted). As Exhibit 2013 has not been entered into the record, Petitioner's request to exclude it is dismissed as moot.

III. SUMMARY

Based on our review of the record, we conclude that Petitioner has demonstrated, by a preponderance of the evidence, that claims 4, 5, 8, 9, 10, 14, and 16 of the '618 patent are unpatentable based on the following grounds:

1. Claims 4, 5, 14, and 16 of the '618 patent under 35 U.S.C. § 103(a) as unpatentable over Ward and ARINC 624-1;
2. Claims 8, 9, and 10 of the '618 patent under 35 U.S.C. § 103(a) as unpatentable over Ward, ARINC 624-1, and Monroe;
3. Claims 4, 5, 14, and 16 of the '618 patent under 35 U.S.C. § 103(a) as unpatentable over Dyson and Chetail;
4. Claims 8, 9, and 10 of the '618 patent under 35 U.S.C. § 103(a) as unpatentable over Dyson, Chetail, and Monroe;
5. Claims 4, 5, 14, and 16 of the '618 patent under 35 U.S.C. § 103(a) as unpatentable over Dowling and ARINC 624-1;
6. Claims 8, 9, and 10 of the '618 patent under 35 U.S.C. § 103(a) as unpatentable over Dowling, ARINC 624-1, and Monroe;
7. Claims 8, 9, and 10 of the '618 patent under 35 U.S.C. § 103(a) as unpatentable over Ward, ARINC 624-1, ARINC 702-6, and FAA, Increased FDR Parameters; and
8. Claims 8, 9, and 10 of the '618 patent under 35 U.S.C. § 103(a) as unpatentable over Ward, ARINC 624-1, FAA, Increased FDR Parameters, and Farmakis.

IV. ORDER

Accordingly, it is

ORDERED that Petitioner has shown by a preponderance of the evidence that claims 4, 5, 8, 9, 10, 14, and 16 of the ’618 patent are unpatentable;

FURTHER ORDERED that Petitioner’s Motion to Exclude is dismissed; and

FURTHER ORDERED that the parties to the proceeding seeking judicial review of this Final Written Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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