

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DJI EUROPE B.V.,
Petitioner,

v.

DAEDALUS BLUE LLC,
Patent Owner.

IPR2020-01472
Patent 7,286,913 B2

Before BARRY L. GROSSMAN, ERIC C. JESCHKE, and
ARTHUR M. PESLAK, *Administrative Patent Judges*.

GROSSMAN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background and Summary

Petitioner, DJI Europe B.V., filed a Petition (Paper 2, “Pet.”) requesting an *inter partes* review of claims 8, 10–12, 14, 23, 25–27, 29, 38, 40–42, and 44 (the “challenged claims”) of U.S. Patent No. 7,286,913 B2 (Ex. 1001, “the ’913 patent”). Patent Owner, Daedalus Blue LLC, timely filed a Preliminary Response (Paper 6, “Prelim. Resp.”). With our permission, Petitioner filed a Reply to the Patent Owner Preliminary Response (Paper 7). Patent Owner filed a Sur-reply (Paper 8).

We concluded that Petitioner satisfied the burden, under 35 U.S.C. § 314(a), to show that there was a reasonable likelihood that Petitioner would prevail with respect to at least one of the challenged claims. Accordingly, on behalf of the Director (37 C.F.R. § 42.4(a)), and in accordance with *SAS Institute, Inc. v. Iancu*, 138 S. Ct. 1348, 1353 (2018), we instituted an *inter partes* review of all the challenged claims, on all the asserted grounds. Paper 12 (“Dec. Inst.”).

Patent Owner filed a Response. Paper 19 (“PO Resp.”). Petitioner filed a Reply. Paper 21 (“Reply”). Patent Owner filed a Sur-reply. Paper 24 (“Sur-reply”).

Petitioner submitted 58 exhibits. *See* Exs. 1001–1058. Petitioner relies, in part, on the Declaration testimony of R. John Hansman, Jr., Ph.D. *See* Exs. 1003, 1061.

Patent Owner submitted 18 exhibits. *See* Exs. 2001–2004, 2006–2018, 2020. Patent Owner relies, in part, on the Declaration testimony of Daniel S. Kaputa, Ph.D. *See* Ex. 2011.

A hearing was held November 16, 2021. Paper 30 (“Tr.”). This was a joint hearing that also included related cases IPR2020-01474 and IPR2020-01475.

We have jurisdiction under 35 U.S.C. § 6. We enter this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

Petitioner has the burden of proving unpatentability of a claim by a preponderance of the evidence. 35 U.S.C. § 316(e).

Based on the findings and conclusions below, we determine that Petitioner has proven that all of the challenged claims are unpatentable.

B. Real Parties in Interest

Petitioner identifies itself and DJI Technology Inc., SZ DJI Technology Co., Ltd., iFlight Technology Company Limited, DJI Japan K.K., and DJI Research LLC as real parties-in-interest. Pet. 96. Patent Owner identifies itself as the only real party in interest. Paper 4, 2.

C. Related Matters

Petitioner and Patent Owner each identify as a related matter *Daedalus Blue LLC v. SZ DJI Technology Co., Ltd. & DJI Europe B.V.*, Civil Action No. 6:20-cv-00073 (W.D. Tex. Jan. 31, 2020), in which the ’913 patent is at issue. Pet. 96; Paper 4, 2.

We also note that the same Petitioner and Patent Owner are involved in IPR2020-01474 and IPR2020-01475, in which Petitioner is challenging U.S. Patent No. 7,228,232 (the “’232 patent”). The ’232 patent and the ’913 patent have the same named inventors, use many of the same figures, and relate to similar technology. The ’232 patent also is at issue in the related litigation cited above. *See, e.g.*, Ex. 2009 (District Court Claim Construction Order providing claim constructions for both the ’232 patent and the ’913 patent).

II. THE '913 PATENT

We make the following findings concerning the '913 patent.

The '913 patent discloses methods, systems, and computer program products for navigating an unmanned aerial vehicle ("UAV"). *See, e.g.*, Ex. 1001, 23:52–67, 26:12–28, 28:48–67. These methods, systems, and products enable UAV navigation by an operator selecting a GUI pixel from a displayed GUI map of the surface of the Earth. *Id.* at 1:33–37. As defined in the '913 patent, "'GUI' means graphical user interface, a display means for a computer screen." *Id.* at 5:48–49.

The selected pixel maps to one or more destinations or "waypoints" for the UAV. *Id.* at 1:37–38, 1:54–2:8, 5:60–63. The waypoint coordinates are uploaded through "uplink telemetry" to a UAV which "calculates a heading and flies, according to a navigation algorithm, a course to the waypoint." *Id.* at 1:38–41. Alternatively, a remote control device can calculate a heading and "uplink" flight control instructions to a UAV. *Id.* at 1:41–43. According to the '913 patent, "[a]ll this occurs with a single keystroke or mouseclick from the operator." *Id.* at 1:45–46.

The disclosed methods, systems, and products also provide for "receiving downlink telemetry," including a starting position from the UAV "through a socket" on the remote control device. *Id.* at 2:25–28. "A socket is one end-point of a two-way communication link between two application programs running on a network." *Id.* at 10:46–48.

According to the '913 patent, operators of prior known UAVs would "manually control the UAV from a starting position to a waypoint with little aid from automation." Ex. 1001, 1:25–28. As described by Patent Owner, using the technology disclosed in the '913 patent:

[a] user can designate waypoints for UAV navigation through selection of graphical user interface (“GUI”) map pixels displayed at a remote control, uplink coordinates of those waypoints to the UAV through a socket, and have the UAV pilot itself under the control of an on-board navigation computer according to the selected waypoints.

PO Resp. 6

A. Illustrative Claims

Among the challenged claims, claims 8, 23, and 38 are independent claims. Independent claim 8 is directed to a “method for navigating” a UAV. Ex. 1001, 23:52–67. Independent claim 23 is directed to a “system for navigating” a UAV. *Id.* at 26:12–28. Independent claim 38 is directed to a “computer program product” for navigating a UAV. *Id.* at 28:48–67.

Claims 8 and 23 are reproduced below.

8. A method for navigating an Unmanned Aerial Vehicle (UAV), the method comprising:

receiving in a remote control device a user's selection of a GUI map pixel that represents a waypoint for UAV navigation, the pixel having a location on the GUI;

mapping the pixel's location on the GUI to Earth coordinates of the waypoint;

transmitting uplink telemetry, including the coordinates of the waypoint, to the UAV through a socket on the remote control device;

receiving downlink telemetry, include a starting position from a GPS receiver, from the UAV through the socket; and

piloting the UAV, under control of a navigation computer on the UAV, from the starting position to the waypoint in accordance with a navigation algorithm.

23. A system for navigating an Unmanned Aerial Vehicle (UAV) the system comprising:

means for receiving in a remote control device a user's selection of a GUI map pixel that represents a

waypoint for UAV navigation, the pixel having a location on the GUI;

means for mapping the pixel's location on the GUI to Earth coordinates of the waypoint;

means for transmitting uplink telemetry, including the coordinates of the waypoint, to the UAV through a socket on the remote control device;

means for receiving downlink telemetry, include a starting position from a GPS receiver, from the UAV through the socket; and

means for piloting the UAV, under control of a navigation computer on the UAV, from the starting position to the waypoint in accordance with a navigation algorithm.

Id. at 23:52–67, 26:12–28.

As is evident from comparing claims 8 and 23, system claim 23 rephrases each of the method steps in claim 8 in “means plus function” format, in accordance with pre-AIA 35 U.S.C. § 112 ¶ 6, by merely adding the words “means for” in front of each method step recited in claim 8. Computer product program claim 38 is substantially similar to system claim 23 except for the preamble in claim 38 that states it is a “computer program product” for navigating a UAV, with the computer program product “disposed on a computer readable medium and executable on a computer system.”

B. Prior Art and Asserted Grounds

Petitioner asserts that the challenged claims are unpatentable on the following eight distinct grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
8, 23, 38	103 ¹	Shim ² , Tso ³
10–12, 25–27, 40–42	103	Shim, Tso, TCP/IP Sockets ⁴
11, 12, 26, 27, 41, 42	103	Shim, Tso, TCP/IP Sockets, Dittrich ⁵
8, 14, 23, 29, 38, 44	103	Shim, Tso, Lohrenz ⁶
8, 23, 38	103	Sato ⁷ , Lin ⁸
10–12, 25–27, 40–42	103	Sato, Lin, NASA ⁹
11, 12, 26, 27, 41, 42	103	Sato, Lin, NASA, Dittrich
8, 14, 23, 29, 38, 44	103	Sato, Lin, Lohrenz

The eight asserted Grounds present two sets of challenges: Grounds 1–4 based on Shim and Tso, plus additional references; and Grounds 5–8,

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 296–07 (2011), took effect on September 16, 2012. The changes to 35 U.S.C. §§ 102 and 103 in the AIA do not apply to any application filed before March 16, 2013. Because the application for the patent at issue in this proceeding has an effective filing date before either of these dates, we refer to the pre-AIA version of the statute.

² Ex. 1005, “Multi-Functional Autopilot Design and Experiments for Rotorcraft-based Unmanned Aerial Vehicles,” Shim, et al., 2001 (“Shim”).

³ Ex. 1010, “A Multi-Agent Operator Interface for Unmanned Aerial Vehicles,” Tso, et al., Oct. 1999 (“Tso”).

⁴ Ex. 1015, “TCP/IP Sockets in Java: Practical Guide for Programmers,” Calvert, et al., 2002 (“TCP/IP Sockets”).

⁵ Ex. 1020, “Multi-Sensor Navigation System for an Autonomous Helicopter,” Dittrich, et al., 2002 (“Dittrich”).

⁶ Ex. 1025, “The Navy Tessellated Spheroid Map Projection System: A Comprehensive Definition,” Lohrenz, et al., 1993 (“Lohrenz”).

⁷ Ex. 1030, English translation of Japanese Patent Application Publication, JP2001-301695, Oct. 31, 2001 (“Sato”).

⁸ Ex. 1031, U.S. Patent 7,143,130, issued Nov. 28, 2006, publ. Oct. 18, 2001 (“Lin”).

⁹ Ex. 1032, “Payload Operations Integration Center Remote Operations Capabilities,” Schneider, et al., 2001 (“NASA”).

that include the identical claim grouping as Grounds 1–4, respectively, but rely on Sato and Lin, plus additional references.¹⁰ Pet. 5–6.

III. ANALYSIS

A. *Legal Standards*

Section 103(a) forbids issuance of a patent when “the differences between the subject matter sought to be patented 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) when available, evidence such as commercial success, long felt but unsolved needs, and failure of others.¹¹ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *see KSR*, 550 U.S. at 407 (“While the sequence of these questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls.”). The Court in *Graham* explained that these factual inquiries

¹⁰ On page 5 of the Petition, under the heading “Statutory grounds for challenge,” Petitioner states Ground 2 challenges claims “10–12, 25–27, and 40–42.” Pet. 5. On page 43 of the Petition, however, Petitioner states that Ground 2 is asserted only against “claims 10, 25, and 40.” *Id.* at 43 (heading “V.B”). Petitioner presents argument and evidence challenging only claims 10, 25, and 40 under Ground 2. *Id.* at 46–51. Accordingly, we limit Ground 2 to a challenge only of claims 10, 25, and 40. Petitioner did not address, dispute, or correct in its Reply, the identification of the claims included in Ground 2. To the contrary, Petitioner repeated the same incorrect claim listing. Reply 11.

¹¹ Patent Owner does not direct us to any objective evidence of non-obviousness.

promote “uniformity and definiteness,” for “[w]hat is obvious is not a question upon which there is likely to be uniformity of thought in every given factual context.” 383 U.S. at 18.

The Supreme Court made clear that we apply “an expansive and flexible approach” to the question of obviousness. *KSR*, 550 U.S. at 415. Whether a patent claiming the combination of prior art elements would have been obvious is determined by whether the improvement is more than the predictable use of prior art elements according to their established functions. *Id.* at 417. To support this conclusion, however, it is not enough to show merely that the prior art includes separate references covering each separate limitation in a challenged claim. *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). Rather, obviousness additionally requires that a person of ordinary skill at the time of the invention “would have selected and combined those prior art elements in the normal course of research and development to yield the claimed invention.” *Id.*; *see also Orexo AB v. Actavis Elizabeth LLC*, 903 F.3d 1265, 1273 (Fed. Cir. 2018) (“The question is not whether the various references separately taught components of the ’330 Patent formulation, but whether the prior art suggested the selection and combination achieved by the ’330 inventors.”).

In determining whether there would have been a motivation to combine prior art references to arrive at the claimed invention, it is insufficient to simply conclude the combination would have been obvious without identifying any reason *why* a person of skill in the art would have made the combination with a reasonable expectation of success. *Metalcraft of Mayville, Inc. v. The Toro Co.*, 848 F.3d 1358, 1366 (Fed. Cir. 2017); *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367 (Fed. Cir. 2016) (“The reasonable expectation of success requirement refers

to the likelihood of success in combining references to meet the limitations of the claimed invention.”).

Moreover, in determining the differences between the prior art and the claims, the question under 35 U.S.C. § 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 164 (Fed. Cir. 1985) (“It is elementary that the claimed invention must be considered as a whole in deciding the question of obviousness.”); *see also Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1537 (Fed. Cir. 1983) (“[T]he question under 35 U.S.C. § 103 is not whether the differences *themselves* would have been obvious. Consideration of differences, like each of the findings set forth in *Graham*, is but an aid in reaching the ultimate determination of whether the claimed invention *as a whole* would have been obvious.”).

As a factfinder, we also must be aware “of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.” *KSR*, 550 U.S. at 421.

Applying these general principles, we consider the evidence and arguments of the parties.

B. Level of Ordinary Skill in the Art

The level of skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). “This reference point prevents . . . factfinders from using their own insight or, worse yet, hindsight, to gauge obviousness.” *Id.*

Factors pertinent to a determination of the level of ordinary skill in the art include: (1) educational level of the inventor; (2) type of problems

encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of workers active in the field. *Env't Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–97 (Fed. Cir. 1983). Not all such factors may be present in every case, and one or more of these or other factors may predominate in a particular case. *Id.* Moreover, these factors are not exhaustive but are merely a guide to determining the level of ordinary skill in the art. *Daiichi Sankyo Co. Ltd, Inc. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007).

In determining a level of ordinary skill, we also may look to the prior art, which may reflect an appropriate skill level. *Okajima*, 261 F.3d at 1355.

Additionally, the Supreme Court informs us that “[a] person of ordinary skill is also a person of ordinary creativity, not an automaton.” *KSR*, 550 U.S. at 421.

“The *Graham* analysis includes a factual determination of the level of ordinary skill in the art. Without that information, a district court cannot properly assess obviousness because the critical question is whether a claimed invention would have been obvious at the time it was made to one with ordinary skill in the art.” *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986).

Petitioner asserts that a person of ordinary skill “at the time of the alleged invention would have had a bachelor’s degree in aeronautical engineering, electrical engineering, computer science or equivalent training and experience, and at least two years of experience in the field of unmanned vehicles.” Pet. 7 (citing Ex. 1003 ¶ 19). Petitioner adds that “[a]dditional work or research experience can substitute for less or different education, and vice-versa.” *Id.* Dr. Hansman, Petitioner’s Declarant

(Ex. 1003) testifies that in his opinion¹², a person of ordinary skill would have had the qualifications and experience asserted by Petitioner. *Id.* In reaching his opinion, Dr. Hansman considered the levels of education and experience of persons working in the field; the types of problems encountered in the field; and the sophistication of the technology. *Id.* ¶ 18. He also acknowledged that “a person of ordinary skill in the art has ordinary creativity and is not an automaton. *Id.* ¶ 19.

Patent Owner refers repeatedly to a “person of ordinary skill in the art” throughout its Patent Owner Response, *see, e.g.*, PO Resp. 22 (“A person of ordinary skill in the art would understand from these disclosures . . .”). Patent Owner does not, however, state in its Response what is this level of ordinary skill.

¹² Dr. Hansman currently is the T. Wilson Professor of Aeronautics & Astronautics at the Massachusetts Institute of Technology. Ex. 1003 ¶ 6. He also serves as the Director of the MIT International Center for Air Transportation. *Id.* Additionally, Dr. Hansman serves as Chair of the U.S. Federal Aviation Administration Research, Engineering & Development Committee. *Id.* ¶ 13. Dr. Hansman earned his A.B. and S.M. Degrees in Physics, and earned his Ph.D. in Physics, Meteorology, Aeronautics & Astronautics, Electrical Engineering from the Massachusetts Institute of Technology. *Id.* ¶¶ 7–9. His current research involves the application of information technology in operational aerospace systems. *Id.* ¶ 10. Dr. Hansman has authored over 250 technical publications and is a named inventor on six United States patents. *Id.* ¶ 11. He has over 6,000 hours of “pilot in-command time” in airplanes, helicopters, and sailplanes, including meteorological, production, and engineering flight test experience. *Id.* ¶ 12. We determine that Dr. Hansman is qualified to testify in the form of an opinion because his knowledge, skill, experience, training, and education will help the Board to understand the evidence or to determine a fact in issue, and because he otherwise meets the requirements of the applicable rule of evidence. *See* Fed. R. Evid. 702; *see also* Ex. 1004 (Curriculum Vitae of Dr. R. John Hansman, Jr.).

Patent Owner's declarant, Dr. Kaputa¹³, testifies that Dr. Hansman's definition, which is the definition adopted in our Decision to Institute (*see* Dec. Inst. 19), "while perhaps *not inaccurate*, does not provide much insight into the POSITA." Ex. 2011 ¶ 18 (emphasis added). Dr. Kaputa also testifies that "while *I do not disagree with Dr. Hansman's sentiments regarding the education and training of a POSITA*, it is important to understand the relatively limited nature of such an individual's education, training, and job duties." *Id.* ¶ 22 (emphasis added). Patent Owner does *not* cite this testimony in its Patent Owner Response. Petitioner comments on Dr. Kaputa's testimony in its Reply. Reply 5–6. Patent Owner responds to Petitioner's comments in Patent Owner's Sur-reply. Sur-reply 9–10. In its Sur-reply, Patent Owner states "[n]either [Patent Owner] nor Dr. Kaputa

¹³ Dr. Kaputa is an Assistant Professor of Computer Engineering Technology at the Rochester Institute of Technology (RIT). Ex. 2011 ¶ 5. He also is the director of Ravven Labs, which is a multi-disciplinary research lab at RIT focusing on augmented reality, artificial intelligence, virtual reality, unmanned aerial vehicles, and embedded vision. *Id.* Dr. Kaputa earned a B.S. degree in Computer Engineering, and M.S. and Ph.D. degrees in Electrical Engineering. *Id.* ¶¶ 6–8. His current research involves: Command and control of UAVs with Field Programmable Gate Arrays (FPGAs); GPS-denied UAV navigation via the use of visual fiducials; and Artificial Intelligence based object detection, classification, and tracking for low latency on-board UAV applications. *Id.* ¶ 9. Dr. Kaputa is the founder and CEO of Craft Drones, which creates FPGA-based UAVs for educational purposes. *Id.* ¶ 12. Additionally, he has industry experience at three military-aerospace companies, focusing on space launch vehicles and satellite technologies. *Id.* ¶ 13. We determine that Dr. Kaputa is qualified to testify in the form of an opinion because his knowledge, skill, experience, training, and education will help the Board to understand the evidence or to determine a fact in issue, and because he otherwise meets the requirements of the applicable rule of evidence. *See* Fed. R. Evid. 702. *See also* Ex. 2012 (Curriculum Vitae of Dr. Daniel S. Kaputa).

suggested that [Petitioner's] proposed person of ordinary skill in the art was not such a person for purposes of the '913 patent." Sur-reply 10.

Thus, Dr. Hansman and Dr. Kaputa, two highly educated, highly experienced experts in the relevant technology, *agree* on the level of education and training of a person of ordinary skill adopted in our Decision to Institute. The parties also agree. The parties and the experts may disagree on what would have been obvious to this hypothetical person, but that does not affect our determination of the level of education and training for a person of ordinary skill.

Based on the testimony of Dr. Hansman and Dr. Kaputa, as well as the references of record, we maintain the definition of the level of ordinary skill in the art adopted in our Decision to Institute (Dec. Inst. 19), which is that a person of ordinary skill would have had a bachelor's degree in aeronautical engineering, electrical engineering, computer science or equivalent training and experience, and at least two years of experience in the field of unmanned vehicles." Dec. Inst. 18–19.¹⁴

C. Claim Construction

In *inter partes* reviews, we interpret a claim "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b). The claim construction standard used in a civil action under 35 U.S.C. § 282(b) is generally referred to as the *Phillips* standard. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). Under the *Phillips* standard, words of a claim generally are given their ordinary and customary meaning.

¹⁴ Although not binding on Patent Owner, we note that in its Preliminary Response, Patent Owner adopted Petitioner's position on the level of ordinary skill in the art. Prelim. Resp. 17.

Id. at 1312. “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Id.* at 1313. Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification. *Id.*

“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’” *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

The challenged claims have numerous limitations written in “means-plus-function” format, as authorized in 35 U.S.C. § 112 ¶ 6. Our rules require that “[w]here the claim to be construed contains a means-plus-function or step-plus-function limitation as permitted under 35 U.S.C. 112(f) [or 112 ¶ 6 under the pre-AIA version of the statute], the construction of the claim must identify the specific portions of the specification that describe the structure, material, or acts corresponding to each claimed function.” *See* 37 C.F.R. § 42.104(b)(3).

As we stated above, there are three groups of claims. Independent claim 8, and the challenged claims dependent from claim 8, are directed to a “method for navigating” a UAV. Ex. 1001, 23:52–67. Independent claim 23, and the challenged claims dependent from claim 23, are directed to a “system for navigating” a UAV. *Id.* at 26:12–28. Independent claim 38, and the challenged claims dependent from claim 38, are directed to a “computer program product” for navigating a UAV. *Id.* at 28:48–67. Only the system claims (claim 23) and the computer program product claims (claim 38)

contain means-plus-function limitations. Method claim 8 does *not* contain any means-plus-function limitations.

1. Petitioner's Claim Construction

Petitioner asserts that except for the means-plus-function limitations, “Petitioner does not believe any terms require explicit construction in this proceeding.” Pet. 8. Petitioner provides the required analysis of each means-plus-function limitation in the challenged claims, including a statement of the claimed function, an identification of the specific structure disclosed in the Specification that corresponds to the claimed function, and a discussion of exactly where in the Specification this structure is disclosed. *Id.* at 8–16.

For the means-plus-function constructions for challenged “computer program product” claims 38, 40–42, and 44, Petitioner states the functions recited in these claims are “identical” to the functions in corresponding “system claims.” Pet. 15–16. Petitioner states, however, that the structure for the computer program product claims “is different.” *Id.* at 16.

In identifying this different structure for the computer program product claims, Petitioner points to the disclosure in the '913 patent that “the remote control includes processor 164 and RAM storing ‘an application program 152 **that implements inventive methods of the present invention**’ and that the UAV includes a processor 164 and RAM storing ‘an application program (158) **that implements inventive methods of the present invention.**’” Pet. 16 (citing Ex. 1001, 9:31–32, 9:41–43, 7:42–43, 7:50–53) (the bold font appears in the Petition, not the quoted text from the '913 patent). Petitioner also points to the disclosure in the '913 patent that “the CPP [computer program product] elements ‘may be implemented by use of any recording medium for machine-readable information.’” Pet. 16

(citing Ex. 1001, 5:24–27). Petitioner concludes from these disclosures that “[b]ecause the preamble of claim 38 recites that the CPP is ‘*disposed on a computer readable medium and executable on a computer system*,’ the structure for each limitation is software performing the recited function.” *Id.* (citing Ex. 1003 ¶ 54) (italicized font appears in the Petition, not the quoted text from the ’913 patent). Petitioner, however, asserted in the related District Court litigation that these same limitations were indefinite. Ex. 2009, 9–12.¹⁵

In its Reply, Petitioner asserted that “irrespective of whether the Board adopts DJI’s or Daedalus’s identified corresponding structure (see Petition, 8–16; POR, 17–18), the parties are in agreement that the ’913 patent discloses sufficient structure for the term.” Reply 5.

2. Patent Owner’s Claim Construction

Patent Owner proposes specific construction for only two terms, “waypoint” and “earth coordinates.” PO Resp. 12–14. We note that “waypoint” is defined in the Specification. *See* Ex. 1001, 5:60–63 (under the heading “Definitions,” defining “waypoint” to mean “a position chosen

¹⁵ In our Decision to Institute, we asked the parties to specifically address in the briefing for this proceeding the construction of the means-plus-function claim terms to clarify the parties’ respective positions, which appeared to be different from their claim construction positions in the District Court. Dec. Inst. 22–27 (citing Ex. 2009). This request for specific briefing was to allow the Board to resolve the claim construction issues under 35 U.S.C. § 112 ¶ 6 in the proceeding before us. It was not to address the disclosure requirements of §§ 112 ¶¶ 1, 2, which are not at issue in this IPR proceeding. *See Cochlear Bone Anchored Sols. AB v. Oticon Med. AB*, 958 F.3d 1348, 1359 (Fed. Cir. 2020) (holding that a claim that fails to meet the disclosure requirements of 35 U.S.C. § 112 ¶ 6 is “indefinite, . . . but that is not the inquiry in an inter partes review, in which the Board may not hold a challenged claim of a patent indefinite”).

as a destination for navigation of a route. A route has one or more waypoints. That is, a route is composed of way points, including at least one final waypoint, and one or more intermediate waypoints.”). Patent Owner’s proposed definition is “a position chosen as a destination for navigation of a route.” PO Resp. 12. Patent Owner’s definition is consistent with the Specification. Nonetheless, we will rely on the definition from the Specification.

As we discuss in detail below, we agree with Patent Owner that the term “earth coordinates” requires specific construction. Sur-reply 2 (“construction of ‘Earth coordinates’ and resolution of that question may well determine the outcome of the proceeding”). Petitioner agrees that construction of this term may determine the outcome of this proceeding. Tr. 26:20–21 (argument of Counsel for Petitioner that “the dispute here in the IPR is really what earth coordinates are”).

Patent Owner also lists eleven means-plus-function clauses construed by the District Court. PO Resp. 14–17 (citing Ex. 2009 (the District Court’s claim construction Order; Ex. 2009, 8–12 construing terms from the ’913 patent)). Patent Owner asserts “[t]he Board should adopt the District Court’s construction” of the means-plus-function terms. PO Resp. 17. Patent Owner also provided a further discussion of the construction of several mean-plus-function claim terms. *Id.* at 19–28.

3. *District Court’s Claim Construction*

Any prior claim construction determination concerning a term of the claim in a civil action that is timely made of record in an *inter partes* review proceeding will be considered. 37 C.F.R. § 42.100(b). A claim construction order from a district court may be informative to PTAB, just as claim construction from PTAB may be informative to a district court. The Board

will give the District Court claim construction determinations “appropriate weight.” Consolidated Trial Practice Guide (“CTPG”) 47 (2019). Non-exclusive factors considered by the Board when determining appropriate weight may include, for example, the similarities between the record in the district court and the record before the Board. *Id.* It may also be relevant whether the prior claim construction is final or interlocutory. *Id.* The facts and circumstances of each case will be analyzed as appropriate. *Id.*

Exhibit 2009 is the District Court’s Claim Construction Order (“DCCC Order” or “Order”). Exhibit 2009 states that “[t]aking into consideration the parties’ briefs and arguments at the Markman hearing, the Court enters its constructions as the final constructions for each term.” *Id.*

The DCCC Order includes claim constructions for two patents. The constructions for the ’913 patent, the patent in the proceeding before us, are on pages 8–12 of the Order. We have considered the District Court’s claim constructions for the ’913 patent.

There is no dispute necessary to resolve the controversy in this IPR proceeding concerning the construction of any of the terms construed by the District Court. As we discuss below, the District Court did not construe the term “Earth coordinates,” which is the one term that is disputed in this IPR proceeding. The major dispute over the means-plus-function terms in the District Court, as to whether these terms are indefinite, as argued by Petitioner, or whether adequate structure is disclosed for these terms, as argued by Patent Owner (*see e.g.*, Ex. 2009, 9–12), is not before us. Accordingly, for purposes of this Decision, we need not adopt or further discuss the District Court’s claim constructions. *Nidec*, 868 F.3d at 1017 (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’”).

4. *Terms Defined in the Specification*

Related to claim construction, we note that, under the heading “Definitions,” the ’913 patent defines several terms used in the patent. *See* Ex. 1001, 5:38–6:29; *see also Phillips*, 415 F.3d at 1316 (stating “the specification may reveal a *special definition* given to a claim term by the patentee *that differs from the meaning it would otherwise possess*. In such cases, the inventor’s lexicography governs.”) (emphases added).

In many cases, the definition in the ’913 patent is not a “special definition,” but merely defines an acronym that appears to be the ordinary and customary meaning the term would have had to a person of ordinary skill in the relevant technology. *See, e.g.,* Ex. 1001, 5:48–49 (defining the term “GUI” to mean “graphical user interface, a display means for a computer screen”). In this Decision, however, we have given all these terms their defined meaning.

5. *Construction of the Term “Earth Coordinates”*

The term “Earth coordinates” is *not* included in the “Definitions” in the Specification.

The District Court did *not* construe the term “Earth coordinates.”

Petitioner provides constructions for the means-plus-function clauses in which the term “Earth coordinates” appears. Petitioner does *not*, however, provide any construction for the term “Earth coordinates.” Petitioner emphasizes that construction of the term “Earth coordinates” is not the same as construing the means-plus-function clauses in which the term appears. Tr. 26:20–21 (“[T]he dispute here in the IPR is really what earth coordinates are, not what mapping the pixel’s location on the GUI to earth coordinates means.”).

Patent Owner asserts that the '913 patent “states that a ‘position’ is specified in ‘Earth coordinates, latitude and longitude.’” PO Resp. 13 (citing Ex. 1001, 5:57–58). Patent Owner concludes that “when the claims recite Earth coordinates, the claims mean latitude and longitude.” *Id.* at 14 (citing Ex. 2011 ¶¶ 31–33 (Dr. Kaputa’s testimony)).

Patent Owner’s cropped quotation from the definition of “position” in the Specification is misleading and not directly on point. The Specification defines “position” as “a location in the air or over the ground. ‘Position’ is *typically* specified as Earth coordinates, latitude and longitude. A specification of position may also include altitude.” Ex. 1001, 5:56–59 (emphasis added). This “typical” definition of “position” is not a definition of “Earth coordinates.” We agree that this definition of “position” suggests an equivalence between “Earth coordinates” and latitude and longitude, and that latitude and longitude are at least one example of “Earth coordinates.” The cited definition of “position,” however, does not establish that “Earth coordinates” are limited solely to latitude and longitude. While latitude and longitude are a common example of Earth coordinates, other coordinate systems also are used. *See* Ex. 1025, 2 (“Tessellated spheroids provide a rectangular coordinate and projection system at any scale for the entire earth ellipsoid.”).¹⁶

Patent Owner also argues that the process of mapping a pixel’s location to Earth coordinates “requires a GUI map that is segmented in a matrix of pixels where the pixel boundaries correspond to latitudes and longitudes.” PO Resp. 13 (citing Ex. 1001, 14:38–63). Patent Owner

¹⁶ Petitioner did not uniquely number in sequence each page of Ex. 1025 as required by our rules. *See* 37 C.F.R. § 42.63(d)(2). We cite to the numbered page 2, which is the sixth page of a 31-page PDF document.

reaches this conclusion because “[n]o other forms of Earth coordinates are described.” *Id.* “[T]he fact that embodiments (or even every embodiment) in the specification depict a particular arrangement or structure does not require reading that arrangement or structure into the claims.” *See Ethicon LLC v. Intuitive Surgical, Inc.*, No. 2020-1528, 2021 WL 3716397, at *4 (Fed. Cir. Aug. 23, 2021) (nonprecedential) (stating this legal principle and providing a comprehensive summary of cases applying this principle, which we quote in full below).

As we have repeatedly held, however, the fact that embodiments (or even every embodiment) in the specification depict a particular arrangement or structure does not require reading that arrangement or structure into the claims. *See Aventis Pharma S.A. v. Hospira, Inc.*, 675 F.3d 1324, 1330 (Fed. Cir. 2012) (“[I]t is . . . not enough that the only embodiments, or all of the embodiments, contain a particular limitation’ to limit a claim term beyond its ordinary meaning.” (second alteration in original) (quoting *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002))); *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1117 (Fed. Cir. 2004) (“[P]articular embodiments appearing in the written description will not be used to limit claim language that has broader effect.” (first citing *Electro Sci. Indus., Inc. v. Dynamic Details, Inc.*, 307 F.3d 1343, 1349 (Fed. Cir. 2002); and then citing *Laitram Corp. v. NEC Corp.*, 163 F.3d 1342, 1347–48 (Fed. Cir. 1998))); *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004) (“[T]his court has expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment.” (collecting cases)).

Ethicon, No. 2020-1528, 2021 WL 3716397, at *4.

To construe the term “Earth coordinates,” which is at issue, we look to the words of the claims themselves, the remainder of the Specification, the prosecution history, and probative extrinsic evidence.

a) Claims

All of the challenged claims refer to mapping a pixel's location on a GUI to Earth coordinates of a waypoint.

Independent method claim 8 includes the step of “mapping the pixel's location on the GUI to Earth coordinates of the waypoint.” Ex. 1001, 23:57–58.

Independent system claim 23 includes the means-plus-function clause “means for mapping the pixel's location on the GUI to Earth coordinates of the waypoint.” *Id.* at 26:18–19.

Independent computer program product claim 38 also includes the identical means-plus-function clause as claim 23, “means for mapping the pixel's location on the GUI to Earth coordinates of the waypoint.” *Id.* at 28:57–58.

Several other claims in the '913 patent, both challenged and unchallenged in this proceeding, also refer to “Earth coordinates.” *E.g., see* independent claim 1.

Claim 14, dependent from claim 8, includes the further limitations of:

- “mapping *pixel boundaries* of the GUI map to *Earth coordinates*;
- *identifying a range of latitude and a range of longitude* represented by each pixel; and
- locating a *region* on the surface of the Earth in dependence upon the boundaries, the ranges, and the location of the pixel on the GUI map.” *Id.* at 24:33–42 (emphases added).

In dependent claim 14, the “mapping” to Earth coordinates step is based on “pixel boundaries,” whereas in independent claim 8, from which claim 14 depends, the “mapping” to Earth coordinates step is based on a

“pixel’s location.” Neither party has directed us to any persuasive evidence or arguments regarding the difference between “pixel boundaries” and a “pixel’s location” based on the claim language.

If we accept Patent Owner’s position that “when the claims recite Earth coordinates, the claims mean latitude and longitude” (PO Resp. 14), the additional, limiting step in claim 14 of “identifying a range of latitude and a range of longitude represented by *each pixel*” is redundant of the step in claim 8 of “mapping *the pixel*’s location on the GUI to Earth coordinates of the waypoint.”

Like claim 14, challenged dependent claim 29 has additional claim limitations that specifically include latitude and longitude, whereas claim 23, from which claim 29 depends, refers to only Earth coordinates, but does not mention latitude or longitude. Independent claim 38 and dependent claim 44 follow this consistent claiming format. Claim 38 refers only to “pixels” and “Earth coordinates,” whereas dependent claim 44 refers to “pixel boundaries” and “latitude and longitude.”

“The doctrine of claim differentiation provides a presumption that differently worded claims cover different claim scope.” *Wi-LAN USA, Inc. v. Apple Inc.*, 830 F.3d 1374, 1391 (Fed. Cir. 2016). “This doctrine finds root in the legal canon of construction against superfluity. A construction that would cause two differently worded claims to cover exactly the same claim scope would render one of the claims superfluous, so we apply a presumption against such constructions.” *Id.* We also recognize, however, that “claim differentiation is ‘a guide, not a rigid rule,’ especially if the claim language is clearly to the contrary.” *Traxcell Techs., LLC v. Nokia Sols. & Networks Oy*, 15 F.4th 1136, 1143 (Fed. Cir. 2021) (quoting *Wi-LAN*, 830 F.3d at 1391).

In the claims before us, based on claim differentiation, there seems to be a difference between Earth coordinates and latitude and longitude. If we were to accept Patent Owners argument that “when the claims recite Earth coordinates, the claims mean latitude and longitude,” then dependent claims 6, 14, and 29 would be redundant by reciting “latitude and longitude” when the claims from which they depend already recite Earth coordinates.

As we discuss in the next section of this Decision, this distinction in claiming is consistent with the Specification.

b) Specification

Under the heading Summary of the Invention, the Specification states that:

Methods, systems, and products are described for UAV navigation that enable an operator to input a single interface operation, a mouseclick or joystick button click, for example, thereby selecting a GUI pixel from a displayed GUI map of the surface of the Earth. The selected pixel maps to a waypoint. The waypoint coordinates are uploaded through uplink telemetry to a UAV which calculates a heading and flies, according to a navigation algorithm, a course to the waypoint.

Ex. 1001, 1:31–41.

This broad summary refers to “selecting a GUI pixel from a displayed GUI map of the surface of the Earth.” *Id.* at 1:36–37. There is no requirement that the GUI map of the surface of the Earth be based on longitude and latitude, rather than other coordinate systems disclosed in the prior art. *See e.g.*, Ex. 1025, 2 (“Tessellated spheroids provide a rectangular coordinate and projection system at any scale for the entire earth ellipsoid.”). According to this broad summary, what is critical to the disclosed invention is allowing an operator to select a GUI pixel from a displayed GUI map of the Earth. The Summary of the Invention also refers to “Landsat maps or

other satellite imaging maps” to be used for mapping pixels. Ex. 1001, 1:59–60. There is no persuasive evidence to which we have been directed that indicates that all maps are based on latitude and longitude. Indeed, the evidence is to the contrary.

The selected pixel is then mapped to a waypoint. The waypoint coordinates, as determined by the selected pixel, are uploaded to a UAV. The only requirement is that the waypoint have defined “coordinates.” Based on this broad summary, the waypoint coordinates are not limited to any specific coordinate system, such as latitude and longitude.

In describing some embodiments, the Specification refers only to Earth coordinates. *Id.* at 2:24–25. The first reference to either latitude or longitude is in the context of mapping “pixel boundaries” of the GUI map to Earth coordinates. *Id.* at 2:61–67. When mapping “pixel boundaries,” to identify a “region,” rather than a specific location, the Specification states that the “pixel boundaries,” “identifying a range of latitude and a range of longitude represented by each pixel, are used for locating a region on the surface of the Earth in dependence upon the boundaries, the ranges, and the location of the pixel on the GUI map.” *Id.*; *see also id.* at 10:24–35 (referencing latitude and longitude in the context of mapping pixel boundaries). Thus, based on the Specification, there is a difference between “pixels” and “pixels boundaries.”

The Specification describes the mapping process as follows:

The method of FIG. 4 includes mapping (404) the pixel’s location on the GUI to Earth coordinates (414) of the waypoint. As discussed in more detail below with reference to FIG. 5, *mapping (404) the pixel’s location on the GUI to Earth coordinates of the waypoint (414) typically includes mapping pixel boundaries of the GUI map to corresponding Earth coordinates and identifying a range of latitude and a range of*

longitude represented by each pixel. Mapping (404) the pixel's location on the GUI to Earth coordinates of the waypoint (414) also typically includes locating a region on the surface of the Earth in dependence upon the boundaries, the ranges, and the location of the pixel on the GUI map.

Ex. 1001, 10:24–35 (emphasis added). Here, the Specification discloses what is “typical,” not what is required by the claimed invention. Moreover, the Specification, and claims, are consistent in using the terms “latitude and longitude” in referring to mapping “pixel boundaries,” not to mapping “pixels.”

In a section of the Specification with the heading “Pixel Mapping,” the specific examples used rely on latitude and longitude. Ex. 1001, 14:32–16:19. As stated in *Ethicon v. Intuitive Surgical*, No. 2020-1528, 2021 WL 3716397, at *4, this preferred embodiment is not determinative of claim construction.

c) Prosecution History

The parties do not direct us to any persuasive evidence in the prosecution history regarding construction of the term “Earth coordinates.”

d) Other Evidence

Dr. Hansman testifies that “Shim (Ex. 1005) teaches a remote control device sending either absolute or relative coordinates of waypoints to the UAV.” Ex. 1061 ¶ 3. The “relative coordinates” tell the UAV to fly to a position relative to its present location “regardless of and without knowledge of the UAV’s present location on Earth.” *Id.* at ¶ 4. He also testifies that a “POSITA would understand that the absolute coordinates specifically identify a point on the Earth and are therefore ‘Earth coordinates.’” *Id.* at ¶ 5. Dr. Hansman does not provide the underlying facts or data on which his opinion is based. Accordingly, it is entitled to little probative

weight. 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”).

Dr. Kaputa testifies that, in his opinion, a POSITA would understand the ’913 [patent] defines [Earth coordinates] as meaning latitude and longitude.” Ex. 2011 ¶ 32. He cites the same portions of the Specification as asserted by Patent Owner, and discussed above, i.e., the definition of “position” and the assertion that latitude and longitude are the only coordinate system disclosed. *Id.* at ¶¶ 31–33. We determine this testimony also has little probative weight for the same reasons as discussed above.

*e) Conclusion Regarding Claim Construction
of the term “Earth coordinates”*

We recognize that “[t]he very nature of words would make a clear and unambiguous claim a rare occurrence.” *Autogiro Co. of Am. v. United States*, 384 F.2d 391, 396 (Ct. Cl. 1967). Using different words for the same element, as proposed by Patent Owner, compounds the difficulties of claim interpretation. The Federal Circuit has provided a beacon to guide us in determining the proper construction when we encounter ambiguities or differing interpretations from the parties.

Ultimately, the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim. The construction that stays true to the claim language and most naturally aligns with the patent’s description of the invention will be, in the end, the correct construction.

Renishaw PLC v. Marposs Societa’ per Azioni, 158 F.3d 1243, 1250 (Fed. Cir. 1998) (citations omitted) (cited with approval in *Phillips*, 415 F.3d at 1316).

We conclude that a person of ordinary skill, with the level of education and experience stated in Section III.B of this Decision, would understand from the claims and Specification that the term “Earth coordinates,” as used in the claims of the ’913 patent, means any coordinate system that identifies a precise Earth location of a GUI map pixel. Based on the evidence discussed above, this is the construction that stays true to the claim language and most naturally aligns with the patent’s description of the invention.

Based on the evidence and the analysis above, we determine that the term “Earth coordinates” is not synonymous with, or otherwise limited to, “latitude and longitude.” We are not persuaded that the record in this case shows that the patentee clearly set forth this definition of “Earth coordinates.”

The written description does not equate “Earth coordinates” and “latitude and longitude” through interchangeable use. The written description and the claims are consistent in using the term “Earth coordinates” broadly in the independent claims and when disclosing the broad concepts of the invention. The terms “latitude and longitude” are used only in dependent claims, and as a “typical” example of an Earth coordinate system. Disclosing “latitude and longitude” as a preferred embodiment does not make clear that the invention is limited to these coordinates. There is no disclosure of any specific advantage of using “latitude and longitude” as the Earth coordinate system. *See Apple, Inc. v. Wi-LAN, Inc.*, 2020-2011, 2020-2094, slip op. 9–12 (Fed. Cir. Feb. 4, 2022).

Patent Owner argues that we should limit the claimed invention to the disclosed embodiment. PO Resp. 13. In the Specification, however, Patent Owner was careful to avoid the claim construction it now asserts. *See*

Ex. 1001, 22:35–38 (“The descriptions in this specification are for purposes of illustration only and are not to be construed in a limiting sense. The scope of the present invention is limited only by the language of the following claims.”).

D. Ground 1
Claims 8, 23, 38 Based on Shim and Tao

Petitioner asserts that independent claims 8, 23, and 38 would have been obvious based on Shim and Tso. Pet. 16. We first discuss the scope and content of these references.

1. Shim (Ex. 1005)¹⁷

We make the following findings concerning Shim.

Shim discloses a “flight control system” for a UAV. Ex. 1005, 3.C.4-

1. As disclosed in Shim,

One of the most essential tasks of a UAV is to autonomously guide itself through the requested trajectories, or waypoints, in an autonomous manner. In order to achieve this goal, a UAV is equipped with onboard navigation sensors, realtime control units, and communication devices. For navigation sensors, the GPS-based INS [inertial navigation system] is the most popular choice. The relatively poor accuracy of strap-down INS is nicely complemented by the use of high-accuracy GPS, which corrects the unbounded error of INS.

Id. at 3.C.4-2. Shim also discloses the use of sensors to acquire the environment-specific information such as relative altitude, and sensors to detect objects around the host vehicle, allowing collision avoidance. *Id.* For computer systems, Shim discloses the use of a variety of CPUs, ranging

¹⁷ Shim is a published paper from a conference proceeding. The substantive pages of Shim begin on page 26 of a 33-page PDF file. The substantive pages are numbered “3.C.4-1” through “3.C.4-8.”

from embedded microprocessors to general-purpose CPUs, for high-speed real-time applications. Ex. 1005, 3.C.4-2.

Shim's disclosed UAV vehicles are able to function with minimal supervision of human operators away from the vehicle. *Id.*

The UAV communicates with the mission post to receive commands and share information. *Id.* When a human operator wants to send a command to a UAV, it actually goes through two interfaces: "human-to-console" interface and "console-to-UAV" interface. *Id.* The human-to-console interface receives commands and displays the information downloaded from the UAV. *Id.* It is often implemented with a "graphics user interface (GUI)." *Id.*

Figure 4 from Shim, a "scalable architecture for multi-agent scenarios," (Ex. 1005, 3.C.4-4) is reproduced below.

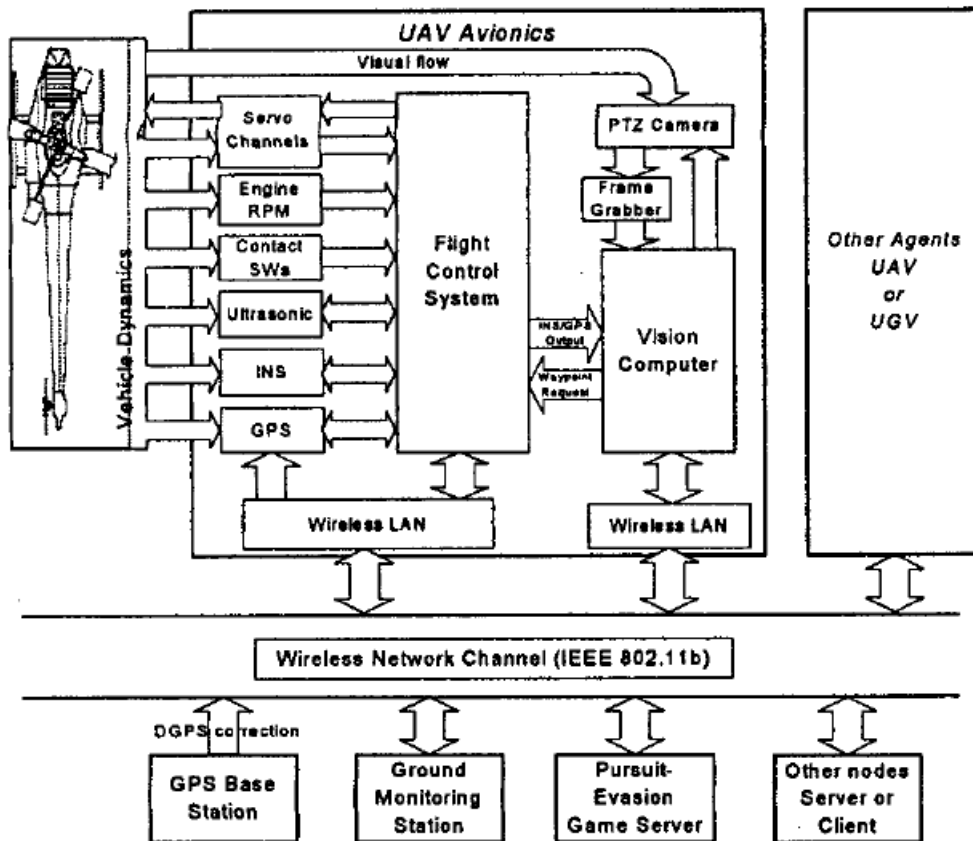


Figure 4 Scalable architecture for multi-agent scenarios

Shim also provides for TCP/IP communications. *Id.* at 3.C.4-4.

Petitioner acknowledges that although Shim mentions “a human-to-console interface including a GUI,” Shim does not provide any further details of this interface. Pet. 21 (citing Ex. 1005, 3.C.4-5; Ex. 1003 ¶ 77).

2. Tso (Exhibit 1010)

We make the following findings concerning Tso.

Tso discloses a “multi-agent operator interface” developed to address issues in UAVs, such as “flight operation, navigation, target spotting and acquisition, weapon deployment, and operation of a variety of mission payloads.” Ex. 1010, 1. The software architecture is highly modularized so that it can be easily reconfigured and expanded for various applications. *Id.*

The cooperative multi-agent architecture facilitates communication and coordinates activities among the various components. *Id.* Tso discloses that the UAV will need to access “heterogeneous information from various sources, such as the Geographical Information System for aerial maps.” *Id.* at 2–3.

For mission planning, Tso discloses that mission plans are represented by waypoints and targets using the “Motion Guides and Task Lines concept.” *Id.* at 4. The waypoints define the flight path that the UAV will fly. *Id.* The targets define the locations and contain task commands to be executed at those locations. *Id.* Target task commands include “taking closeup images, launching weapons, operating payloads, etc.” *Id.* A “Mission Planning Agent” is shown in Figure 4 of Tso, which is reproduced below.

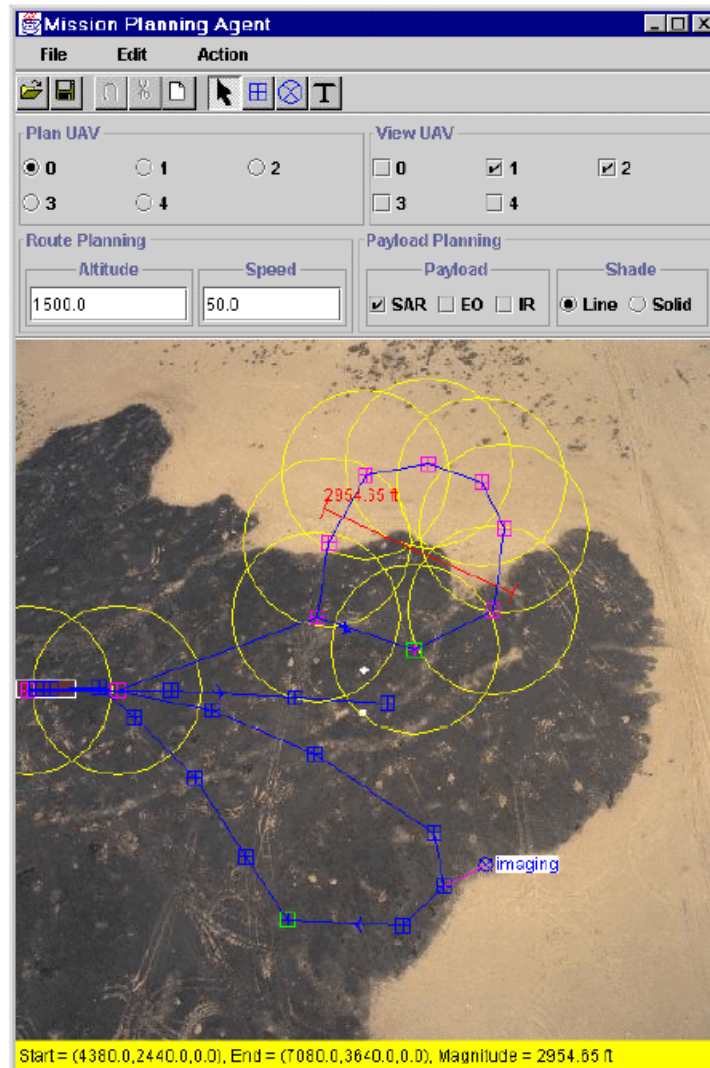


Figure 4: Mission Planning Agent

Figure 4, reproduced above, “shows the navigation plans of three typical mission scenarios.” Ex. 1010, 4. Tso explains that navigation planning is used to specify the flight path of the UAV for a mission. *Id.* The “Mission Planning Agent” allows the operator to visualize the mission area and “enter waypoints at the locations directly on the terrain image.” *Id.* Each pixel in the terrain image corresponds to the “actual location” in the mission area. *Id.* Tso explains that using pixels from a map or “terrain

image” relieves the operator “from knowing the detailed coordinates and doing calculations.” Ex. 1010, 4.

Tso further discloses that “[t]ask planning is used to specify locations and the task commands to be executed at those locations.” *Id.* By clicking on a target using the mouse in the “Command mode,” the operator can open the “Target Task Window to specify tasks to be performed at that target.” *Id.*

Tso also discloses “communication planning,” which is used “to plan information distribution in order to meet the required performance of the communication channels.” Ex. 1010, 5. The various stations in Tso “continuously receive data from and send commands to the server, over a local area network or the Internet.” *Id.* The server also continuously receives data from and forwards commands to the UAVs, using a radio or satellite link. *Id.*

3. *Analysis of Independent Claims 8, 23, 38*

Petitioner provides an element-by-element analysis of where each element is disclosed in either Shim or Tso for claims 8, 23, and 38. Pet. 23–43. Petitioner also relies on the testimony of Dr. Hansman (Exs. 1003, 1061).

Shim discloses a remote control device sending either absolute or relative coordinates of waypoints to the UAV. Ex. 1061 ¶ 3 (citing Ex. 1005, 3.C.4-5¹⁸, Fig. 6). Figure 6 from Shim, annotated, is reproduced below.

¹⁸ Petitioner did not number the pages of this exhibit in accordance with our rules. 37 C.F.R. § 42.63(d)(2)(i). We cite, as did Dr. Hansman, to the page numbers on the document, which correspond to pages 29 and 30 of the 33-page PDF exhibit.

```
TakeoffTo <coord>{abs,rel} : perform
autonomous take-off to certain target point

Hover <coord>{abs,rel}
{heading=<heading>{deg,rad}}
duration>{sec,min}
: hover with given heading angle for given time

FlyTo <coord>{abs,rel} {vel
<velocity>{mps,kmps,fps,knots,mph}}
{passby,stopover} {autoheading,
heading=<heading>{deg,rad}}
: cruise to certain waypoint stopping over or passing by

MoveTo <coord>{abs,rel} {vel
<velocity>{mps,kmps,fps,knots,mph}}
{autoheading, heading=<heading>
{deg,rad}}
: move to certain way point to stopover with fixed
heading

BankToTurn <heading change>{deg,rad}
{{radius<radius>{m,ft}}
{{vel} <velocity>
{mps,kmps,fps,knots,mph}
: perform bank-to-turn during cruise

Land : command the vehicle to land
```

Figure 6 Vehicle Control Language Syntax

Figure 6 from Shim, annotated to highlight two vehicle control commands, of flying to, and moving to, absolute (“abs”) and relative (“rel”) coordinates.

Shim does not disclose details of the human-to-console interface using a GUI. Petitioner “admits that Shim does not teach the element of ‘mapping the pixel’s location on the GUI to Earth coordinates of the waypoint.’”

Reply 1. As stated by Petitioner, “Shim requires the operator to figure out the coordinates of the desired waypoint and enter the coordinates as part of control commands on the GUI.” *Id.* at 2.

Petitioner relies on Tso for the claimed pixel mapping. Reply 2 (citing Ex. 1010, 4) (“That is where Tso comes in. Tso’s system “allows the operator to visualize the mission area and enter waypoints at the locations directly on the terrain image [on the GUI].”).

In the context of the method of claim 8, Dr. Hansman states his opinion that:

The combination of Shim and Tso suggests “*mapping the pixel’s location on the GUI to Earth coordinates of the waypoint*” [8B]. Although Tso does not use the explicit words “*mapping the pixel’s location ... to Earth coordinates*,” a POSITA would understand that such a mapping occurs based on Tso’s teachings. Alternatively, to the extent an argument is made that the mapping is not necessarily present in Tso, mapping the pixel’s location to Earth coordinates would have been obvious to a POSITA based on the teaches of both Tso and Shim.

Ex. 1003 ¶ 90. A similar analysis of the “mapping” limitation applies to all challenged claims.

Petitioner also acknowledges an error in its original analysis of Tso. Reply 2, n.1. Petitioner, and Dr. Hansman, incorrectly characterized the numbers at the bottom of Tso’s Figure 4 for latitude and longitude of the waypoint. *Id.*; *see also* Ex. 1061 ¶ 7 (“Upon further review of Tso, I agree with [Patent Owner] that the numbers at the bottom of Tso’s Figure 4 do not represent latitude and longitude of the waypoint. That was an inadvertent mistake in my August 14, 2020, declaration [(Ex. 1003)].”). According to Petitioner, the error “does not, however, negate the fact that Tso teaches a visual way for an operator to identify a waypoint on the Earth by directly identifying a point on the displayed map and not having to calculate the coordinates of the waypoint.” Reply 2 n., n.1.

Petitioner asserts that it would have been obvious to use Tso’s “planning agent,” which allows a user to enter waypoints using pixels from a GUI. Pet. 22. According to Petitioner, the reason why a person of ordinary skill would have been motivated to use Tso’s “planning agent” in Shim’s system is to provide a “simplified, user-friendly interface for Shim’s

system.” *Id.* (citing Ex. 1003 ¶¶ 78–79). Petitioner also asserts that a person of ordinary skill would have had a reasonable expectation of success of the proposed combination. *Id.* (citing Ex. 1003 ¶ 80).

Petitioner also argues:

Tso’s intuitive GUI receives the operator’s selection of a pixel on the displayed map and determines the coordinates of the waypoint on the Earth. Regardless of whether the waypoint is identified as the latitude/longitude, Tso’s GUI allows the operator to simply select a pixel on the display and let the computer translate the selected pixel into the corresponding waypoint location on the Earth for the UAV. When Shim is modified to include such an intuitive GUI, the result would be a GUI that maps the operator’s selection of a pixel to the absolute or relative coordinates in Shim.

Reply 7–8 (citing Ex. 1010 (citations and footnote omitted)).

As a reason why a person of ordinary skill would make the proposed combination of the references, and have a reasonable expectation of success, Petitioner asserts Tso “provides a solution that ‘relieves the operator from knowing the detailed coordinates and doing calculations.’” Reply 7 (citing “Ex. 1010, 4”). Petitioner also argues “integrating Tso’s intuitive GUI into Shim’s ground station reduces the level of training needed for a UAV operator.” *Id.* (citing Pet. 22; Ex. 1003 ¶¶ 73–74, 78, 89; Ex. 1061 ¶ 7).

Patent Owner takes a different view of the evidence. Patent Owner argues “a POSITA would not have been motivated to combine the teachings of Shim and Tso. PO Resp. 35 (citing Ex. 2011 ¶¶ 40–49). Patent Owner argues an error in Petitioner’s analysis based on whether Shim is modified with Tso or Tso is modified with Shim. *Id.* at 35–36. We find this argument misplaced because the order of references is irrelevant. *See, e.g., In re Bush*, 296 F.2d 491, 496 (CCPA 1961) (“In a case of this type where a rejection is predicated on two references each containing pertinent disclosure which has

been pointed out to the applicant, we deem it to be of no significance, but merely a matter of exposition, that the rejection is stated to be on A in view of B instead of B in view of A, or to term one reference primary and the other secondary.”); *see also In re Cook*, 372 F.2d 563, 566 n.4 (CCPA 1967).

Moreover, the obviousness inquiry does not ask “whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole.” *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (en banc); *see also In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.”)

Patent Owner also argues that “[r]eplacing the VCL- (“Vehicle Control Language” (Ex. 1005, 3.C.4-5)) based strategic planning layer of Shim’s ground control station with the mission planning agent of Tso involves much more than simply substituting one for the other as the petition contends.” PO Resp. 37 (citing Ex. 2011 ¶¶ 44, 46–47). We find these argued differences in the references, based on “strategic planning” versus “mission planning,” even if accepted as true, irrelevant to whether it would have obvious to combine the teachings of the references to yield the claimed invention. As explained in Shim, “[w]hen a flight pattern for a UAV is given, the VCL code may be generated using a graphic user interface, or handwritten. The generated VCL is stored in an ASCII file and uploaded to the flight computer, which executes the VCL in a sequential manner.”

Patent Owner also relies on its proposed claim construction that the term “Earth coordinates” means “latitude and longitude” as a fundamental reason why we should deny Petitioner’s challenges to the claims. PO Resp. 38–54. We have not adopted Patent Owner’s proposed construction for the term “Earth coordinates.” The parties were in agreement, and correct, that our construction of the term “Earth coordinates” likely would control the outcome of this proceeding. Sur-reply 2 (stating that “construction of ‘Earth coordinates’ and resolution of that question may well determine the outcome of the proceeding”); Tr. 26:20–21 (argument of Counsel for Petitioner that “the dispute here in the IPR is really what earth coordinates are”). Based on our determination that “Earth coordinates” are not limited to latitude and longitude, Patent Owner’s arguments relying on its proposed, but rejected, construction are not persuasive.

We have not been directed to any persuasive evidence that Tso’s disclosure of mapping a pixel’s location on a GUI to “Earth coordinates” is different than the “mapping” recited in the challenged claims.

Our analysis above applies to the method in independent claim 8, the system in independent claim 23, and the computer program product in independent claim 38. Based on this analysis, we determine that Petitioner has shown by a preponderance of the evidence that claims 8, 23, and 38 would have been obvious based on Shim and Tso.

E. Ground 2
Claims 10, 25, 40
Based on Shim, Tao, and TCP/IP Sockets

As we stated in Section II.B of this Decision, there is an inconsistency in the Petition as to what claims are challenged in Ground 2. Under the heading “Statutory grounds for challenge,” Petitioner states Ground 2

challenges to claims “10–12, 25–27, and 40–42.” Pet. 5. On page 43 of the Petition, however, Petitioner states that Ground 2 is asserted only against “claims 10, 25, and 40.” *Id.* at 43 (heading “V.B”). Petitioner presents argument and evidence challenging only claims 10, 25, and 40 under this Ground. *Id.* at 46–51. We noted this inconsistency in our Decision to Institute this proceeding. Dec. Inst. 36–37. Petitioner did not correct or clarify this inconsistency in its Reply. Indeed, Petitioner repeated the same incorrect claim listing in its Reply. Reply 11. In Ground 2, we consider patentability of only claims 10, 25, and 40.

Claim 10 depends from claim 8 and adds that the step of receiving downlink telemetry further includes “listening on the socket for downlink data; storing downlink data in computer memory; and exposing the stored downlink data through an API^[19] to a navigation application.” Ex. 1001, 24:7–12. Claims 25 (dependent from claim 23) and claim 40 (dependent from claim 38) are substantially identical to claim 10.

TCP/IP Sockets is a 120-page book titled “TCP/IP Sockets in JAVA, Practical Guide for Programmers.” Ex. 1015. TCP/IP stands for Transmission Control Protocol/Internet Protocol. TCP/IP is a set of standardized rules that allow computers to communicate on a network such as the Internet.²⁰ A socket is one end-point of a two-way communication link between two programs running on a network. Ex. 1043, 1 of 6.

Petitioner provides a detailed analysis of where each limitation of claims 10, 25, and 40 are disclosed in TCP/IP Sockets, and why it would have been obvious to modify Shim and Tso to include the socket limitations

¹⁹ API is the acronym for “Application Programming Interface.” Ex. 1001, 12, 30–34.

²⁰ Ex. 1015, 1.

in these claims. Pet. 46–51. Throughout this analysis, Petitioner relies on the testimony of Dr. Hansman for evidentiary support. Petitioner also explains why it would have been obvious to modify Shim and Tso with the socket disclosed in TCP/IP Sockets, again citing Dr. Hansman’s testimony. Petitioner concludes that the invention claimed in claims 10, 25, and 40 “is identical” to the disclosed socket technology in TCP/IP Sockets. Pet. 46.

Patent Owner does not address any of the claims in Ground 2. Patent Owner asserts only that “[a]ll of the remaining claims 10–12, 25, and 40–42 depend from one of claims 8, 23, and 38. Each respective dependent claim is not unpatentable in view of Shim and Tso for at least the same reasons as its respective independent claim.” PO Resp. 54.

Based on the record before us, we adopt Petitioner’s analysis and Dr. Hansman’s cited testimony as our findings of fact. Based on these findings we determine that Petitioner has shown by a preponderance of the evidence that claims 10, 25, and 40 would have been obvious based on Shim, Tso, and TCP/IP Sockets.

F. Ground 3
Claims 11, 12, 26, 27, 41, 42
Shim, Tso, TCP/IP Sockets, and Dittrich

Claims 11 and 12 depend from claim 10, which depends from claim 8. Claims 26 and 27 depend from claim 25, which depends from claim 23. Claims 41 and 42 depend from claim 40, which depends from claim 38. Claims 11, 26, and 41 are substantially similar, as are claims 12, 27, and 42. We describe below claims 11 and 12.

Claim 11 adds to claim 10 that the “downlink telemetry” includes “Earth coordinates of waypoints.” Ex. 1001, 24:13–14. Claim 12 adds to

claim 10 that the “downlink telemetry” includes “one or more UAV instructions.” *Id.* at 24:15–16.

Petitioner asserts that Shim combined with Tso transmits “Earth coordinates of waypoints in uplink telemetry.” Pet. 51. Petitioner points to Shim’s Figure 6 to show that Shim’s “VCL specifies waypoints by their coordinates” and “associates each waypoint with an instruction (e.g., Hover, FlyTo, MoveTo, etc.).” *Id.* (citing Ex. 1005, Figure 6, 3.C.4-5). Petitioner also asserts that “Hover, FlyTo, MoveTo, and Land are UAV instructions.” *Id.* (citing Ex. 1003 ¶ 183; Ex. 1001, 2:5–8 (identifying “instructions to orbit, take photographs or stream video, and continue flying a route or mission to a next waypoint” as exemplary UAV instructions)).

Petitioner also asserts, correctly, that “Tso similarly teaches that waypoints, defining a flight plan, ‘may also contain waypoint task commands related to flight and navigation control.’” Pet. 52. Tso clearly discloses that:

In MIIRO, mission plans are represented by waypoints and targets using the Motion Guides and Task Lines concept. The waypoints define the flight path that the UAV will fly. The targets define the locations and contain task commands to be executed at those locations. Target task commands include *taking closeup images, launching weapons, operating payloads*, etc. Waypoints may also contain waypoint task commands related to flight and navigation control.

Ex. 1010, 4 (emphasis added).

Petitioner also asserts that “Shim’s ground station uploads the VCL script as a file to the UAV.” Pet. 53 (citing Ex. 1005, 3.C.4-5.). As stated in Shim, Shim uses a “Vehicle Control Language, or *VCL*. VCL is a script language that specifies the given mission with the provided command set.” Ex. 1005, 3.C.4-5. Shim also discloses that a “VCL module consists of the

user interface part on the ground station, the language interpreter, and the sequencer on the UAV FCS.” *Id.*

Petitioner relies on Dittrich for the disclosure of the retrieval of data structures from a UAV. Pet. 53.

Dittrich is an article titled “Multi-Sensor Navigation System for an Autonomous Helicopter.” Ex. 1020, 8.C.1-1.²¹ Dittrich discloses “an avionics system that provides navigational and terrain information to the flight computer of a rotorcraft UAV.” *Id.* In Dittrich, the operating system on the flight computer is equipped with an FTP-Server that enables the ground operator to download recorded flight data while the vehicle is still in flight. *Id.* at 8.C.1-4. Also, a connection between the development environment and the onboard computer is run to update and execute the flight code remotely using a TCP/IP connection. *Id.*

Petitioner also asserts that “an important feature” of Dittrich’s system “is the request of data structures from the aircraft.” Pet. 53 (citing Ex. 1020, 8.C.1-6). As disclosed in Dittrich, “[a] ‘get’ command enables the ground crew to retrieve any data structure from the helicopter while in flight, display it in the ESim browser window, modify it if needed, and eventually upload it again with a ‘send’ command.” *Id.* (citing Ex. 1020, 8.C.1-6).

According to Petitioner, “Dittrich explains the benefits and necessity for the ground crew to retrieve information from the UAV so that the operator is aware of the previously uploaded instructions and data, for purposes of either updating or troubleshooting a flight.” Reply 11.

²¹ Dittrich, like Shim, is a published paper from a conference proceeding. The substantive pages of Dittrich begin on page 13 of a 21-page PDF file. The substantive pages are numbered “8.C.1-1” through “8.C.1-9.”

Petitioner explains why a person of ordinary skill would have been motivated to add Dittrich's data retrieval mechanism to the combined system of Shim, Tso, and TCP/IP Sockets by including a command such as "get" to permit retrieval of previously uploaded instructions. Pet. 53 (citing Ex. 1003 ¶ 180). According to Petitioner, a person of ordinary skill would have recognized "that such a capability is critical for coordinated control environments such as Shim and Tso where another ground station can take over control of a UAV during a flight. Pet. 53–54 (citing Ex. 1003 ¶ 181). Petitioner concludes from Dittrich that, because the VCL script for a mission includes "waypoints" and associated "*UAV instructions*," when the script is retrieved from the UAV, "*the downlink telemetry further comprises Earth coordinates of waypoints*" and "*one or more UAV instructions*." Pet. 54 (citing Ex. 1003 ¶¶ 183–188).

Dr. Hansman's cited testimony supports Petitioner's analysis of Dittrich and the reasons why a person of ordinary skill would have gleaned information from each reference and combined them as proposed.

Patent Owner asserts that "[a]t best, Dittrich suggests that a retrieval feature allows an operator to modify a data structure if needed." PO Resp. 58. It is Patent Owner's view that Dittrich uses script-based commands, "but says nothing about the ability (or desire) to 'get' or download such command scripts from the UAV." PO Resp. 58; Sur-reply 17. Patent Owner's arguments, however, do not focus on why Dittrich's disclosure does not meet the elements and limitations in the challenged claims, or why the proposed combination of references would not have been obvious.

Based on the evidence, including Dr. Hansman's testimony, we determine that it would have been obvious to a person of ordinary skill to combine the references as proposed by Petitioner, and with a reasonable

expectation of success. Dittrich suggests that “downlink telemetry” can include “Earth coordinates of waypoints” and that the “downlink telemetry” includes one or more UAV instructions as required by the claims.

Based on our analysis above for the claims in Grounds 1, 2, and 3, we determine that a preponderance of the evidence establishes that claims 11, 12, 26, 27, 41, and 42 would have been obvious based on Shim, Tso, TCP/IP Sockets, and Dittrich.

G. Ground 4
Claims 8, 14, 23, 29, 38, and 44
Shim, Tso, and Lohrenz

Claims 14, 29, and 44 are included here for the first time, as well as a new reference, Lohrenz.

Claim 14 depends from claim 8 and adds that mapping the pixel’s location on the GUI to Earth coordinates of the waypoint further includes mapping pixel boundaries of the GUI map to Earth coordinates; identifying a range of latitude and a range of longitude represented by each pixel; and locating a region on the surface of the Earth in dependence upon the boundaries, the ranges, and the location of the pixel on the GUI map. Ex. 1001, 24:33–42. Claim 29, dependent from claim 23, and claim 44, dependent from claim 38, are substantially similar to claim 14.

Petitioner provides a clause-by-clause analysis of the challenged claims (*see, e.g.*, Pet. 64–66).

Lohrenz is a publication titled “The Navy Tessellated Spheroid Map Projection System: A Comprehensive Definition.” Ex. 1025. Lohrenz states that the “purpose of this report is to completely describe the CAC [Compressed Aeronautical Chart] Tessellated Spheroid (TS) map projection system so it can be applied to other databases of interest to mission

planners.” *Id.* at 1. “Tessellated spheroids provide a rectangular coordinate and projection system at any scale for the entire earth ellipsoid.” *Id.* at 2. Segments in both systems are divided into pixels. Each pixel is associated with a fixed latitude and longitude point. *Id.*

As discussed above, we determine that Shim and Tso disclose mapping a pixel’s location on the GUI to Earth coordinates of a waypoint, as claimed in claims 8, 23, and 38, recognizing that claims 23 and 38 use means-plus-function claim formats, which have been construed in this Decision to cover the corresponding structure, material, or acts described in the Specification and equivalents thereof.

Petitioner concedes that “Tso does not describe details of the process used to map pixel locations to coordinates and therefore does not explicitly disclose the limitations of claims 14, 29, and 44.” Pet. 54. Petitioner relies on Lohrenz to disclose the “details” of the process to map pixel locations to coordinates, as required for claims 14, 29, and 44.

We have determined in Ground 1 that claims 8, 23, and 38 are unpatentable based on Shim and Tso, alone, without Lohrenz. Nonetheless, we also consider this additional Ground asserted against claims 8, 23, and 38.

As described in Lohrenz, using tessellated spheroids, the earth is divided into latitudinal *bands* with a slight overlap between adjacent bands. Ex. 1025, 2. These bands are subdivided into *segments* that are bounded by fixed latitude and longitude lines. *Id.* Segments are divided into *pixels*. *Id.* Each pixel is associated with a fixed latitude and longitude point. *Id.* Lohrenz also provides details of the specific relationship of pixels to latitude and longitude. *Id.* at 10–11.

As Petitioner states correctly, “Lohrenz presents equations to determine the specific Earth coordinate for a pixel using the segment boundaries which define the origin of the GUI segment and pixels within the segments, latitude and longitude ranges for a pixel, and the row and column containing the user-selected position.” Pet. 64 (citing Ex. 1025, 11; Ex. 1003 ¶ 223). Petitioner concludes that, as disclosed in Lohrenz, “a pixel defines a smaller region on the Earth’s surface within the map’s region.” *Id.* (citing Ex. 1003 ¶ 220).

Petitioner asserts that a person of ordinary skill would have been motivated to use Lohrenz’s map projection because Tso does not provide explicit details of the technique used to map its GUI map pixels to associated Earth coordinates, as required in claims 14, 29, and 44. Pet. 57 (citing Ex. 1003 ¶ 198). Petitioner also asserts that Tso motivates the combination in its disclosure of the need to access information from various sources, such as the Geographical Information System for aerial maps. *Id.* (citing Ex. 1010, 2–3).

Petitioner, however, relies on Tso for the disclosure of the general concept of mapping of pixels representing waypoints to earth coordinates of latitude and longitude. Pet. 58. Petitioner relies on the system of Lohrenz for the specific details of how storing and selecting pixels is accomplished. *E.g., id.* at 60–63.

Patent Owner acknowledges that Lohrenz discloses that “the Earth is divided into several latitudinal bands or zones, each band (zone) is divided into segments, and each segment is divided into pixels.” PO Resp. 55. Patent Owner argues, however, that Lohrenz in combination with Shim and Tso does not suggest the requirement of mapping a pixel’s location on a GUI to Earth coordinates of a waypoint as recited in claims 8, 23, and 38. PO

Resp. 56 (citing Ex. 2011 ¶ 75). We have rejected Patent Owner’s argument in Ground 1, based on our determination that Shim and Tso, alone, without Lohrenz, meet the limitation of mapping a pixel’s location on a GUI to Earth coordinates of a waypoint, as required in claims 8, 23, and 38.

Patent Owner also asserts “nothing in Lohrenz suggests that *GUI map pixel selections* representing waypoints would be ‘mapped’ to latitude/longitude (Earth coordinates). PO Resp. 56 (citing Ex. 2011 ¶ 77–84). This argument is misplaced. As asserted in the Petition, and as we have determined in Ground 1, the combination of Shim and Tso already provides the mapping of a pixel on a GUI to Earth coordinates. *See* Reply 12 (making this same argument). Petitioner asserts that “Lohrenz simply provides the mathematical means to do so.” *Id.* We agree.

Claims 14, 29, and 44 each require a method step or structure for identifying a range of latitude and a range of longitude represented by each pixel; and locating a region on the surface of the Earth in dependence upon the pixel boundaries, the ranges, and the location of the pixel on the GUI map. As asserted by Petitioner, Lohrenz presents equations to determine the specific Earth coordinate for a pixel using the segment boundaries which define the origin of the GUI segment and pixels within the segments, latitude and longitude ranges for a pixel, and the row and column containing the user-selected position. Ex. 1025, 11. This disclosure of Lohrenz discloses the use of the same pixel boundaries, ranges, and location of the pixel on the GUI map as recited in claims 14, 29, and 44.

Based on our analysis above, including our analysis for Ground 1, we determine that a preponderance of the evidence establishes that claims 8, 14, 23, 29, 38, and 44 would have been obvious based on Shim, Tso, and Lohrenz.

*H. Grounds 5–8
Sato and Lin
Plus NASA, Dittrich, and Lohrenz*

Grounds 5–8 duplicate Grounds 1–4, respectively, with one major difference. Grounds 5–8 rely on Sato and Lin as the references for independent claims 8, 23, and 38, whereas Grounds 1–4 rely on Shim and Tso as the references for these independent claims. Grounds 6 and 7 also add the NASA reference as another new reference to this mix.

1. Sato (Ex. 1030)

We make the following findings concerning Sato.

Sato is an English translation of a published Japanese patent application. Ex. 1030. The application is titled “Flight control system for unmanned helicopter.” *Id.* at 1, code (54). Sato discloses a flight control system for an unmanned helicopter that autonomously controls the operation of a UAV with a microcomputer on the UAV based on flight command input to a personal computer on the ground. *Id.* ¶ 1. Velocity command values of front-rear, left-right, up-down, and rotation (azimuth) and time, which are flight command data, are input to this personal computer, and are transmitted to the UAV. *Id.* ¶ 2. The UAV is equipped with a sensor such as a GPS or a gyro that detects the position and attitude of the UAV. *Id.* ¶ 4. This data is transmitted from the microcomputer on the UAV to the ground control computer. *Id.* This allows the actual trajectory of the UAV in flight to be confirmed in real time. *Id.* Sato’s disclosed flight systems simplifies data input “by reducing the number of pieces of position command data to be input and automatically setting command values for an optimal flight route suitable for flight conditions.” *Id.* ¶ 11.

Sato's flight system provides input command values in "four directions of front-rear, left-right, up-down, and rotation directions" at a flight point, and a flight is controlled with velocity command data based on the input command values. Ex. 1030 ¶ 12. Where the number of flight points requiring input of the command values is two or more, command values in three of the four directions are input as "position command data for each flight point." *Id.* The command value in the remaining one direction is automatically determined depending on flight conditions preset in the personal computer. *Id.* Sato also discloses that "by specifying the position data of two points, the starting position (or the current position) and the target position, the optimal flight route between the two points can be automatically set in consideration of flight conditions such as distance, time or fuel consumption." *Id.* ¶ 61.

Sato discloses that a method for inputting a target position is using "a mouse pointer" and "clicking a target position P on the map screen of the map display unit 35, [so that] *the position coordinate data corresponding to the latitude and longitude of the earth coordinates is automatically input.*" *Id.* ¶ 73 (emphasis added). Sato thus discloses a direct relation between "earth coordinates" and latitude and longitude.

2. *Lin (Ex. 1031)*

We make the following findings concerning Lin.

Lin is a U.S. Patent titled "Portable Multi-Tracking Method and System." Ex. 1031, code (54). It allows tracking "a person, a vehicle, or any other property." *Id.*, code (57). Lin summarizes the disclosed invention as a "method and system . . . to acquire the current locations of individuals of interest." *Id.* at 1:45–47. It does this by tracking a "person or vehicle." *Id.* at 1:49–50. The disclosed invention provides "a portable multi-tracking

method and system, in which the position data from the positioning module is shared with other individuals via a public network, such as the Internet.” *Id.* at 1:52–55. Lin discloses that the “communication link of the present invention is built on the TCP/IP technology to realize portability and cost effectiveness.” *Id.* at 9:24–26.

3. *Ground 5*
Claims 8, 23, 38 Based on Sato and Lin

Petitioner provides a clause-by-clause analysis asserting that Sato or Sato and Lin disclose or suggest each limitation in independent claims 8, 23, and 38. Pet. 70–83. For many limitations, Petitioner asserts the limitation is disclosed by “the combination of Sato and Lin.” *See, e.g., id.* at 71 (asserting that the combination of Sato and Lin discloses a method and system “*for navigating an Unmanned Aerial Vehicle (UAV)*” as recited in the preamble of claims 8 and 28). Petitioner does not state what information Lin adds to this clause.

Petitioner relies on Lin only for Lin’s disclosure of a TCP/IP socket. Petitioner asserts that a person of ordinary skill “would have been motivated to integrate Lin’s TCP/IP sockets into Sato’s system for communication between applications running in the ground station and UAV.” Pet. 69 (citing Ex. 1003 ¶ 245). Petitioner acknowledges that “Sato omits the well-known details of device communication.” *Id.* The details of a specific communication system, such as a TCP/IP socket, however, are *not* recited in independent claims 8, 23, and 38. Sato clearly has some way of having the ground-based computer communicate with its UAV. Nonetheless, we consider the Grounds asserted in the Petition. *SAS*, 138 S. Ct. at 1355 (stating that “it’s the petitioner, not the Director, who gets to define the contours of the proceeding”). Here, Petitioner chose to define the contours

of this proceeding by asserting the combination of Sato and Lin, so that is the Ground we consider.

Claims 8 requires transmitting through a socket. Claims 23 and 38 have “means plus function” transmitting clauses. Claim 23 requires, according to Petitioner, the generic structure of a “communication adapter and remote control processor executing application that performs transmitting function.” Pet. 11. Claim 38 requires, according to Petitioner, “software performing the recited function.” *Id.* at 16. Petitioner has not established with persuasive evidence or argument how or why Sato and Lin are combined to meet the specific requirements of independent claims 8, 23, and 38.

In our Decision to Institute this proceeding, we held that, based on the record before us at institution, “Petitioner has *not* established a credible reason why a person of ordinary skill would have combined Lin’s TCP/IP communication protocol with Sato’s UAV control system in the context of independent claims 8, 23, and 38.” Dec. Inst. 49. We also held that “[t]his defect in the independent claims infects all the remaining claims in Grounds 6–8 because all the remaining claims depend directly or indirectly from one of these independent claims.” Dec. Inst. 49. Thus, we determined “Petitioner has *not* established a reasonable likelihood that it will prevail on Grounds 5–8.” *Id.* Nonetheless, under the holding in *SAS*, Grounds 5–8 remained in the proceeding.

Petitioner now asserts we “failed to appreciate that a POSITA would have been motivated to modify Sato’s system in view of Lin.” Reply 13–14. According to Petitioner, “[i]t was widely known, as evidenced by Lin, that communications based on the TCP/IP protocol are carried out using sockets.” *Id.* at 15.

Petitioner asserts that a person of ordinary skill looking for “implementation details” would have been motivated to search for a reference describing communications techniques and would have been led to Lin for use of “Lin’s TCP/IP network and sockets,” which describe communication of position data between devices. Pet. 69 (citing Ex. 1003 ¶ 245). Being “motivated to search for a reference” does not establish why or how it would have been obvious to combine Sato and Lin, and if they were combined, how they would meet the claim limitations.

Petitioner now argues that “because there was a finite number of options for implementing wireless communications, and because the better of such options most likely used TCP/IP protocol, a POSITA likely would have ended up using TCP/IP socket communication.” Reply 16–17. Again, this is not the standard by which we determine whether a claimed invention would have been obvious. The fact that “a POSITA likely would have ended up using TCP/IP socket communication” is irrelevant to our determination of whether the claimed inventions would have been obvious. Petitioner’s analysis and reasoning seems to say no more than that a skilled artisan, once presented with the two references, would have understood that they *could be* combined. And that is not enough; it does not imply a motivation to pick out those two references and combine them to arrive at the claimed invention. *Pers. Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993–94 (Fed. Cir. 2017) (citing *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (“[O]bviousness concerns whether a skilled not only *could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention.”)).

Moreover, claims 8, 23 and 38 do not require a TCP/IP protocol.

This defect in the independent claims infects all the remaining claims in Grounds 6–8 because all the remaining claims depend directly or indirectly from one of these independent claims. Thus, we determine that Petitioner has *not* established based on the evidence and arguments that the challenged claims are unpatentable on Grounds 5–8.

IV. DUE PROCESS AND APPOINTMENTS CLAUSE CHALLENGE

Patent Owner argues “[t]he Board’s handling of this IPR is structurally biased in a way that has violated Patent Owner’s due-process rights.” PO Resp. 63. According to Patent Owner, “the Board has a strong financial incentive to institute trials.” *Id.* at 64. The Federal Circuit has decided these issues, and we need not reach them in this case. *See Mobility Workx, LLC v. Unified Patents, LLC*, 15 F.4th 1146, 1155 (Fed. Cir. 2021) (stating that “congressional control of the USPTO’s budget renders any agency interest in fee generation too tenuous to constitute a due process violation”), 1156 (“Mobility has therefore failed to establish that APJs have an unconstitutional financial interest in instituting AIA proceedings.”).

Patent Owner also argues that “the judges handling this case were appointed in violation of the appointments clause.” PO Resp. 66 (bold, all capital letter font deleted). This issue has been decided by the Supreme Court. *United States v. Arthrex, Inc.*, 141 S. Ct. 1970 (2021).

Accordingly, we do not consider further Patent Owner’s due process or Appointments Clause challenges.

V. CONCLUSION²²

We have determined that Petitioner has established unpatentability of the challenged claims under Grounds 1–4, but *not* on Grounds 5–8.

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 8, 10–12, 14, 23, 25–27, 29, 38, 40–42, and 44 have been proven by a preponderance of the evidence to be unpatentable; and

FURTHER ORDERED that, because this is a final written decision, parties to this proceeding seeking judicial review of our Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
8, 23, 38	103	Shim, Tso	8, 23, 38	
10, 25, 40	103	Shim, Tso, TCP/IP Sockets, Dittrich	10, 25, 40	
11, 12, 26, 27, 41, 42	103	Shim, Tso, TCP/IP Sockets, Dittrich	11, 12, 26, 27, 41, 42	

²² Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

8, 14, 23, 29, 38, 44	103	Shim, Tso, Lohrenz	8, 14, 23, 29, 38, 44	
8, 23, 38	103	Sato, Lin		8, 23, 38
10–12, 25–27, 40–42	103	Sato, Lin, NASA		10–12, 25–27, 40–42
11, 12, 26, 27, 41, 42	103	Sato, Lin, NASA, Dittrich		11, 12, 26, 27, 41, 42
8, 14, 23, 29, 38, 44	103	Sato, Lin, Lohrenz		8, 14, 23, 29, 38, 44
Overall Outcome			8, 10–12, 14, 23, 25–27, 29, 38, 40–42, 44	

IPR2020-01472
Patent 7,286,913 B2

For PETITIONER:

Joshua Goldberg
Quinyu Yin
Kelly Lu
Benjamin Saidman
FINNEGAN HENDERSON FARABOW GARRETT & DUNNER LLP
Joshua.goldberg@finnegan.com
Qingyu.yin@finnegan.com
Kelly.lu@finnegan.com
Benjamin.saidman@finnegan.com

Yin Cheung
DJI TECHNOLOGY, INC.
yin.cheung@dji.com

For PATENT OWNER:

Tarek Fahmi
Holly Atkinson
Jonathan Tsao
ASCENDA LAW GROUP, P.C.
tarek.fahmi@ascendalaw.com
holly.atkinson@ascendalaw.com
jonathan.tsao@ascendalaw.com