

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AXON ENTERPRISE, INC., DEDRONE HOLDINGS, INC., and
SKYDIO, INC.,
Petitioner,

v.

AIRSPACE SYSTEMS, INC.,
Patent Owner.

IPR2025-00629
Patent 10,514,711 B2

Before MICHAEL R. ZECHER, BARRY L. GROSSMAN, and
SCOTT C. MOORE, *Administrative Patent Judges*.

MOORE, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. *Background and Summary*

Axon Enterprise, Inc., Dedrone Holdings, Inc., and Skydio, Inc. (collectively, “Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–20 of U.S. Patent No. 10,514,711 B2 (Ex. 1001, “the ’711 Patent”). Paper 1 (“Pet.”). Airspace Systems, Inc. (“Patent Owner”) did not file a brief requesting discretionary denial of institution and, as a result, the proceeding was referred to this panel for consideration on the merits. See Paper 10. Patent Owner subsequently filed a Preliminary Response. Paper 11 (“Prelim. Resp.”).

We may institute an *inter partes* review when “the information presented in the petition . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). If we institute an *inter partes* review, the trial must encompass all claims and grounds identified in the Petition. 37 C.F.R. § 42.108(a) (“When instituting *inter partes* review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim.”).

For the reasons set forth below, we conclude that there is a reasonable likelihood that Petitioner will prevail in establishing the unpatentability of one or more claims of the ’711 Patent. We, therefore, institute *inter partes* review of claims 1–20 on the grounds identified in the Petition.

B. *Real Parties in Interest*

Petitioner identifies Axon Enterprise, Inc., Dedrone Holdings, Inc., and Skydio, Inc., as Petitioner’s real parties in interest. Pet. 1. Patent Owner identifies Airspace Systems, Inc. as Patent Owner’s real party in interest. Paper 4, 2.

C. *Related Matters*

Petitioner indicates that the '711 Patent is the subject of the following co-pending district court litigation: *Airpsace Systems, Inc. v. Dedrone Holdings, Inc.*, No. 1-24-cv-01625 (E.D. Va). Pet. 1. Petitioner is also pursuing two co-pending *inter partes* review proceedings against Patent Owner: IPR2025-00525 and IPR2025-00530. The patents challenged in those *inter partes* reviews are not related to the '711 Patent. Paper 4, 2.

D. *The '711 Patent*

The '711 Patent, titled “Flight Control Using Computer Vision,” relates to controlling the flight of a reference aerial vehicle by, for example, capturing an image, identifying a target in the image, determining the relative location of the target with respect to the reference aerial vehicle, and performing a flight control operation on the reference aerial vehicle based on this relative location. Ex. 1001, codes (54), (57). The '711 Patent discloses that an Unmanned Aerial Vehicle (UAV) may be used as an interceptor aerial vehicle to monitor and/or capture offending or threatening aerial vehicles. *Id.* at 3:3–21. The interceptor aerial vehicle may be configured to “autonomously track and fly to the target UAV using machine vision based on images captured by a camera of the interceptor aerial vehicle.” *Id.* at 3:27–30. In particular, the interceptor aerial vehicle may capture an image, use “deep learning, neural networks, and/or other machine learning techniques” to identify a target aerial vehicle in the captured image, compute a “three-dimensional relative location of the target aerial vehicle” based on the image, and then perform a “flight control operation” to guide the interceptor aerial vehicle towards the target aerial vehicle. *Id.* at 3:31–45.

E. Challenged Claims

Petitioner challenges claims 1–20 of the '711 Patent. Claim 1, which is representative, is reproduced below with bracketed identifiers added. See Ex. 1026, 1.

[1a] 1. A method of performing a flight control operation of a reference aerial vehicle, comprising:

[1b] receiving an image captured by an image sensor of the reference aerial vehicle;

[1c] detecting a target in the image including by applying a machine learning model to the image to identify a portion of the image that includes the target;

[1d] determining a three-dimensional relative location of the target with respect to the reference aerial vehicle based on the image including by determining a distance to the target based at least in part on a size of the target detected within the image; and

[1e] performing the flight control operation based on the three-dimensional relative location of the target with respect to the reference aerial vehicle, wherein performing the flight control operation includes determining a speed adjustment factor based on a magnitude of deviation of a direction of the three-dimensional relative location with respect to a current flight direction of the reference aerial vehicle.

Ex. 1001, 31:9–29.

F. Asserted Grounds

Petitioner asserts the following grounds of unpatentability for the challenged claims:

Ground	Claims Challenged	35 U.S.C. § ¹	Reference(s)/Basis
1	1–3, 5, 6, 9, 10, 12, 14–16, 18–20	103	Beard, ² Laufer ³
2	4	103	Beard, Laufer, Khan ⁴
3	7, 8	103	Beard, Laufer, Kumar ⁵
4	11	103	Beard, Laufer, Malecki ⁶
5	13	103	Beard, Laufer, Sahasrabudhe ⁷
6	17	103	Beard, Laufer, Hogasten ⁸
7	1, 3, 5–9, 15, 19, 20	102	Pierce ⁹
8	1, 3, 5–9, 15, 19, 20	103	Pierce, Kumar
9	2, 12, 18	103	Pierce, Laufer
10	2, 12, 18	103	Pierce, Kumar, Laufer
11	4	103	Pierce, Khan
12	4	103	Pierce, Kumar, Khan
13	17	103	Pierce, Hogasten
14	17	103	Pierce, Kumar, Hogasten
15	1, 3, 5–9, 14–16, 19, 20	103	Pierce, Sahasrabudhe
16	1, 3, 5–9, 14–16, 19, 20	103	Pierce, Kumar, Sahasrabudhe
17	2, 12, 18	103	Pierce, Sahasrabudhe, Laufer
18	2, 12, 18	103	Pierce, Kumar, Sahasrabudhe, Laufer
19	4	103	Pierce, Sahasrabudhe, Khan
20	4	103	Pierce, Kumar, Sahasrabudhe, Khan
21	17	103	Pierce, Sahasrabudhe, Hogasten
22	17	103	Pierce, Kumar, Sahasrabudhe, Hogasten

Pet. 7–8. Petitioner also relies on the Declaration of Dr. William Singhose. Ex. 1003. Patent Owner has not submitted declaration testimony at this stage of the proceeding.

II. ANALYSIS

A. *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).

Petitioner contends that one of ordinary skill in the art would have had the following qualifications:

[E]ither (1) a Bachelor of Science in Mechanical Engineering, Electrical Engineering, Aerospace engineering, or an equivalent field, as well as at least 2 years of academic or industry experience in the aerospace or avionics fields, or (2) at least four years of experience in any of the above industries.

¹ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. §§ 102 and 103 that became effective on March 16, 2013. Because the applications from which the ’711 Patent claims priority were all filed after this date, the post-AIA version of §103 applies. See Ex. 1001, codes (60), (63).

² U.S. Patent No. 9,769,387 B1, iss. Sept. 19, 2017 (Ex. 1009).

³ U.S. Patent App. Pub. No. 2017/0059692 A1, pub. Mar. 2, 2017 (Ex. 1010).

⁴ U.S. Patent App. Pub. No. 2012/0106800 A1, pub. May 3, 2012 (Ex. 1021).

⁵ U.S. Patent App. Pub. No. 2017/0161911 A1, pub. June 8, 2017 (Ex. 1007).

⁶ U.S. Patent App. Pub. No. 2013/0301905 A1, pub. Nov. 14, 2013 (Ex. 1024).

⁷ U.S. Patent App. Pub. No. 2012/0004844 A1, pub. Jan. 5, 2012 (Ex. 1025).

⁸ PCT App. Pub. No. WO 2017/123477 A1, pub. July 20, 2017 (Ex. 1022).

⁹ U.S. Patent App. Pub. No. 2017/0160751 A1, pub. June 8, 2017 (Ex. 1005).

Pet. 8 (citing Ex. 1003 ¶¶ 50–54). Patent Owner does not presently dispute Petitioner’s proposed formulation. *See generally* Prelim. Resp. For purposes of this Decision, we adopt and apply Petitioner’s formulation regarding the level of ordinary skill in the art because it is (1) consistent with the ’711 Patent and the asserted prior art; and (2) it is supported by the testimony of Dr. Singhose.

B. Claim Construction

We interpret claims in the same manner used “in a civil action under 35 U.S.C. § 282(b), including construing the claim in accordance with 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.” 37 C.F.R. § 42.100(b). When applying that standard, we interpret the claim language as it would have been understood by one of ordinary skill in the art in light of the specification. *Wasica Fin. GmbH v. Cont’l Auto. Sys., Inc.*, 853 F.3d 1272, 1279–80 (Fed. Cir. 2017). Thus, we give claim terms their ordinary and customary meaning as understood by an ordinarily skilled artisan. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

Petitioner does not identify any claim terms that it contends require construction. Pet. 8–9. Patent Owner, however, contends that the claim limitation “detecting a target in the image including by applying a machine learning model to the image” of claims 1 and 20, and the limitation “detect a target in the image” of claim 19 (collectively, the “Detecting Limitations”), should be interpreted more narrowly than their ordinary meanings in view of

certain disclosures in the Specification. *See* Prelim. Resp. 12–17. In particular, Patent Owner asserts that the Detecting Limitations should be construed so as to require:

applying *aboard the reference UAV a machine learning model* to the captured image for: (i) identifying a target in the captured image, (ii) identifying a bounding box for the identified target, and (iii) classifying the identified target, including identifying a type of the target.

Id. at 12 (emphasis added). For the reasons discussed below, we are not persuaded at this stage of the proceeding that the scope of the Detecting Limitations should be limited in the manner Patent Owner proposes.

Patent Owner first argues that the Detecting Limitations should be construed to require “applying *aboard the reference UAV a machine learning model* to the captured image for: (i) *identifying* a target in the captured image” (Prelim. Resp. 13, emphasis added) because, in claims 1, 19, and 20, “[t]he only target detection within an image captured aboard a reference UAV that the ’711 Patent discloses is by applying a *machine learning model aboard the reference UAV*” (*id.* at 12, emphasis added). Patent Owner also argues that the Specification discloses the use of “machine learning models that are trained to label a detected object based on the visual data.” *Id.* at 13.

But the Detecting Limitations of claims 1, 19, and 20, merely require that a target be “detected.” The Detecting Limitations do not require that target detection be performed “aboard the reference UAV,” and claim 19 does not recite or require “machine learning.” Moreover, the Specification makes clear that the claims should not be limited to aspects of the disclosed embodiments, as Patent Owner proposes to do here. *See, e.g.*, Ex. 1001, 2:56–59 (“The invention is described in connection with such embodiments,

but the invention is not limited to any embodiment. The scope of the invention is limited only by the claims”) Patent Owner additionally fails to cite any lexicographic definition or clear and unambiguous disclaimer of claim scope sufficient to limit the claims in the manner it proposes. We, thus, are not persuaded that the Detecting Limitations require “applying aboard the reference UAV a machine learning model to the capture image for: (i) identifying a target in the captured image.”

Patent Owner next argues that the Detecting Limitations require “(ii) identifying a bounding box for the identified target, and (iii) classifying the intended target, including identifying a type of the target.” Prelim. Resp. 13–15. Patent Owner again supports its argument solely by citing exemplary embodiments from the Specification. *See id.* For example, Patent Owner cites disclosures that the size of an image *may* be detected by identifying a minimum-sized bounding box that includes the features of the detected target; that both the bounding box and a target classification *may* be used to determine the relative distance of a target; and that a “size profile” that corresponds to a specific target type *may* be used to determine the distance to the target. *See id.* (citing Ex. 1001, 17:39–66, 18:54–59). But Patent Owner again fails to cite any lexicographic definition or clear and unambiguous disclaimer of claim scope sufficient to limit the claims in the manner it proposes. *See id.* Moreover, claim 5, which depends from claim 1, recites “wherein detecting the target in the image includes identifying a bounding box outlining a portion of the image that includes the detected features of the target.” *See* Ex. 1001, 31:40–43. Patent Owner’s proposed construction would effectively read this limitation into claim 1. Such claim constructions are generally disfavored. *See, e.g., Ortho-McNeil Pharm. v. Mylan Lab ’ys, Inc.*, 520 F.3d 1358, 1362 (Fed. Cir. 2008) (“[T]his court

strives to reach a claim construction that does not render claim language in dependent claims meaningless.”) We are not persuaded on this record to adopt this portion of Patent Owner’s proposed construction of the Detecting Limitations.

Patent Owner cites additional aspects of preferred embodiments to argue that certain claims should be construed to require identifying the size of a target using a bounding box, identifying the type of target by using a machine learning model, and performing a flight control operation *by the reference aerial vehicle itself*. See Prelim. Resp. 15–17. Patent Owner also argues that the “target” of claims 1, 19, and 20, must be a flying object because “[t]he problem addressed by the ’711 Patent exclusively pertains to flying objects.” *Id.* at 17. We have reviewed these remaining arguments and determine that they are unpersuasive at least because Patent Owner has failed to cite any lexicographic definitions or clear and unambiguous disclaimers sufficient to justify importing limitations from the Specification into the claims. See *id.* at 15–17. Moreover, the Specification makes clear (i) that a remote “[g]round station” may issue instructions or data “that can be used by the interceptor aerial vehicle” to “navigate to and/or capture a target aerial vehicle” (Ex. 1001, 3:54–60), and (ii) that the disclosed invention is not limited to “aerial vehicles” (see Ex. 1001, 17:4–7 (“Although the examples were discussed with respect to aerial vehicles, in various other embodiments, the techniques discussed herein may be applied to other types of vehicles such as terrestrial or aquatic vehicles.”))).

On this record and at this stage of the proceeding, we preliminarily determine that the challenged claims should be given their ordinary and customary meaning. We presently are not persuaded that the challenged claims require further clarification; and for the reasons discussed above, we

decline on this record to adopt the specific claim construction proposals set forth in the Patent Owner Response.¹⁰

C. Priority Date of the Challenged Claims

Petitioner contends that claims 1–20 of the ’711 Patent “should not have priority to the October 9, 2016 filing date of U.S. provisional [patent] application 62/405,972 due to a lack of written description support.” Pet. 3. Petitioner thus “assumes” a priority date of October 1, 2017 (the filing date of U.S. Provisional Patent Application No. 62/556,449) for purposes of this proceeding. *Id.* at n.2; *see also* Ex. 1003, code (60).

Patent Owner does not presently dispute Petitioner’s contention that the ’711 Patent is not entitled to a priority date earlier than October 1, 2017. *See generally* Prelim. Resp.

For purposes of this decision, we accept Petitioner’s undisputed contention that the ’711 Patent is not entitled to a priority date prior to

¹⁰ Any determination, no matter how designated in this Institution Decision (except our ultimate decision to institute), is preliminary and non-binding. Our Final Written Decision, based on a fully developed record of arguments and evidence, will state our binding determinations, findings, and conclusions. If a party disagrees with this preliminary construction, or any other determination set forth in this Institution Decision, that party should present its arguments at trial. The parties are reminded that any arguments not made during trial will be considered waived. Patent Owner is further reminded that arguments in the Preliminary Response are not preserved and will be considered waived at trial unless those arguments are re-raised in the Patent Owner Response. The parties are additionally reminded that arguments raised in subsequent briefing must be set forth in full in the briefs themselves, and may not be incorporated by reference from prior filings such as the Preliminary Response. *See* 37 C.F.R. § 42.6(a)(3).

October 1, 2017.¹¹ Accordingly, Petitioner has made a sufficient showing that all of the cited references qualify as prior art. *See* Pet. 4–6.

D. Obviousness under 35 U.S.C. § 103

An invention is not patentable under 35 U.S.C. § 103 “if 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.” 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) where in evidence, so-called secondary considerations, including commercial success, long-felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

Additionally, the obviousness inquiry typically requires an analysis of “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring “articulated reasoning with some rational underpinning to support the legal conclusion of obviousness”)). Petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements,” but “must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

¹¹ To the extent Patent Owner disagrees with Petitioner’s contentions concerning the priority date of the ’711 Patent, it should set forth its contentions in the Patent Owner Response.

1. *Secondary Considerations*

Patent Owner argues that secondary considerations of non-obviousness are present here because the invention claimed in the '711 Patent solved a previously unmet need in the industry, and has also received industry praise. *See* Prelim. Resp. 61–65. Patent Owner bases its objective evidence arguments on a commercial product called the Airspace Interceptor. *See id.* Patent Owner contends that the Airspace Interceptor “solved a previously unresolved need for an unmanned aerial platform that is able to autonomously interdict UAVs operated by bad actors,” and has been recognized “in the aeronautics industry [for] . . . significant technical advances.” Prelim. Resp. 61, 65.

But Patent Owner can only rely on this type of evidence if it demonstrates a nexus between the evidence it presents regarding the Airspace Interceptor product, and the challenged claims of the '711 Patent. As explained by the U.S. Court of Appeals for the Federal Circuit,

[f]or objective evidence of secondary considerations to be relevant, there must be a nexus between the merits of the claimed invention and the objective evidence. *See In re GPAC*, 57 F.3d 1573, 1580 (Fed. Cir. 1995). A showing of nexus can be made in two ways: (1) via a presumption of nexus, or (2) via a showing that the evidence is a direct result of the unique characteristics of the claimed invention.

A patent owner is entitled to a presumption of nexus when it shows that the asserted objective evidence is tied to a specific product that “embodies the claimed features, and is coextensive with them.” *Brown & Williamson Tobacco Corp. v. Philip Morris, Inc.*, 229 F.3d 1120, 1130 (Fed. Cir. 2000).

Volvo Penta of the Americas, LLC v. Brunswick Corp., 81 F.4th 1202, 1210 (Fed. Cir. 2023).

At this stage of the proceeding, Patent Owner has not demonstrated the required nexus. Patent Owner argues that the Airspace Interceptor is “the invention disclosed and claimed in the ’711 [P]atent” because “the Airspace Interceptor is depicted in FIGS. 3A and 3B of the ’711 Patent as an example embodiment of the claimed invention of the ’711 Patent.” Prelim. Resp. 58. But this argument misconstrues what it means for an embodiment to be included in a patent specification. There is no requirement that a patent include claims covering any particular embodiment, much less that claims be coextensive with particular embodiments. Thus, even if the Airspace Interceptor is described and depicted in the ’711 Patent Specification, that is not evidence that the Airspace Interceptor “embodies the claimed features” of any particular challenged claim, much less that it is “coextensive” with any such claim.

Patent Owner also contends that “the Airspace Interceptor practices at least Claims 1, 19, and 20.” *See* Prelim. Resp. 60. But this statement is unsupported attorney argument. *See id.* The Preliminary Response does not contain an element-by-element comparison between the Airspace Interceptor and any challenged claim. *See id.* at 57–60. And even assuming, *arguendo*, that Patent Owner had shown that the Airspace Interceptor practices at least claims 1, 19, and 20, Patent Owner would still have failed to demonstrate that the Airspace Interceptor is “coextensive” with any of these claims, i.e., that the Airspace Interceptor is “essentially the claimed invention.” *See, e.g., Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1374–75 (Fed. Cir. 2019) (holding that a product was not “coextensive” with a patent claim where that product practiced the claim, but also included “critical unclaimed features.”).

For the foregoing reasons, at this stage of the proceeding, Patent Owner has failed to demonstrate the necessary nexus. Patent Owner's secondary considerations evidence is, therefore, entitled to little weight in our institution analysis.

2. *Obviousness of Claims 1–3, 5, 6, 9, 10, 12, 14–16, and 18–20 over Beard and Laufer*

a) *Overview of Beard and Laufer*

Beard discloses an “action camera system for an unmanned aerial vehicle” that “selects a target based on a reference image captured by an onboard camera,” and uses “[i]mage processing” to “determin[e] a desired orientation of the target to the UAV, by which the UAV can track the target.” Ex. 1009, code (57). Beard's system may analyze images captured by a camera to “identify potential target objects . . . via bounding boxes.” *Id.* at 3:57–67. Targets “may include human or animal subjects, natural features, or man-made landmarks.” *Id.* at 3:62–64.

Laufer discloses systems and methods for drone interdiction. Ex. 1010, code (57). Laufer's system can use doppler radars and fixed cameras within a surveillance zone to differentiate between targets that present a threat (e.g., small unmanned aircraft systems or drones) and targets not presenting a threat (e.g., birds). *Id.* Fig. 1, ¶¶ 21–24. Laufer's system can also employ machine learning algorithms to determine whether a target is a drone and, if so, whether it is a threat. *Id.* ¶ 31. When a threat is identified, Laufer's system may use doppler radar signals to determine an “interception location.” *Id.* ¶¶ 22, 38–39. When the target is within range of an interceptor's camera, the interceptor may capture images of the target and then use those images to control its own flight. *Id.* ¶¶ 42–44. The

interceptor may then immobilize the threat, for example, by using a net gun.
Id. ¶ 29.

b) Rationale to Combine

Petitioner, citing testimony from Dr. Singhose, contends that one of ordinary skill in the art would have been motivated to combine Beard and Laufer in the following manner:

Beard's image processor 234 of UAV 100 would use machine learning to detect aircraft targets in captured images, the UAV would be brought to within an imaging range of the target using a radar-generated interception location and autopilot commands, and the UAV would use image-based flight control when within the imaging range, as taught by Laufer.

Pet. 12 (citing Ex. 1003 ¶¶ 107–111). Petitioner contends that there would have been a reasonable expectation of success in making the proposed combination, because “[e]nhancing Beard as discussed would have been routine and straightforward,” and “would have been well within a [person of ordinary skill’s] capabilities because machine learning object detection and radar were well-known.” Pet. 13 (citing Ex. 1003 ¶ 114). Petitioner also contends that such a combination “would have been applying a known technique (Laufer’s machine learning object detection and use of radar) to improve similar devices (Beard’s drone flight control system) in the same way,” that the “results would have been predictable,” and that one of ordinary skill in the art, thus, “would have had a reasonable expectation of success.”
Id.

c) Claim 1

(1) Petitioner’s Contentions

Petitioner contends that its proposed combination of Beard and Laufer would have taught or suggested all limitations of claim 1. In particular,

Petitioner contends that Beard teaches or suggests a method of performing a flight control operation of a reference aerial vehicle in which images are captured by and received from an image sensor of the reference aerial vehicle, a three-dimensional relative location between a target and the reference aerial vehicle is determined based at least in part on the size of the target detected within the image, and a flight control operation is performed based on the three-dimensional relatively location of the target with respect to the aerial vehicle, in the manner recited in limitations [1a], [1b], [1d], and [1e]. *See* Pet. 14–27. With respect to limitation [1c], Petitioner claims that the proposed combination of Beard and Laufer would have detected the target by applying a machine learning model as taught by Laufer, to the image captured by Beard’s system, to identify a portion of that image that contains the target. *See id.* at 15–16.

(2) *Patent Owner’s Contentions*

Patent Owner argues that one of ordinary skill in the art would not have combined Beard and Laufer for three reasons:

(i) Petitioners have not shown that a [person of ordinary skill in the art] would have been motivated to make the substitution that Petitioners propose, . . . (ii) the proposed combination (“Beard-Laufer”) “would produce an inoperative result,” . . . and (iii) the proposed combination does not provide a reasonable expectation of achieving the claimed invention.”

Prelim. Resp. 18. Patent Owner also contends that the proposed combination of Beard and Laufer would not satisfy limitation [1c]. *See id.* at 25–28.

(3) *Analysis*

Petitioner has accounted for each element of the method of claim 1 in its challenge to that claim as being obvious over Beard and Laufer, and has

set forth a rationale for why one of ordinary skill in the art would have combined the teachings of Beard and Laufer to arrive at the invention of claim 1 with a reasonable expectation of success. *See* Pet. 10–27. We have reviewed the evidence cited by Petitioner, including Beard, Laufer, and the Singhose Declaration. We have also reviewed the arguments and evidence cited by Patent Owner, including the secondary considerations evidence discussed above, and the arguments discussed below. On the current record, we find Petitioner has shown a reasonable likelihood of prevailing on its challenge to claim 1 based on Laufer and Beard. We now turn to the specific arguments raised by Patent Owner in its Preliminary Response.

In support of Patent Owner’s first motivation to combine argument—that Petitioner has failed to show that one of ordinary skill in the art would have been motivated to make the proposed substitution—Patent Owner alleges that Petitioner’s motivation to combine argument is based on hindsight, and that neither Beard nor Laufer teaches “using machine-learning for target detection, let alone such use aboard an interceptor UAV itself,” or “on-board autonomous flight operations, e.g., beyond an operator’s visual line of sight.” Prelim. Resp. 19–20. Patent Owner also contends that Beard is “silent on ‘performing the flight control operation,’ according to a proper construction thereof, i.e., autonomous navigation.” *Id.* at 21.

Petitioner, however, has articulated a rationale for why one of ordinary skill in the art would have combined the teachings of Beard and Laufer in the proposed manner and has supported that rationale with testimony from Dr. Singhose. *See* Pet. 10–13 (citing Ex. 1003 ¶¶ 107–114). Dr. Singhose also testifies that one of ordinary skill in the art would have recognized that Laufer’s technique of using machine learning to identify

aircraft targets in captured images would improve Beard’s system, and would have recognized that Laufer provides “known implementation details regarding Beard’s described object detection.” Ex. 1003 ¶ 112. This testimony does not appear to be based on hindsight, and stands unrebutted at this stage of the proceeding. Moreover, as discussed in Section II.B, *supra*, we are not persuaded on the current record that claim 1 of the ’711 Patent requires that target detection be performed “aboard an interceptor UAV itself,” “on-board autonomous flight operations,” or what Patent Owner calls “autonomous navigation.” Accordingly, Patent Owner’s first motivation to combine argument is not persuasive.

In support of Patent Owner’s second motivation to combine argument—that the proposed combination of Beard and Laufer would be inoperative—Patent Owner argues that Petitioner has not adequately explained why one of ordinary skill in the art would have substituted Beard’s visual “facial recognition algorithms” with Laufer’s machine learning technique, and that Laufer’s machine learning technique is “not a target *detection* technique, but a classification technique.” Prelim. Resp. 22. But Beard’s target detection is not limited to facial recognition, as Petitioner suggests. Beard’s targets may be, “[f]or example, . . . human or animal subjects, natural features, or manmade landmarks.” Ex. 1009, 3:59–64. And, as discussed above, Petitioner has set forth a rationale, supported by testimony that presently stands unrebutted, for why one of ordinary skill would have combined these two teachings. *See, e.g.*, Ex. 1003 ¶ 112. Moreover, as Patent Owner admits, Laufer’s machine learning algorithms determine, for example, “whether a target is a drone, and if the target is a drone, whether it is a threat.” *See* Prelim. Resp. 22 (citing Ex. 1010 ¶ 31). Dr. Singhose testifies that this disclosure in Laufer teaches or suggests target

identification (*see* Ex. 1003 ¶¶ 117–118), and this testimony presently stands un rebutted. Accordingly, on the present record, we are not persuaded that the proposed combination would be inoperative.

In support of Patent Owner’s third and final motivation to combine argument—that the proposed combination does not provide a reasonable expectation of achieving the claimed invention—Patent Owner repeats its assertion that Laufer’s algorithm “classifies” rather than “detects” targets, citing an article and a presentation that distinguish between detecting and classifying objects. *See* Prelim. Resp. 23 (citing Exs. 2003, 2004). But, as discussed above, Dr. Singhose’s testimony as to claim limitation [1c] is un rebutted at this stage of the proceeding. Moreover, the statements that Patent Owner cites from Exhibits 2003 and 2004 (a 2001 article published by two Australian authors, and a slide presentation of unknown date) are extrinsic evidence, and have little probative value as to how one of ordinary skill in the art would have interpreted the claim terms at the time of invention. Thus, while Patent Owner is certainly free to re-raise this argument in its Patent Owner Response, it is not adequately supported by the current record.

Regarding limitation [1c], Patent Owner argues that “Beard does not teach . . . machine learning,” and that “Petitioners do not cite any particular disclosure from Laufer” to demonstrate that Laufer applies machine learning to identify potential targets. Prelim. Resp. 25. But Petitioner relies on Laufer, not Beard, to supply the “machine learning model” limitation. *See* Pet. 10–13. Petitioner also cites a specific disclosure of Laufer that allegedly teaches or suggests the use of machine learning to identify targets. *See* Ex. 1003 ¶¶ 117–118 (citing Ex. 1010 ¶ 31). Thus, these arguments are not persuasive.

Patent Owner also argues that the proposed combination would not apply machine learning “aboard the reference UAV” for “identifying a bounding box for the identified target” and “classifying the identified target, including identifying the type of the target,” and also would not determine the “size of the bounding box for the target that is provided by the machine learning model.” Prelim. Resp. 26. But as explained in our discussion of Patent Owner’s claim construction arguments (*see* § II.B, *supra*), we are not persuaded that limitation [1c] requires applying machine learning “aboard the reference UAV,” the use of a “bounding box,” or “classifying the identified target, including the type of target.”¹² Accordingly, these arguments are not persuasive.

Patent Owner then reiterates its argument that Petitioner and Dr. Singhose are improperly conflating object detection with object classification. *See* Prelim. Resp. 26–28. But, as explained above, Dr. Singhose’s testimony on this subject currently stands un rebutted. Thus, on the current record, this argument is not adequately supported.

Considering all of the evidence presently before us, including evidence concerning secondary considerations of non-obviousness, we determine Petitioner has demonstrated a reasonable likelihood of prevailing in demonstrating that claim 1 is unpatentable as obvious under 35 U.S.C. § 103 over Beard and Laufer. Accordingly, we institute an inter partes

¹² We note that dependent claim 4, which recites “wherein detecting the target in the image includes identifying a model type of the target,” does appear to require “classifying the identified target, including the type of target.” *See* Ex. 1001, 31:38–39. And, as mentioned above, dependent claim 5 requires a bounding box. *See id.* at 31:40–43. Claim 1, in contrast, does not recite these limitations.

review as to claims 1–20 on all grounds set forth in the Petition. *See* 37 C.F.R. § 42.108(a).

d) *Claims 2, 3, 5, 6, 9, 10, 12, 14–16, and 18–20*

Petitioner also contends that claims 2, 3, 5, 6, 9, 10, 12, 14–16, and 18–20 are unpatentable as obvious over Beard and Laufer. Because we have already decided to institute an *inter partes* review as to all challenged claims on all asserted grounds, we need not fully address Patent Owner’s remaining arguments directed to these claims in this Decision. We express no opinion on the strength or weakness of those challenges at this stage of the proceeding.

3. *Grounds 2–22*

Petitioner sets forth 21 other challenges against claims of the ’711 Patent. Because we have already decided to institute an *inter partes* review as to all challenged claims on all asserted grounds, we need not fully address these challenges in this Decision, and we express no opinion on the strength or weakness of those challenges at this stage of the proceeding.

III. CONCLUSION

For the reasons discussed above, Petitioner has shown a reasonable likelihood it will succeed in demonstrating that at least one claim of the ’711 Patent is unpatentable under 35 U.S.C. § 103. We, therefore, institute an *inter partes* review as to all challenged claims on all grounds set forth in the Petition. 35 U.S.C. § 314(a); 37 C.F.R. § 42.108(a).

This Decision does not reflect a final determination on the patentability of any claim. We further note that the burden remains on Petitioner to prove unpatentability of each challenged claim. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED, pursuant to 35 U.S.C. § 314(a), that an *inter partes* review of claims 1–20 of U.S. Patent No. 10,514,711 B2 is instituted with respect to all grounds set forth in the Petition; and

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

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Patent 10,514,711 B2

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