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Paper 14
Date: February 12, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DJI EUROPE B.V.,
Petitioner,

v.

DAEDALUS BLUE LLC,
Patent Owner.

IPR2020-01474
Patent 7,228,232 B2

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

PESLAK, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314, 37 C.F.R. § 42.4

I. INTRODUCTION

Petitioner, DJI Europe B.V., filed a Petition (Paper 2, "Pet.") requesting an *inter partes* review of claims 1–6 and 13–18 (the "challenged claims") of U.S. Patent No. 7,228,232 B2 (Ex. 1001, "the '232 patent"). Patent Owner, Daedalus Blue LLC, timely filed a Preliminary Response (Paper 7, "Prelim. Resp."). With our permission, Petitioner filed a Reply to the Patent Owner Preliminary Response (Paper 9, "Pet. Reply"). Patent Owner filed a Sur-reply (Paper 10, "Sur-reply").

We have authority, acting on the designation of the Director, to determine whether to institute an *inter partes* review under 35 U.S.C. § 314(a). *See also* 37 C.F.R § 42.4(a) (2020) ("The Board institutes the trial on behalf of the Director."). Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted unless the information presented in the Petition shows "there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." Taking into account the Petition, the arguments presented in the Preliminary Response, the additional briefing, as well as all supporting evidence, we conclude that the information presented in the Petition establishes that there is a reasonable likelihood that Petitioner would prevail in its challenge of at least one claim of the '232 patent as unpatentable. Pursuant to 35 U.S.C. § 314, we hereby institute an *inter partes* review of all challenged claims of the '232 patent on all grounds stated in the Petition.

Our factual findings, claim construction, and legal conclusions at this stage of the proceeding are based on the evidentiary record developed thus far. This decision to institute trial is not a final decision as to the unpatentability of the claims for which *inter partes* review is instituted. Our final decision will be based on the full record developed during trial.

A. Related Matters

The parties state that the '232 patent is asserted in *Daedalus Blue LLC v. SZ DJI Technology Co., Ltd., & DJI Europe B.V.*, Case No. 6:20-cv-0073 (W.D. Tex.). Pet. 91; Paper 5, 2. The '232 patent is also the subject of IPR2020-01475 filed by Petitioner concurrently with this proceeding. Pet. 91.

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. 91. Patent Owner identifies itself as the only real party in interest. Paper 5, 2.

C. The '232 Patent (Ex. 1001)

The '232 patent is titled Navigating a UAV[1] with Obstacle Avoidance Algorithms. Ex. 1001, code (54). The '232 patent issued on June 5, 2007 from an application filed on January 24, 2005. *Id.* at codes (45), (22).

The '232 patent is directed to "[m]ethods, systems, and computer program products . . . for navigating a UAV that include piloting the UAV, under control of a navigation computer, in accordance with a navigation algorithm." *Id.* at 1:34–37. Embodiments of the '232 patent "include reading from the GPS receiver a sequence of GPS data, anticipating a future position of the UAV, identifying an obstacle in dependence upon the future position, selecting an obstacle avoidance algorithm, and piloting the UAV in accordance with an obstacle avoidance algorithm." *Id.* at 1:37–42.

Figure 1 of the '232 patent, reproduced below, illustrates various components of a system for navigating an UAV. *Id.* at 4:48–50.

[1] "UAV" is short hand for an "unmanned aerial vehicle." Pet. 1.

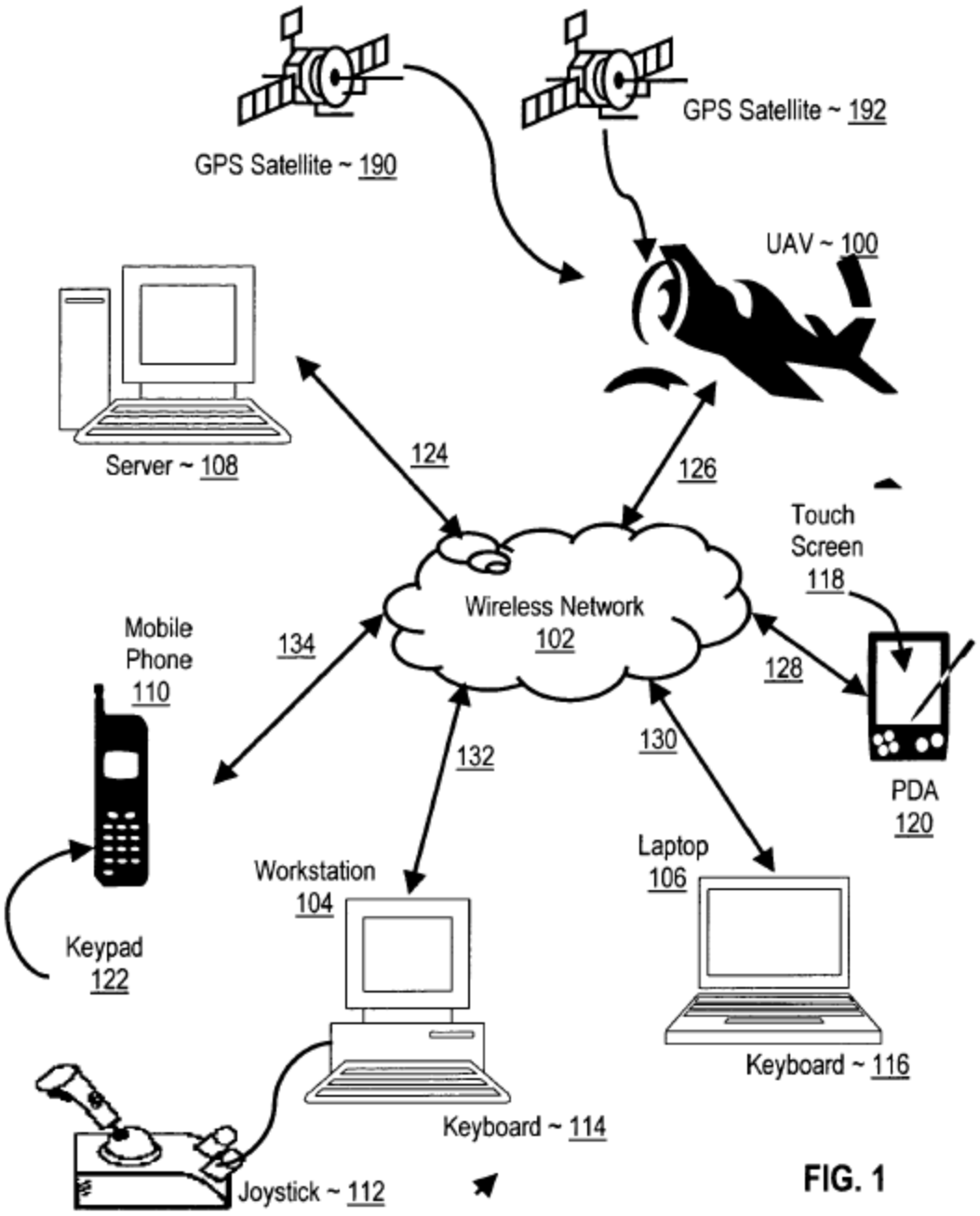

Figure 1 of the '232 patent "illustrat[es] relations among components of an exemplary system for navigating a UAV." *Id.* at 2:10–12.

In the system shown in Figure 1, UAV 100 "includes a GPS (Global Positioning System) receiver (not shown) that receives a stream of GPS data from satellites (190, 192)." *Id.* at 4:50–53. UAV 100 is navigated "by

receiving in a remote control device a user's selection of a GUI [graphical user interface] map pixel that represents a waypoint for UAV navigation." *Id.* at 4:57–60. Exemplary remote control devices include mobile telephone 110, laptop computer 106, and personal digital assistant 120. *Id.* at 4:61–64. The remote control devices "map the pixel' location on the GUI to Earth coordinates of a waypoint and . . . transmit the coordinates of the waypoint to the UAV (100)" through wireless network 102. *Id.* at 5:8–13. The system shown in Figure 1 "is capable of operating a UAV to read a starting position from a GPS receiver . . . on the UAV and pilot the UAV, under control of a navigation computer on the UAV, from a starting position to a waypoint in accordance with a navigation algorithm." *Id.* at 5:30–35. The system also reads "a sequence of GPS data, anticipat[es] a future position of the UAV, identif[ies] an obstacle in dependence upon the future position, select[s] an obstacle avoidance algorithm, and pilot[s] the UAV in accordance with an obstacle avoidance algorithm." *Id.* at 6:43–49.

D. *Challenged Claims*

Claims 1 and 13 are independent. Claim 1 is reproduced below:

> A method for navigating a UAV, the method comprising:
> piloting the UAV, under control of a navigation computer in accordance with a navigation algorithm;
> while piloting the UAV:
> reading from a GPS receiver a sequence of GPS data;
> anticipating a future position of the UAV in dependence upon the sequence of GPS data;
> identifying an obstacle in dependence upon the future position;
> selecting an obstacle avoidance algorithm; and
> piloting the UAV in accordance with the selected obstacle avoidance algorithm.

Id. at 21:7–19.

E. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–6 and 13–18 would have been unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 6, 13, 18	103(a)	Sanders[2]
2, 14	103(a)	Sanders, Pilley[3]
3, 15	103(a)	Sanders, Suiter[4]
4, 5, 16, 17	103(a)	Sanders, Pappas[5]
1–3, 6, 13–15, 18	103(a)	Duggan[6], Pilley
4, 5, 16, 17	103(a)	Duggan, Pilley, Sainthuile[7]

II. ANALYSIS

A. Overview

A petition must show how the construed claims are unpatentable under the statutory grounds it identifies. 37 C.F.R. § 42.104(b)(4). Petitioner bears the burden of demonstrating a reasonable likelihood that it would prevail with respect to at least one challenged claim for a petition to be granted. 35 U.S.C. § 314(a) (2018).

A claim is unpatentable under § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a

[2] Christopher P. Sanders, *Real-time Collision Avoidance for Autonomous Air Vehicles*, (M.I.T. 1998) (Ex. 1005) ("Sanders").
[3] U.S. Patent No. 5,867,804 issued Feb. 2, 1999 (Ex. 1010) ("Pilley").
[4] U.S. Patent No. 6,690,299 B1 issued Feb. 10, 2004 (Ex. 1011) ("Suiter").
[5] George J. Pappas, *Conflict Resolution for Multi-Agent Hybrid Systems*, (1996) (Ex. 1015) ("Pappas").
[6] U.S. Patent No. 7,343,232 B2 issued Mar. 11, 2008 (Ex. 1012) ("Duggan").
[7] U.S. Patent No. 6,546,338 B2 issued April 8, 2003 (Ex. 1013) ("Sainthuile").

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 skill in the art; and (4) when in evidence, objective indicia of non-obviousness (i.e., secondary considerations). *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

We analyze the asserted ground based on obviousness with these principles in mind.

B. Level of Ordinary Skill in the Art

Petitioner contends that a skilled artisan "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. 7–8 (citing Ex. 1003 ¶ 20). Petitioner further contends that "[a]dditional work or research experience can substitute for less or different education, and vice-versa." *Id.* at 8. Patent Owner agrees with Petitioner's level of ordinary skill in the art. *See* Prelim. Resp. 11.

For the purposes of this Decision, we adopt Petitioner's proposed level of ordinary skill in the art because it comports with the level of skill reflected in the '232 patent and the prior art of record.

C. Claim Construction

We apply the same claim construction standard used by Article III federal courts and the ITC, both of which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. 37 C.F.R. § 42.100(b) (2019). Accordingly, we construe each challenged claim of the

'232 patent to generally be "the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." *Id.*

Petitioner contends that no claim terms require express construction. Pet. 8. Petitioner submits a chart detailing disclosure in the '232 patent of the corresponding function and structure for the means plus function claim elements recited in claims 13–18. *Id.* at 8–10.

Patent Owner contends that the term "selecting" in claims 1 and 13 should be given its ordinary and customary meaning. Prelim. Resp. 11. Patent Owner "adopts Petitioner's proposed functions for the" means plus function claim elements. *Id.* at 12. Patent Owner provides various contentions concerning the structures corresponding to the claim elements. *Id.* at 12–13.

Upon review of the parties' arguments and based on the present record, we determine that no claim terms require express construction for purposes of this Decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (noting that "we need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy'") (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). However, in our analysis of claim 1, we discuss an implicit construction of the claim term "selecting" set forth in Patent Owner's prior art analysis.

We note that the District Court held a Markman hearing and provided constructions for a number of claim terms in the '232 patent. *See* Ex. 2009. It appears that the parties took positions on claim construction in the District Court that appear somewhat different than the positions taken in this proceeding. *See id.* In subsequent briefing, the parties should address why

they took different positions here than in the District Court and why we should not follow the District Court claim constructions if necessary.

The parties are not precluded from arguing proposed constructions of any claim terms in subsequent briefing during trial. Claim construction, in general, is an issue to be addressed at trial. Our final claim construction, if any, will be determined at the close of all the evidence.

D. Discretionary Denial

1. Parallel Petitions

Concurrent with the filing of this Petition, Petitioner also filed a second Petition challenging claims 7–12 of the '232 patent. IPR2020-01475, Paper 2, 3–4. Petitioner contends that Patent Owner asserts infringement of claims 1–4, 7–10, and 13–16 by Petitioner in the co-pending District Court litigation. Paper 3, 2. Petitioner further contends that two petitions are required "[d]ue to the large number of claims and limitations using means-plus-function claim language" in the '232 patent. *Id.* Petitioner further contends that the large number of asserted claims "required two petitions — the first challenging claims 1–6 and 13–18 (the method and computer product claims) and the second challenging claims 7–12 (system claims)." *Id.* at 2–3. Petitioner relies on the same prior art in both petitions. *Id.* at 3. Petitioner requests that we institute both petitions and ranks both petitions as "#1." *Id.*

Patent Owner did not file a paper responding to Petitioner's Explanation of Parallel Petitions or address this issue of parallel petitions in

the Patent Owner Preliminary Response as our Consolidated Trial Practice Guide allows. *See* Consol. TPG, 60–61 (Nov. 2019)[8].

Our Consolidated Trial Practice Guide indicates that in most cases, "one petition should be sufficient to challenge the claims of a patent." *Id.* at 59. But, the Guide also "recognizes that there may be circumstances in which more than one petition may be necessary, including for example, when the patent owner has asserted a large number of claims in litigation." *Id.* At first blush it does not appear that Patent Owner asserts an extraordinary number of claims in the litigation. Petitioner, however, supports its request that we institute on both petitions by emphasizing that there are "**42 limitations** in means-plus-function format, requiring claims construction pursuant to 37 C.F.R. § 42.104(b)(3)." Paper 3, 2. Given the requirements in our rules for challenging means-plus-function claim limitations and in the absence of argument or comment from Patent Owner, we accept Petitioner's argument that two petitions are necessary in this case.

2. District Court Proceeding

Institution of *inter partes* review is discretionary. *See Harmonic Inc. v. Avid Tech., Inc.*, 815 F. 3d 1356, 1367 (Fed. Cir. 2016) ("[T]he PTO is permitted but never compelled to institute an [*inter partes* review (IPR)] proceeding."); 35 U.S.C. § 314(a). Patent Owner contends that we should exercise our discretion under 35 U.S.C. § 314(a) to deny institution in light of parallel District Court litigation involving Patent Owner and Petitioner. Prelim. Resp. 33–40.

We consider the advanced state of a parallel district court action as a factor that may weigh in favor of denying a petition under § 314(a). *See*

[8] Available at https://www.uspto.gov/TrialPracticeGuideConsolidated.

NHK Spring Co. v. Intri-Plex Techs., Inc., IPR2018-00752, Paper 8, 20 (PTAB Sept. 12, 2018) (precedential). The following factors inform our assessment of "whether efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding":

1) whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted;
2) proximity of the court's trial date to the Board's projected statutory deadline for a final written decision;
3) investment in the parallel proceeding by the court and the parties;
4) overlap of issues raised in the petition and in the parallel proceeding;
5) whether the petitioner and the defendant in the parallel proceeding are the same party; and
6) other circumstances that impact the Board's exercise of discretion, including the merits.

Apple Inc. v. Fintiv, Inc., IPR2020-00019, Paper 11, 5–6 (PTAB Mar. 20, 2020) (precedential). When considering these factors, we "[t]ake a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review." *Id.* at 6. Upon consideration of these factors and for the reasons stated below, we do not exercise our discretion to deny institution.

Factor 1: Whether the Court Granted a Stay or Evidence Exists That One May Be Granted if a Proceeding is Instituted

Patent Owner contends that this factor "favors denial in this case, as the district court has not stayed the co-pending litigation and is unlikely to do so." Prelim. Resp. 35–36. Patent Owner further contends that "no motion for stay has yet been filed" and "a stay of the co-pending litigation is unlikely." *Id.* at 36–37.

Petitioner contends that because a motion to stay has not been filed, any argument regarding this factor would be speculative. *See* Pet. Reply 5.

Apparently, the parties have neglected to inform us that a motion for a stay was filed by the Defendant in the District Court (Petitioner in the IPR proceeding before us), and that the motion was denied on January 4, 2021. *See* Ex. 3001 (Text Order denying Defendants' Motion to Stay Case entered "01/04/2021") (This is a text-only entry generated by the court. There is no document associated with this entry.).

Because a requested stay has been denied by the District Court and we have not been informed by the parties whether the Court has, or has not, indicated to the parties that it will consider a renewed motion or reconsider a motion to stay if a PTAB trial is instituted, this fact weighs in favor of exercising authority to deny institution.

Factor 2: Proximity of the Court's Trial Date to the Board's Projected Statutory Deadline for a Final Written Decision

Patent Owner contends that this factor "supports denial or is at worst neutral" because trial "is likely to commence October 4, 2021, and will likely conclude 3-4 months prior to the time any final written decision in this proceeding would be due." Prelim. Resp. 37 (citing Ex. 2003, 1; Ex. 2006).

Petitioner first contends that Patent Owner obtained the October 4, 2021 trial date "via an improper e-mail to [the] Court clerk 2 days before its Preliminary Response filing." Pet. Reply 1. On November 17, 2020, Petitioner filed a Motion to Set the Trial Date at the Markman Hearing.[9] *See* Ex. 1035, 1. In response to Petitioner's motion, the District Court stated that "it found it beneficial to schedule trial for October 4, 2021 and provide this

[9] The District Court scheduled the Markman Hearing for January 7, 2021. Ex. 2002, 2.

date to the Parties ahead of the Markman hearing." Ex. 2008. After the Markman hearing, the District court in a Minute Entry "suggest[ed] 10/12/2021 as Jury Selection and Trial Date." Ex. 3002.

Patent Owner, in turn, contends it did not engage in gamesmanship but "was following the District Court's practice in having an initial trial date specified before the *Markman* hearing." Sur-reply 4. Patent Owner further contends that "Petitioner now seeks to change that trial date solely in an effort to garner 'two bites at the apple' by manufacturing a reason for the Board not to exercise its discretion to deny institution." *Id.*

Petitioner next contends that "estimated trial dates in 2021 are highly speculative" due to the Covid-19 pandemic. Pet. Reply 5. Petitioner further contends that the District Court judge "has held only one trial in the past ten months" and all jury trials in the Western District of Texas have been continued through January 31, 2021. *Id.* (citing Ex. 1038; Ex. 1039; Ex. 1040).

The latest word from the District Court is that it "suggests" October 12, 2021 as a trial date. When taking this date at face value, this factor weighs in favor of exercising discretion to deny institution. However, it appears that this trial date is not a firm date but rather a suggested trial date. Consequently, in the absence of a definitive trial date, we find that this factor is neutral.

Factor 3: Investment in the Parallel Proceeding by the Court and the Parties

Patent Owner contends that this factor favors denial of institution because "the parties and the court will have invested significant time and energy in the case to complete their exchange of preliminary invalidity

contentions and claim construction discovery, briefing, and hearing." Prelim. Resp. 37 (citing Ex. 2002).

Petitioner contends that this factor is neutral or weighs in favor of institution because at the time of a Decision on Institution, "investment in the co-pending district court litigation will be limited." Pet. Reply. 2. According to Petitioner, "discovery is stayed until after the claim construction hearing on January 7, 2021," "almost all fact and expert discovery and substantive motion practice will occur after the institution date," and final invalidity contentions will be served after institution. *Id.*

Patent Owner, in turn, disagrees with Petitioner's contention that only limited investment in the district court proceeding would have occurred at the time of our Decision on Institution. Sur-reply 2. Patent Owner contends that "Petitioner ignores the substantive validity and infringement contentions . . . that have already occurred and the submissions in support of the *Markman* hearing that are coming due." *Id.* (citing Ex. 2002). Patent Owner further contends that discovery in the District Court will commence immediately after the Markman hearing and that therefore the "parties will be in the midst of significant discovery" by the time our Decision on Institution is due. *Id.* at 3.

As part of our holistic analysis for this factor, we also consider the speed by which Petitioner acted to file the Petition. *See Apple Inc. v. Seven Networks, LLC*, IPR2020-00156, Paper 10, 11–12 (PTAB June 15, 2020) (evaluating the time between service of invalidity contentions and the filing of a petition). Petitioner contends that it "acted diligently in preparing and filing the Petition" six and a half months after being served with infringement contentions. Pet. Reply 2. Patent Owner counters that "[o]ther petitioners have acted just as quickly, yet the Board has not deemed their

efforts sufficient to warrant institution of trial." Sur-reply 3 (citing *Cisco Sys., Inc. v. Ramot at Tel Aviv Univ. Ltd.*, IPR2020-00122, Paper 15 (PTAB May 15, 2020)).

Fact discovery in the District Court will open and initial disclosures are due one week after the Markman hearing. Ex. 1034, 7. After that time, final invalidity contentions are to be served and fact and expert discovery will continue for many weeks. *Id.* at 8. Thereafter, the parties will engage in dispositive motion practice as well as the preparation of a Final Joint Pretrial Order and Pretrial Submissions. *Id.* Although some work has been done in connection with the Markman hearing, substantial work remains to be done relating to validity issues *after* the Markman hearing and *after* this Decision on Institution. The fact that the Petition was filed 6 months after infringement contentions were served is neutral in our analysis but significantly aligns with our finding that substantial work remains to be done in the District Court proceeding. Therefore, considering these facts as part of our holistic analysis, we find that this factor weighs slightly in favor of institution.

Factor 4: Overlap of Issues Raised in the Petition and the Parallel Proceeding

Patent Owner contends this factor favors denial of institution because "the same claims are at issue in both proceedings" and there is "overlap in the invalidity contentions." Prelim. Resp. 38. Patent Owner further contends that Petitioner's conditional representation in the Petition to not pursue any ground raised in this proceeding in the District Court if trial is instituted is insufficient for this factor to weigh towards institution. *Id.* (citing Pet. 90–91).

Petitioner responds that it filed a stipulation in the District Court that it will not assert "any grounds that were raised or reasonably could have been raised during the present IPR, if trial is instituted." Pet. Reply 1 (citing Ex. 1041). Petitioner contends this stipulation "eliminate[s] any concerns of duplicative efforts between the district court and Board in the parallel proceedings." *Id.* (citing *Sand Revolution II, LLC v. Cont'l Intermodal Grp. – Trucking LLC*, IPR2019-01393, Paper 24, 12 (PTAB June 16, 2020) (informative).

Patent Owner, in turn, argues that the stipulation does not moot the overlap of issues. Sur-reply 1. Patent Owner argues that the stipulation is insufficient because it does not state that Petitioner "will not rely on the same prior art references as are relied upon in this proceeding or that it waives any such defenses." *Id.* (citing *Sand Revolution*, Paper 24, 12 n.5; *Sotera Wireless, Inc. v. Masimo Corp.*, IPR 2020-01019, Paper 12, 13–14 (PTAB Dec. 1, 2020) (precedential)).

In *Sand Revolution*, the Petitioner stipulated "only that it will not pursue, in district court, the 'same grounds' presented in the Petition," *Sand Revolution*, Paper 24 at 12 n.5. The Board suggested that a broader stipulation such as one stipulating that "it would not pursue any ground raised or that could have been reasonably raised in an IPR, i.e., any ground that could be raised under §§ 102 or 103 on the basis of prior art patents or printed publications" would better address concerns relating to overlapping issues. *Id.* In this case, Petitioner's stipulation is broader than the stipulation in *Sand Revolution* and includes much of the language suggested by the Board, including stipulating not to raise in District Court any grounds that could have reasonably been raised during this proceeding. *See* Ex. 1041, 3. That is, this stipulation is similar to that provided in *Sotera*

Wireless. The stipulation, thus, obviates much, if not all, of any potential overlap between the issues in this proceeding and the district court proceeding. Consequently, we find that this factor weighs strongly in favor of institution.

Factor 5: Whether the Petitioner and the Defendant in the Parallel Proceeding are the Same Party

There is no dispute that the Petitioner is the defendant in the District Court proceeding. Patent Owner argues that this factor, thus, weighs in favor of denying institution. Prelim. Resp. 39. Petitioner counters that this factor should be neutral because, like most IPRs, the parties are the same and a petitioner would be prejudiced "merely for being sued." Pet. Reply 5. Because Petitioner is the defendant in the parallel district court proceeding, this does not weigh against exercising discretion to deny institution. *Fintiv*, Paper 11 at 13–14.

Factor 6: Other Circumstances Including the Merits

Patent Owner contends that this factor favors denial of institution because "Petitioner's case for unpatentability of the challenged claims is far from compelling and there are serious flaws in the various challenges." Prelim. Resp. 40. Not surprisingly, Petitioner counters that the Petition "presents a strong case of unpatentability of the challenged claims." Pet. Reply 3.

As discussed below, we are persuaded that the Petition meets the statutory standard for institution. We, thus, do not agree with Patent Owner that Petitioner's showing has "serious flaws," but do not necessarily agree with Petitioner that the challenges present a "strong case." Therefore, we find that this factor to be neutral.

Conclusion

After holistically weighing the factors discussed above, we determine not to exercise our discretion to deny institution due to the parallel District Court proceeding.

E. Ground 1: Obviousness over Sanders alone

Petitioner contends that claims 1, 6, 13, and 18 are unpatentable over Sanders. Pet. 12–34. In support thereof, Petitioner identifies the disclosures in Sanders alleged to describe the subject matter in the challenged claims. *Id.* Additionally, Petitioner offers declaration testimony from Dr. R. John Hansman, Jr. ("Hansman Declaration")[10] in support of the Petition. Ex. 1003 ¶¶ 68–167.

Patent Owner contends that "Sanders does not teach the selection required by claims 1 and 13, and does not even teach an obstacle avoidance algorithm that ever actually flew on a UAV, i.e., 'while piloting the UAV as required by claim 1.'" Prelim. Resp. 20.

We begin our analysis with a brief overview of Sanders. We then address the parties' respective contentions with respect to the challenged claims.

[10] Dr. Hansman is "currently the T. Wilson Professor of Aeronautics & Astronautics at the Massachusetts Institute of Technology" and "Director of the MIT International Center for Air Transportation." Ex. 1003 ¶ 7. He has authored numerous publications and received numerous awards for his work in aeronautics. *Id.* at ¶¶ 12–15. He provides extensive testimony in this matter. *See generally id.* At this point in the proceeding, Patent Owner has not provided any testimony or other evidence to rebut Dr. Hansman's testimony.

Sanders – Ex. 1005

Sanders is entitled "Real-time Collision Avoidance for Autonomous Air Vehicles" and bears a copyright date of 1998. Ex. 1005. Sanders is a Master's degree thesis that describes "the design and analysis of a collision avoidance system (CAS) for autonomous air vehicles." *Id.* at Abstract. The document focuses on "algorithm design, multi-AAV simulation, closed-loop analysis, and actual vehicle flight tests." *Id.* Sanders discloses a "guidance, navigation, and control (GNC) system" for autonomous air vehicles ("AAV's"). *Id.* at 22–23. The CAS engages in conflict detection and resolution. *Id.* at 55. Sanders discloses two collision avoidance algorithms. *Id.* at 68. The first is referred to as bang-bang maneuvers and the second is referred to as continuous maneuvers. *Id.* at 73–98.

Claim 1

a. Preamble

Petitioner contends that Sanders' system includes "a ground station and an AAV, which is a type of UAV." Pet. 12 (citing Ex. 1003 ¶ 83; Ex. 1005, 11, 23, Fig. 2.2). Petitioner further contends that Sanders' navigation system "tells the AAV where it is" and its control system uses commands to "get the vehicle to where it is going." *Id.* at 13 (citing Ex. 1005, 26–27). Based on this, Petitioner contends that "Sanders teaches a 'method for navigating a UAV.'" *Id.* (citing Ex. 1003 ¶¶ 81–83).

Patent Owner does not squarely address Petitioner's contentions or whether the preamble is limiting. *See* Prelim. Resp. 19–28. We need not decide whether the preamble is limiting because Petitioner demonstrates sufficiently that Sanders discloses the subject matter of the preamble.

b. Piloting the UAV Under Control of a Navigation Computer, in Accordance with a Navigation Algorithm

Petitioner contends that Sanders' guidance system "receives a set of user-defined waypoints for a desired flight route" and, based on the waypoints and data from the navigation system, a "guidance algorithm 'outputs position, heading, and velocity commands which are uplinked to the vehicle.'" Pet. 13 (citing Ex. 1005, 23, 26–27). According to Petitioner, "Sanders' guidance system is therefore the recited '*navigation computer*' and the guidance algorithm is the recited '*navigation algorithm.*'" *Id.* (citing Ex. 1003 ¶ 84). Petitioner further contends that Sanders' control system "get[s] the vehicle to where it is going" with a control algorithm that "adjusts the AAV's five control effectors: 'pitch cyclic, roll cyclic, collective pitch, tail rotor pitch, and throttle.'" *Id.* at 14 (citing Ex. 1005, 27, Ch. 4, App. A, 141). Based on the foregoing, Petitioner contends that Sanders' control system "'*pilots*' the AAV '*under control of a navigation computer, in accordance with a navigation algorithm.*'" *Id.* (citing Ex. 1003 ¶¶ 84–86).

Patent Owner does not squarely address Petitioner's contentions. *See* Prelim. Resp. 19–28. Based on the present record, Petitioner demonstrates sufficiently that Sanders discloses this claim limitation.

c. Reading from a GPS receiver a sequence of GPS Data

Petitioner contends that Sanders' "system includes a differential global positioning system (DGPS) . . . that 'provides accurate position information of the vehicle relative to the ground station receiver.'" Pet. 16 (citing Ex. 1005, 24). According to Petitioner, the "DGPS is the recited '*GPS receiver*.'" *Id.* (citing Ex. 1003 ¶ 88). Petitioner further contends that several of Sanders' components "read GPS data from the GPS receiver." *Id.*

Petitioner contends that "a navigation filter on the UAV . . . reads a sequence of data from the DGPS and combines the 'outputs into one single estimate of the vehicle state'" and the "GPS data output from the navigation filter is read by the control and collision avoidance software on the AAV." *Id.* at 16–17 (citing Ex. 1005, 26, 55, Fig. 2.2). Based on the foregoing, Petitioner contends that "Sanders teaches '*reading from a GPS receiver a sequence of GPS data*'" and because the collision avoidance system operates in real-time while an AAV is flying a mission, "Sanders' system performs the '*reading*' function '*while piloting the UAV.*'" *Id.* at 17 (citing Ex. 1003 ¶¶ 88–91).

Patent Owner does not squarely address Petitioner's contentions. *See* Prelim. Resp. 19–28. Based on the present record, Petitioner demonstrates sufficiently that Sanders discloses this claim limitation.

d. Anticipating a Future Position of the UAV in Dependence Upon the Sequence of GPS Data

Petitioner contends that Sanders' collision detection process "predict[s] the **future trajectory** of the AAVs, given their state data." Pet. 17 (citing Ex. 1005, 58, 73). Petitioner further contends that Sanders' "trajectory prediction algorithm calculates position and velocity at a later time 'given the vehicle position and velocity at time t_0.'" *Id.* at 18 (citing Ex. 1005, 58). Petitioner further contends that "the CAS algorithm uses 'a series of position measurements,' rather than a single measurement" meaning that "the future position prediction is made '*in dependence upon the sequence of GPS data*.'" *Id.* (citing Ex. 1003 ¶ 95). Petitioner further contends that because the collision avoidance system operates in real-time while an AAV is flying a mission, "Sanders' DSAAV[11] system performs the

[11] The acronym "DSAAV" refers to the Draper Small Autonomous Air Vehicle. Ex. 1005, Abstract.

'*anticipating*' function *'while piloting the UAV.*'" *Id.* at 19 (citing Ex. 1003 ¶ 96).

Patent Owner does not squarely address Petitioner's contentions. *See* Prelim. Resp. 19–28. Based on the present record, Petitioner demonstrates sufficiently that Sanders discloses this claim limitation.

e. Identifying an Obstacle in Dependence Upon the Future Position

Petitioner contends that Sanders assigns each aircraft "a protected zone 'into which no other vehicle is to enter'" and "[i]f an aircraft's protected zone is violated by another vehicle, 'a collision has occurred, even if the vehicles did not actually come into contact with each other.'" Pet. 19 (citing Ex. 1005, 49). Petitioner further contends that Sanders' collision detection algorithm uses trajectories for the AAV and other aircraft to "determine if any of the AAVs' protected zones will be violated." *Id.* (citing Ex. 1005, 61). Petitioner further contends that "[i]f the predicted separation distance at closest approach is less than the minimum allowed separation, a conflict is predicted." *Id.* at 19–20 (citing Ex. 1005, 62, Fig. 4.2). Petitioner further contends that "the other aircraft is '*an obstacle*' in the path of the AAV." *Id.* at 20 (citing Ex. 1003 ¶ 98). Based on the foregoing, Petitioner contends that Sanders "discloses '*identifying an obstacle in dependence upon the future position*'" and because the collision avoidance system operates in real-time while an AAV is flying a mission, "Sanders' system performs the '*identifying*' function '*while piloting the UAV.*'" *Id.* at 20–21 (citing Ex. 1003 ¶¶ 97–100).

Patent Owner does not squarely address Petitioner's contentions. *See* Prelim. Resp. 19–28. Based on the present record, Petitioner demonstrates sufficiently that Sanders discloses this claim limitation.

f. Selecting an Obstacle Avoidance Algorithm

Petitioner contends that Sanders "system includes two collision avoidance algorithms: the bang-bang maneuver and the continuous maneuver." Pet. 21 (citing Ex. 1005, 68). Petitioner contends that the bang-bang maneuver consists of a one-time avoid command and a one-time return command and "the CAS software determines whether to maneuver up or down." *Id.* (citing Ex. 1005, 68, 74, 76). Petitioner further contends that the "continuous maneuver 'strives to send the vehicles on smooth, gradual trajectories'" but like the bang-bang maneuvers "determines whether to maneuver up or down to 'minimize[] the AAV's deviations from their current trajectories." *Id.* at 22 (citing Ex. 1005, 79, 83). Based on the foregoing, Petitioner contends that "Sanders' algorithm selects a maneuver (bang-bang or continuous), parameters, and direction (e.g., up or down)" and "therefore teaches '*selecting an obstacle avoidance algorithm.*" *Id.* at 23 (citing Ex. 1003 ¶¶ 101–107). Petitioner further contends that because the collision avoidance system operates in real-time while an AAV is flying a mission, "Sanders' system performs the '*selection*' function '*while piloting the UAV.*'" *Id.* at 20–21 (citing Ex. 1003 ¶ 107).

Patent Owner contends that Petitioner "mischaracterizes Sanders by arguing it teaches *selection* of a UAV algorithm while piloting the UAV." Prelim. Resp. 24. Patent Owner contends that "the bang-bang algorithm was ultimately deemed unsuitable" by Sanders. *Id.* at 21 (citing Ex. 1005, 78–79). Patent Owner contends that Sanders "continuous controller was designed to be an improvement over the bang-bang collision avoidance system." *Id.* at 23 (citing Ex. 1005, 78). Patent Owner further contends that "it was the continuous controller that Sanders deemed acceptable for actual use on a UAV." *Id.* (citing Ex. 1005, 72–73). Patent Owner further

contends that "Sanders never intended that both the bang-bang algorithm and the continuous algorithm would ever be made available (e.g., for selection) concurrently on a UAV." *Id.* at 24. According to Patent Owner, "[s]election of a collision avoidance algorithm requires a choice and no choice can exist or be made if only the continuous option was ever to be available" because "there would never be any 'selection' among collision avoidance algorithms." *Id.* Patent Owner further contends that Sanders confirms that neither algorithm "ever actually flew on a UAV at the time," and, consequently neither algorithm was ever "actually being selected 'while piloting the UAV.'" *Id.* (citing Ex. 1005, 136; Ex. 1008, 3632).

We initially note that Patent Owner appears to be correct that, at the time of publication, Sanders had not used its CAS during actual flight tests. *See* Ex. 1005, 136. However, that fact is largely irrelevant to whether Sanders teaches or suggests either a "method for navigating a UAV" or a "computer program product for navigating a UAV" as recited in claim 1 and claim 13 of the '232 patent.

Next, we note that Patent Owner's contentions are implicitly based on a construction of the phrase in claim 1 "selecting an obstacle avoidance algorithm" as "selecting an obstacle avoidance algorithm *from a plurality of collision avoidance algorithms*." Patent Owner does not offer any analysis based on intrinsic evidence from the '232 patent or its prosecution history to support such a construction but asserts only that the term selecting "is used in accordance with its ordinary and customary meaning: that is, choosing." *See* Prelim. Resp. 11, 24.

The language of claim 1 does not appear to suggest a requirement of selecting or choosing from more than one collision avoidance algorithm. Rather, it recites "piloting the UAV under control of a navigation computer,

in accordance with a navigation algorithm" and then "selecting an obstacle avoidance algorithm" after "identifying an obstacle." The ordinary meaning of the sequence of steps requires selecting or choosing an obstacle avoidance algorithm in place of the recited navigation algorithm after an obstacle is detected and then piloting the UAV in accordance with the obstacle avoidance algorithm. Patent Owner argues that Figure 16 of the '232 patent "shows the selection of an obstacle avoidance algorithm (556) from among several such algorithms (554)." Prelim. Resp. 25. However, box 554 in Figure 16 is labelled "Obstacle Avoidance Algorithm", thus, suggesting a single algorithm is contemplated. Ex. 1001, Fig. 16. The description of Figure 16 likewise does not provide support for selecting from more than one collision avoidance algorithm. *See id.* at 19:23–31. Additionally, the description of Figure 2 does not provide support for selecting from more than one collision avoidance algorithm. *See id.* at 6:41–49.

Nonetheless, the Petition explicitly states that "Sanders' implemented DSAAV system *includes* two collision avoidance algorithms: the bang-bang maneuver and the continuous maneuver" and "*selects* a maneuver (bang-bang or continuous)." Pet. 21, 23 (emphases added). The Petition, thus, appears to implicitly rely on a construction of claim 1 similar to that proposed by Patent Owner. Consequently, we analyze Patent Owner's contention that Sanders does not disclose this claim limitation.

Petitioner directs us to page 68 of Sanders in support of its contention that Sanders' system includes two collision avoidance algorithms. Pet. 23 (citing Ex. 1005, 68). Sanders discusses both bang-bang maneuvers and continuous maneuvers. *See* Ex. 1005, 68. However, after discussing the bang-bang maneuver, Sanders states that limitations of the bang-bang maneuver "sparked the design for the continuous DSAAV collision

avoidance controller, described next." *Id.* at 78. Sanders begins the description of the continuous controller by stating that "we wanted to eliminate the shortcomings of the open-loop controller, especially the all-or-nothing behavior which gets it into trouble." *Id.* Sanders also states that "the continuous controller . . . will probably be used in the flight tests." *Id.* at 73. Sanders, thus, suggests that the continuous maneuver algorithm was superior to the bang-bang maneuver algorithm. Given this disclosure, we are left to puzzle over the question of whether Sanders actually included both algorithms in its system, if one was superior to the other. None of the disclosure cited by Patent Owner or Petitioner definitively resolves whether both were contemplated to be included in Sanders' DSAAV system. However, based on our preliminary analysis of the language of claim 1, the fact that Sanders' system may not include both the bang-bang and continuous algorithms appears to be irrelevant to whether claim 1 is unpatentable over Sanders.

Petitioner sets forth a theory as to how Sanders satisfies this claim limitation by selecting from one of two collision avoidance algorithms. That theory would satisfy this claim limitation if supported by evidence from Sanders. But, such evidence appears to be insufficient at this point in the proceeding. On the other hand, based on our preliminary analysis of claim 1, Sanders discloses selecting the continuous collision avoidance algorithm after identifying an obstacle, which appears to satisfy this limitation.

The parties should address in subsequent briefing both the proper construction of claim 1 in light of our preliminary analysis as well as the disclosure of Sanders.

g. Piloting the UAV in Accordance with the Selected Obstacle Avoidance Algorithm

Petitioner contends that "[a]s part of the selected algorithm, CAS generates commands that pilot the AAV to avoid obstacles and return to the original trajectory." Pet. 24 (citing Ex. 1005, 65–71). Based on this, Petitioner contends that because the collision avoidance system operates in real-time while an AAV is flying a mission, piloting occurs "*while piloting the UAV*." *Id.* (citing Ex. 1003 ¶ 112).

Patent Owner does not squarely address Petitioner's contentions. *See* Prelim. Resp. 19–28. Based on the present record, Petitioner demonstrates sufficiently that Sanders discloses this claim limitation.

h. Summary of Claim 1

Based on the current record and our preliminary analysis of claim 1, Petitioner establishes a reasonable likelihood that claim 1 is unpatentable over Sanders.

Claim 13

Claim 13 is directed to "A computer program product for navigating a UAV" and recites various means plus function claim elements that appear to parallel the limitations of claim 1. Ex. 1001, 22:44–61.

Petitioner provides a table setting forth the disclosure in the '232 patent identifying its contentions as to the disclosed structure and function of the limitations of claim 13. Pet. 8–9. Petitioner also provides a table setting forth its contentions of the disclosure in Sanders corresponding to the limitations of claim 13. *Id.* at 27–28. Patent Owner relies on the same contentions for claim 13 as for claim 1. Prelim. Resp. 19. For similar reasons as discussed for claim 1, we determine that Patent Owner's contentions are not persuasive based on the current record.

The parties should address in subsequent briefing both the proper construction of claim 13 in light of our preliminary analysis as well as the disclosure of Sanders. In particular, the parties should address whether the scope of the "means . . . for selecting an obstacle avoidance algorithm" in claim 13 should be given the same scope as the "selecting" limitation in claim 1.

Claims 6 and 18

Claim 6 depends from claim 1 and claim 18 depends from claim 13. Ex. 1001, 21:53, 24:1. Petitioner details the disclosure in Sanders that it contends corresponds to the limitations in claims 6 and 18. Pet. 28–34. Patent Owner does not provide contentions for claims 6 and 18 apart from the contentions discussed above for claim 1 and 13. *See* Prelim. Resp. 28. We reviewed Petitioner's contentions as well as the cited evidence and find it reasonable and sufficient for institution.

F. Grounds 2, 3, 4

Claims 2–5 depend from claim 1 and claims 14–17 depend from claim 13. Petitioner details the disclosure in Sanders, Pilley, Sutter, and Pappas that it contends corresponds to the limitations in claims 2–5 and 14–17 as well as reasons for combining Sanders with each of Pilley, Sutter, and Pappas. Pet. 34–52. Patent Owner does not provide contentions for claims 2–5 and 14–17 apart from the contentions discussed above for claims 1 and 13. *See* Prelim. Resp. 28. We reviewed Petitioner's contentions as well as the cited evidence and find it reasonable and sufficient for institution.

G. Ground 5: Obviousness over Duggan and Pilley

Petitioner contends that claims 1–3, 6, 13–15, and 18 are unpatentable over Duggan and Pilley. Pet. 61–81. In support thereof, Petitioner identifies the disclosures in Duggan and Pilley alleged to describe the subject matter in

the challenged claims. *Id.* Additionally, Petitioner offers declaration testimony from Dr. R. John Hansman, Jr. Ex. 1003 ¶¶ 224–326.

Patent Owner contends that Petitioner's proposed combination of Duggan and Pilley is insufficient because "Pilley does not describe any embodiment where the collision detection process is performed on board an aircraft." Prelim. Resp. 29.

We begin our analysis with a brief overview of Duggan and Pilley. We then address the parties' respective contentions with respect to the challenged claims.

Duggan – Ex. 1012

Duggan discloses "a variable autonomy control system that enables a human to manage and operate a vehicle through interaction with a human-system interface." Ex. 1012, 1:14–17. The embodiments disclosed in Duggan are described "in the context of an unmanned aerial vehicle (UAV)." *Id.* at 4:53–54. Duggan's variable autonomy control system (VACS) provides for control of a UAV "from fully autonomous control to simplified manual flight control modes for enhanced real-time control." *Id.* at 5:19–25. Duggan's VACS comprises a ground station connected by a data link to a UAV. *Id.* at Fig. 6. Executive component 652 located on airborne system interface 604 "process[es] commands and information received from command control component 606" and manages UAV components such as navigation 662, guidance 658, and autopilot 654. *Id.* at 15:64–66. Among the functions performed by Duggan's system are autonomous ground collision avoidance and autonomous see-and-avoid air collision avoidance. *Id.* at 7:48–53, Fig. 1. Ground collision avoidance system 120 "provides an automated mechanism enabling the control system

to avoid terrain" and air collision avoidance system 122 autonomously avoids collisions with other aircraft. *Id.* at 11:8–11, 43:12–17.

Pilley — Ex. 1010

Pilley is directed to a system for controlling surface and airborne traffic using GNSS-based or GPS-based data. Ex. 1010, 4:11–14. Pilley's system controls and manages the flow of traffic approaching and departing an airport as well as the flow of surface vehicles and taxiing aircraft. *Id.* at 4:24–27.

Pilley defines a dynamic zone around an aircraft that moves with the aircraft. *Id.* at 11:11–17, Fig. 4. Pilley performs a rough check for vehicles in the immediate vicinity and uses a detection algorithm that "project[s] the position of a vehicle ahead by an increment of Time(t) using the received vehicle velocity." *Id.* at 94:1–4, 297:32–34, Fig. 10. If the distance between vehicles at projected distances is less than a safe distance, Pilley generates an alert of a potential collision. *Id.* at 94:8–21.

Claim 1

a. Preamble

Petitioner contends that "Duggan's VACS segregates UAV control into two fundamental categories: flight control associated 'with the aviation of the aircraft' and flight management associated 'with the mission plan (navigation tasking) for the aircraft." Pet. 61 (citing Ex. 1012, 6:1–6). Based on this, Petitioner contends that "the combination of Duggan and Pilley discloses a '*[a] method for navigating a UAV.*'" *Id.* (citing Ex. 1003, ¶ 239).

Patent Owner does not squarely address Petitioner's contentions or whether the preamble is limiting. *See* Prelim. Resp. 28–33. We need not

decide whether the preamble is limiting because Petitioner demonstrates sufficiently that Duggan discloses the subject matter of the preamble.

b. Piloting the UAV Under Control of a Navigation Computer, in Accordance with a Navigation Algorithm

Petitioner contends that Duggan discloses "a baseline set of guidance laws" such as "waypoint guidance law 1134; and loiter guidance mode 1142." Pet. 63 (citing Ex. 1012, 21:33–35, 51:58). Petitioner further contends that "Duggan's set of guidance laws collectively is the recited '*navigation algorithm*.'" *Id.* (citing Ex. 1003 ¶ 243). Petitioner further contends that "Duggan's guidance component 'is responsible for generating autopilot commands that, when executed, achieve a particular guidance objective.'" *Id.* at 64 (citing Ex. 1012, 21:22–24). Petitioner further contends that "Duggan's autopilot 654 . . . 'receives flight control commands, processes the commands . . . and passes commands to actuator control component 668 and engine control component 666 as necessary for flight control execution.'" *Id.* (citing Ex. 1012, 16:9–14). According to Petitioner, "Duggan's autopilot therefore pilots the UAV under control of the guidance component ('*navigation computer*') in accordance with the guidance laws ('*navigation algorithm*')." *Id.* (citing Ex. 1003 ¶ 244).

Patent Owner does not squarely address Petitioner's contentions. *See* Prelim. Resp. 28–33. Based on the present record, Petitioner demonstrates sufficiently that Duggan discloses this limitation.

c. Reading from a GPS receiver a sequence of GPS Data

Petitioner contends that Duggan discloses that its flight control system can be configured to support a GPS receiver. Pet. 64 (citing Ex. 1012, 58:1–4; 17:39–44). Petitioner further contends that Duggan's navigation component 662 "facilitates the collection and provision of data pertaining to

aircraft location." *Id.* at 65 (citing Ex. 1012, 16:7–9, Fig. 6). Petitioner further contends that the information obtained by navigation component 662 is "used by the guidance functionality to aid in decision-making such as, but certainly not limited to, path-regulation." *Id.* (citing Ex. 1012, 21:12–20). Petitioner further contends that "GPS data is continuously generated and 'read' by the navigation and guidance components to perform collision avoidance and flight management functions." *Id.* (citing Ex. 1003 ¶ 248; Ex. 1012, 17:51–57, Fig. 8). Based on the foregoing, Petitioner contends that "Duggan's systems '*read[s] . . . a sequence of GPS data*.'" *Id.* (citing Ex. 1003 ¶¶ 248–249).

Petitioner further contends that "Pilley also uses GPS data for 'position projections, coordinate conversions, zone detection, collision prediction, [and] runway incursion detection' among other functions." *Id.* at 66 (citing Ex. 1010, 7:33–35). Petitioner further contends that "Pilley teaches that '[c]ollision processing is performed **each second,** upon receipt of the FEV's [fully equipped vehicle] GPS position and velocity data.'" *Id.* (citing Ex. 1010, 328:25–27). Based on the foregoing, Petitioner contends that "Pilley's system also '*reads . . . a sequence of GPS data.*'" *Id.* (citing Ex. 1003 ¶ 249). Petitioner then concludes that "the combined system of Duggan and Pilley discloses '*reading from a GPS receiver a sequence of GPS data*'" and "[b]ecause the reading function is performed continuously during flight (e.g., every second as disclosed by Pilley), the '*reading*' functions occurs '*while piloting the UAV.*'" *Id.* at 66–67 (citing Ex. 1003 ¶¶ 245–249).

Patent Owner does not squarely address Petitioner's contentions. *See* Prelim. Resp. 28–33. Based on the present record, Petitioner demonstrates sufficiently that Duggan and Pilley disclose this limitation.

d. Anticipating a Future Position of the UAV in Dependence Upon the Sequence of GPS Data

Petitioner contends that "Duggan's 'ground collision avoidance system (GCAS) provides an automated mechanism enabling the control system to avoid terrain." Pet. 67 (citing Ex. 1012, 43:12–17). Petitioner further contends that Duggan reads a vehicle's position from GPS data and its' "GCAS algorithm predicts a collision by generating a scan pattern that 'starts at the vehicle position.'" *Id.* (citing Ex. 1012, 43:54–55). Petitioner further contends that Duggan generates a horizontal uncertainty box and the GCAS algorithm calculates the maximum terrain altitude in each uncertainty box. *Id.* (citing Ex. 1012, 43:55–59, Fig. 23). Petitioner further contends that the "GCAS algorithm next 'assumes a constant initial velocity and **projects the trajectory** along the velocity line to estimate a time to fly up.'" *Id.* (citing Ex. 1012, 44:23–25). Petitioner further contends that "[i]n an embodiment, Pilley's detection process is performed *onboard the aircraft*." *Id.* at 56 (citing Ex. 1010, 93:47–52) (emphasis added). Petitioner further contends that "[t]he modified air collision avoidance component of the combined system integrates Pilley's GPS-based collision detection" and that "Pilley teaches that collision detection performed on the vehicle '[u]ses the current GPS data and the information stored in the vehicle database.'" *Id.* at 68 (citing Ex. 1010, 297:19–21). Petitioner further contends that Pilley's algorithm "performs . . . collision checking by projecting the aircraft's position ahead at one second intervals." *Id.* at 69 (citing Ex. 1010, 297:36–38). Petitioner further contends that "the combined system of Duggan and Pilley discloses '*anticipating a future position of the UAV in dependence upon the sequence of GPS data.*'" *Id.* (citing Ex. 1003, ¶¶ 250–258); *see also* Pet. 55–58 (Detailing combination of Duggan and Pilley because

"Duggan . . . does not provide details regarding its air collision detection. Pilley discloses air collision detection technique."). According to Petitioner, "the combined system performs the '*anticipating*' function '*while piloting the UAV*' because "Pilley describes that its '[c]ollision processing is performed **each second**, upon receipt of the FEV's GPS position and velocity data.'" *Id.* (citing Ex. 1003 ¶ 258; Ex. 1010, 328:25–27).

Patent Owner contends that "Pilley does not describe any embodiment in which the collision detection process is performed on board the aircraft." Prelim. Resp. 29. In support of this contention, Patent Owner directs us to "Pilley's Vehicle Functional Matrix" which according to Patent Owner shows that "dynamic collision processing is not performed on aircraft." *Id.* (citing Ex. 1010, 325:60–326:34). Patent Owner further contends that Pilley's Vehicle Functional Matrix shows that collision detection processing "is performed at the ground-based AC&M system, and on fully equipped ground vehicles." *Id.* at 31 (citing Ex. 1010, 327:6–12, 328:20–35). For the following reasons and based on the current record, we are not persuaded by Patent Owner's contention.

First, we note that the claims do not require performing collision detection on the aircraft. Second, Pilley's Vehicle Functional Matrix relates to "prototype demonstrations" of "[t]hree vehicles, equipped with varying configurations of hardware and software." Ex. 1010, 325:19–22. The matrix indicates that the aircraft used in the prototype demonstrations did not "Perform[] dynamic collision processing" but it also indicates that the aircraft did "Perform[] zone incursion processing." *Id.* at 325:39–42. The description of the matrix does not suggest that Pilley's system is limited to the specific details of the prototype vehicles. *Id.* at 325:15–327:33.

Pilley discloses that it anticipates that its system is "capable of performing the navigation, surveillance, collision prediction, and zone/runway incursion . . . on the aircraft." *Id.* at 3:41–42. Pilley further discloses dynamic zones around aircraft that move with the aircraft. *Id.* at 11:11–13, Fig. 4. The zones shown in Pilley's Figure 10 are used in the collision detection system described in Pilley. *See id.* at 93:41–94:45; 297:16–63, Fig. 10. Although the prototype demonstration aircraft referenced in the matrix did not include dynamic collision processing, we have not located disclosure in Pilley limiting the use of its collision avoidance processing only to ground vehicles or ground systems. Further, as noted above, the matrix indicates that zone incursion processing, which appears to be part of collision avoidance, is performed on the prototype aircraft. Based on the current record, we are, thus, not persuaded by Patent Owner's contention. Petitioner, thus, demonstrates sufficiently that the combination of Duggan and Pilley discloses this limitation.

e. Identifying an Obstacle in Dependence Upon the Future Position

Petitioner contends that "Duggan's GCAS algorithm 'provides the operator with some form of situational awareness information about an upcoming collision (e.g., a warning signal).'" Pet. 69 (citing Ex. 1012, 43:17–20). Petitioner further contends that "GCAS 'monitors vehicle altitude and ground altitude and attempts to **predict at what point the vehicle will intersect the terrain**.'" *Id.* (citing Ex. 1012, 44:1–3). Petitioner further contends that the "air collision avoidance component" in Petitioner's proposed combination "determines whether the UAV is within a safe clearance distance of other vehicles at projected future positions" and "[w]hen the separation distance between the UAV and another vehicle is less

than the safe clearance distance, a potential collision alert is generated." *Id.* at 70 (citing Ex. 1010, 94:8–14, 297:42–45). According to Petitioner, "the algorithm identifies whether the vehicle is an '*obstacle*' at a future position of the UAV." *Id.* (citing Ex. 1003 ¶ 261). Based on the foregoing, Petitioner contends that "the combination of Duggan and Pilley discloses '*identifying an obstacle in dependence upon the future position.*'" *Id.* (citing Ex. 1003 ¶¶ 259–261). According to Petitioner, the combined system "perform[s] the '*identifying*' function '*while piloting the UAV*'" because "Pilley describes that its '[c]ollision process is performed **each second**, upon receipt of the FEV's GPS position and velocity data.'" *Id.* (citing Ex. 1003 ¶ 262; Ex. 1010, 328:25–27).

Patent Owner does not squarely address Petitioner's contentions. *See* Prelim. Resp. 28–33. Based on the present record, Petitioner demonstrates sufficiently that Duggan and Pilley disclose this limitation.

f. Selecting an Obstacle Avoidance Algorithm

Petitioner contends that if Duggan detects terrain as an obstacle, "the system selects GCAS which provides an automated mechanism to avoid the terrain." Pet. 70–71 (citing Ex. 1012, 43:13–15). Petitioner further contends that "[i]f the obstacle is another vehicle, the system selects air collision avoidance," which "override[s] the waypoint path and direct[s] the aircraft off of the collision course." *Id.* at 71 (citing Ex. 1003 ¶ 264; Ex. 1012, 11:6–11). Based on the foregoing, Petitioner contends that "the combined system of Duggan and Pilley discloses '*selecting an obstacle avoidance algorithm.*'" *Id.* (citing Ex. 1003 ¶¶ 263–265).

Patent Owner does not squarely address Petitioner's contentions. *See* Prelim. Resp. 28–33. Based on the present record, Petitioner demonstrates sufficiently that Duggan and Pilley disclose this limitation.

g. Piloting the UAV in Accordance with the Selected Obstacle Avoidance Algorithm

Petitioner contends that both of Duggan's GCAS and air collision avoidance components autonomously execute obstacle avoidance algorithms. Pet. 72. Petitioner contends that "[f]or ground collision avoidance, the system causes the autopilot to execute a vertical fly-up maneuver to 'automatically avoid the terrain.'" *Id.* (citing Ex. 1012, 43:20–23). Petitioner further contends that for air collisions, "Duggan's collision avoidance commands 'will first correspond to the requested waypoint path, then there will be a transition to a non-collision path, and then there will be a graceful transition back to the waypoint path.'" *Id.* at 71 (citing Ex. 1012, 11:11–15). Based on the foregoing, Petitioner contends that "the combined system of Duggan and Pilley discloses '*piloting the UAV in accordance with the selected obstacle avoidance algorithm*.'" *Id.* at 72 (citing Ex. 1003 ¶¶ 266–268).

Patent Owner does not squarely address Petitioner's contentions. *See* Prelim. Resp. 28–33. Based on the present record, Petitioner demonstrates sufficiently that Duggan and Pilley disclose this limitation.

h. Motivation to Combine

Petitioner provides several reasons why a skilled artisan would have been motivated to combine Duggan and Pilley. Pet. 59–60. First, Petitioner contends that "Duggan does not provide any details regarding the mechanism used to **detect** potential obstacles or collisions other than a brief mention of an optical tracker" and would therefore "look for references disclosing details of air collision detection techniques and would have been led to Pilley." *Id.* at 59 (citing Ex. 1003 ¶ 236). Second, Petitioner contends that a skilled artisan "would have been motivated to integrate GPS-based air

collision detection into Duggan to provide an enhanced collision avoidance system that avoids problems of optical systems due to environmental conditions (e.g., clouds, fog, etc.)." *Id.* at 59–60 (citing Ex. 1003 ¶ 237). Petitioner further contends that Pilley provides motivation for the combination by touting "the application of new technologies to the management of our airports [to] provide improved efficiency, enhanced safety." *Id.* at 60 (citing Ex. 1010, 3:45–50). Third, Petitioner contends that Duggan "stresses that collision avoidance 'and other applicable functions are commercially available modules for integration'" and "can be integrated in a 'plug-n-play' format.'" *Id.* at 60 (citing Ex. 1012, 7:12–15, 7:42–44, 8:57–61). Petitioner further contends that it would have "been obvious to a [skilled artisan] to integrate modified or additional collision avoidance capabilities to enhance the operation and safety of Duggan's system." *Id.* (citing Ex. 1003 ¶ 238).

Patent Owner contends that "[n]either the petition nor petitioner's expert explains how or why a [skilled artisan] would have found it obvious to adapt 'ground station collision detection process' (or even one for a fully equipped ground vehicle) in an air collision avoidance component as described by Duggan." Prelim. Resp. 31. Patent Owner further contends that "Petitioner's expert bases this conclusion on Pilley's description of 'its collision detection process at both a ground station and a vehicle,' *id.*, but in doing so fails to mention that this is a ground vehicle, not an aircraft." *Id.* Patent Owner's contention is, thus, based on the same arguments made in connection with the "anticipating a future position" limitation discussed above that Pilley does not disclose using collision avoidance processing on the aircraft. We are not persuaded by this contention, at this time, for the same reasons discussed above in connection with that claim limitation.

i. Summary of Claim 1

For all the foregoing reasons, we determine that Petitioner has established a reasonable likelihood that claim 1 is unpatentable over Duggan and Pilley.

Claim 13

Claim 13 recites "A computer program product for navigating a UAV" in the form of various means plus function claim elements that appear to parallel the limitations of claim 1. Ex. 1001, 22:44–61.

Petitioner provides a table setting forth its contentions of the disclosure in Duggan and Pilley corresponding to the limitations of claim 13. Pet. 74–75. Patent Owner relies on the same contentions for claim 13 as for claim 1. Prelim. Resp. 28. For similar reasons as discussed for claim 1, we determine that Patent Owner's contentions are not persuasive based on the current record.

Claims 2, 3, 6, 14, 15, and 18

Claims 2, 3, and 6 depend from claim 1 and claims 14, 15, and18 depend from claim 13. Petitioner details the disclosure in Duggan and Pilley that it contends corresponds to the limitations in claims 2, 3, 6, 14, 15, and 18. Pet. 75–81. Patent Owner does not provide contentions for claims 6 and 18 apart from the contentions discussed above for claims 2, 3, 6, 14, 15, and 18. *See* Prelim. Resp. 28–32. We reviewed Petitioner's contentions as well as the cited evidence and find it reasonable and sufficient for institution.

H. Ground 6: Obviousness over Duggan, Pilley, and Sainthuile

Claims 4 and 5 depend from claim 1 and claims 16 and 17 depend from claim 13. Petitioner details the disclosure in Duggan, Pilley, and Sainthuile that it contends corresponds to the limitations in claims 4, 5, 16, and 17 as well as reasons for combining Duggan, Pilley, and Sainthuile.

Pet. 81–90. Patent Owner does not provide contentions for claims 4, 5, 16, and 17 apart from the contentions discussed above for claim 1 and 13. *See* Prelim. Resp. 33. We reviewed Petitioner's contentions as well as the cited evidence and find it reasonable and sufficient for institution.

III. CONCLUSION

Based on the record before us, we determine that Petitioner demonstrates a reasonable likelihood that it would prevail in establishing that at least one challenged claim of the '232 patent is unpatentable. We, thus, institute an *inter partes* review of all challenged claims of the '232 patent based on all grounds in the Petition. At this stage of the proceeding, we have not made a final determination under 35 U.S.C. § 318(a) with respect to the unpatentability of any challenged claim.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of the '232 patent is instituted with respect to all claims and grounds set forth in the Petition; and

FURTHER ORDERED pursuant to 35 U.S.C. § 314(a) and 37 C.F.R. § 42.4(b), *inter partes* review of the '634 Patent shall commence on the entry date of this Order, and notice is hereby given of the institution of a trial.

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