

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

AIRSPACE DEFENSE, INC.,
Patent Owner.

IPR2025-00525
Patent 10,713,959 B2

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

MOORE, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Denying Patent Owner's Revised Non-Contingent Motion to Amend
35 U.S.C. § 318(a)

I. INTRODUCTION

Axon Enterprise, Inc. and Dedrone Holdings, Inc. (“Petitioner”) filed a Petition (Paper 1) challenging the patentability of claim 21 of U.S. Patent No. 10,713,959 B2 (Ex. 1001, “the ’959 Patent”). We issued an Institution Decision (Paper 13) instituting an *inter partes* review based on all grounds raised in the Petition challenging claim 21.

Airspace Systems, Inc. (“Patent Owner”) filed a non-contingent motion to amend (Paper 16) and Petitioner filed an opposition (Paper 21). We issued Preliminary Guidance concerning the initial Motion to Amend. Following the Preliminary Guidance (Paper 23), Patent Owner filed a revised, non-contingent motion to amend (Paper 26, “Motion” or “Mot.”), and Petitioner filed an opposition to the Motion (Paper 33, “Opposition” or “Opp.”). Patent Owner filed a reply to the Opposition (Paper 35, “Reply”), and Petitioner filed a sur-reply to the Reply (Paper 37, “Sur-reply”).

An oral hearing was held on August 25, 2026, and a transcript was entered into the record (Paper 46).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision, issued pursuant to 35 U.S.C. § 318(a), addresses issues raised in the Motion and related briefing during the trial in this *inter partes* review. We treat the non-contingent Motion as a request to cancel original claim 21. *See Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15, 3 (PTAB Feb. 25, 2019) (precedential) *aff’d* 2002 WL 499848 (Fed. Cir. Feb. 18, 2022) (distinguishing between “[a] request to cancel claims [that] will not be regarded as contingent” and “a request to substitute claims [that] ordinarily will be treated as contingent,” and prescribing that “[a] patent owner should adopt a claim-by-claim approach to specifying the contingency of

substitution”). Accordingly, original claim 21 is cancelled, and we do not reach the grounds of unpatentability raised in the Petition.

After considering all arguments and evidence of record, we *deny* the Motion with respect to proposed substitute claim 22 because it seeks to add new matter to the application that issued as the ’959 Patent, and because Petitioner has demonstrated by a preponderance of the evidence that proposed substitute claim 22 is unpatentable as obvious under 35 U.S.C. § 103.

II. BACKGROUND

A. Real Parties-in-Interest

Petitioner identifies Axon Enterprise, Inc. and Dedrone Holdings, Inc. as the real parties-in-interest. Pet. 1. Patent Owner identifies Airspace Defense, Inc. as the real party-in-interest. Paper 18, 2.

B. Related Matters

The parties inform us that the ’959 Patent has been asserted in *Airspace Systems, Inc. v. Dedrone Holdings, Inc.*, No. 1-24-cv-01625 (E.D. Va.). Pet. 1; Paper 18, 2. The parties also inform us of the following related *inter partes* review proceedings: IPR2025-00530 and IPR2025-00629. Paper 18, 2.

C. Applied References

Petitioner’s Opposition relies on the references summarized in the table below.

Name	Reference	Exhibit
Beard	US 10,733,894 B1, filed Feb. 26, 2018 (claiming priority benefit of US 62/480,031, filed Mar. 31, 2017), issued Aug. 4, 2020	1008

Taveira	US 2016/0253907 A1, published Sep. 1, 2016	1010
Wang	WO 2016/078093 A1, published May 26, 2016	1011
Gong	WO 2016/154949 A1, published Oct. 6, 2016	1012
Qi	US 2016/0127890 A1, published May 5, 2016	1013
Wang-II	WO 2015/043123 A1, published Apr. 2, 2015	1014
Viggiano	US 2007/0239986 A1, published Oct. 11, 2007	1024
FF	<i>Who Goes There: Friend or Foe?</i> , U.S. Congress, Office of Technology Assessment (U.S. Government Printing Office, June 1993)	1028
Hayes	US 10,380,775 B2, filed Aug. 6, 2014, issued Aug. 13, 2019	1030

Opp. ii–iv, 8.

D. Asserted Grounds

Petitioner asserts in its Opposition that proposed substitute claim 22 is unpatentable based on the following grounds:

Claim(s) Challenged	35 U.S.C. §¹	Reference(s)/Basis
22	112	Indefiniteness
22	103	Beard, Viggiano, Hayes (Ground 5B)

¹ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. §§ 102, 103, 112, and 316 that became effective on March 16, 2013. Because the applications from which the ’959 Patent claims priority were all filed after this date, the post-AIA versions of §§ 102, 103, and 112 apply. *See* Ex. 1001, codes (60), (63).

Claim(s) Challenged	35 U.S.C. §¹	Reference(s)/Basis
22	103	Taveira, Wang, Gong, Viggiano, Hayes (Ground 6B)
22	103	Taveira, Qi, Gong, Viggiano, Hayes (Ground 7B)
22	103	Gong, Wang-II, Viggiano, Hayes (Ground 8B)
22	103	Beard, Viggiano, Hayes, FF (Ground 9B)
22	103	Taveira, Wang, Gong, Viggiano, Hayes, FF (Ground 10B)
22	103	Taveira, Qi, Gong, Viggiano, Hayes, FF (Ground 11B)
22	103	Gong, Wang-II, Viggiano, Hayes, FF (Ground 12B)

Opp. 8. Grounds 5B–8B and 9B–12B include the same references as in Grounds 1–4 asserted in the Petition, with the addition of Viggiano and Hayes, or further addition of FF, respectively. *See* Pet. 21; Opp. 8.

Patent Owner asserts that Beard does not qualify as prior art, but does not dispute the prior art status of the remaining references. *See* Paper 45; *see generally* Reply.

E. The '959 Patent

The '959 Patent, titled “Low Altitude Aircraft Identification System,” relates to identifying low altitude aircraft such as drones. Ex. 1001, codes (54), (57). For example, the '959 Patent discloses that a low altitude aircraft can be provided with an identification box that transmits identification information via color emitters that produce a visible light color sequence or

by a radio frequency signal. *Id.* at 2:7–17, 5:1–23, Fig. 1. The '959 Patent also describes ground identification equipment that can receive the transmitted identification information and thereby detect the identity of the low altitude aircraft. *Id.* at 3:37–46, 5:55–6:19. The identification information transmitted by the identification box may be secured, e.g., by encryption, in a manner that allows the ground identification equipment to validate the identity of the low altitude aircraft. *See, e.g., id.* at 1:56–2:3, 10:20–41.

III. ANALYSIS OF PROPOSED SUBSTITUTE CLAIM 22

Patent Owner's Motion proposes to add substitute claim 22 to the '959 Patent. For the reasons below, we deny the Motion.

A. Claim 22

Proposed substitute claim 22 is reproduced below, with underlined language showing subject matter added to original claim 21, and with double-bracketed language showing subject matter removed from original claim 21. Patent Owner's designations of claim elements are indicated by single brackets.

[22.pre] A device configured to communicate identification information associated with a first low-altitude aircraft, the device comprising:

[22.a] a radio frequency communication antenna; and

[22.b] a radio communication module coupled to the radio frequency communication antenna and configured to transmit identification information associated with the first low-altitude aircraft through a transmitted radio signal,

[22.c] wherein the radio communication module is configured to receive a [[received]] radio signal and store the received information in a storage,

- [22.d] wherein the radio frequency communication antenna is coupled to the first low-altitude aircraft and
- [22.e] the radio communication module is configured to utilize a secure identifier, the secure identifier comprising a specified excitation enabling disambiguation of the first low-altitude aircraft from other detected low-altitude aircraft, [[and]]
- [22.f] wherein utilizing the secure identifier comprises receiving by the radio communication module the specified excitation from a remote portable detection system, wherein the specified excitation causes the first low-altitude aircraft to change a behavior thereof,
- [22.g] the radio communication module is configured for two-way communication with [[a]]the remote portable detection system; and
- [22.h] wherein the device is coupled to the first low-altitude aircraft and
- [22.i] the remote portable detection system includes a user interface configured to provide to a user, information associated with a plurality of different low-altitude aircrafts detected by the remote portable detection system[[.]], the plurality comprising the first low-altitude aircraft and the remote portable detection system is configured to disambiguate the first low-altitude aircraft from the other detected low-altitude aircraft of the plurality based on the changed behavior of the first low-altitude aircraft.

Mot., Claims App.

B. Legal Standard

In a Motion to Amend, Petitioner bears the burden of persuasion to show that any proposed substitute claim is unpatentable by a preponderance of the evidence. *Lectrosonics*, IPR2018-01129, Paper 15; 37 C.F.R. § 42.121(d)(2). “Before considering the patentability of any substitute claims, however, the Board first must determine whether the motion to

amend meets the statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121.” *Lectrosonics*, Paper 15 at 4–8. Patent Owner, however, bears the burden of persuasion to show by a preponderance of the evidence that the motion to amend complies with these requirements. 37 C.F.R. § 42.121(d)(1). Specifically, Patent Owner must demonstrate: (1) that a “reasonable number of substitute claims” have been proposed for each challenged claim (35 U.S.C. § 316(d)(1)(B)); (2) that the proposed amendments respond to a ground of unpatentability involved in the trial (37 C.F.R. § 42.121(a)(2)(i)); and (3) the amendments do not seek to enlarge the scope of the claims and do not introduce new matter (35 U.S.C. § 316(d)(3)). *Lectrosonics*, Paper 15 at 4–8.

C. Compliance with the Legal Requirements Set Forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121

Patent Owner bears the burden to ensure that its Motion complies with the legal requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121. *Lectrosonics*, Paper 15 at 4, 7–8. For the reasons that follow, we determine that Patent Owner has not satisfied that burden.

1. Proposal of a Reasonable Number of Substitute Claims

A motion to amend must “propose a reasonable number of substitute claims.” 35 U.S.C. § 316(d)(1)(B); *see also* 37 C.F.R. § 42.121(a)(3) (“A motion to amend may cancel a challenged claim or propose a reasonable number of substitute claims.”). “There is a rebuttable presumption that a reasonable number of substitute claims per challenged claim is one (1) substitute claim.” *Lectrosonics*, IPR2018-01129, Paper 15 at 4; *see also* 37 C.F.R. § 42.121(a)(3). Patent Owner has shown it proposes a reasonable number of substitute claims by proposing a single substitute claim to replace

challenged claim 21. Mot. 1, Claims App. Petitioner does not argue otherwise. *See generally* Opp.

We determine that Patent Owner meets this requirement.

2. Amendments Respond to a Ground of Unpatentability

“A motion to amend may be denied where. . . [t]he amendment does not respond to a ground of unpatentability involved in the trial.” 37 C.F.R. § 42.121(a)(2)(i). Patent Owner has responded to the grounds of unpatentability involved in this proceeding by amending the only challenged claim in response to the Petition’s asserted prior art. *See* Mot. 1–2, Claims App. Petitioner does not argue otherwise. *See generally* Opp.

We determine that Patent Owner meets this requirement.

3. No Enlargement of the Scope of the Claims

An amendment may not seek to enlarge the scope of the claims of the patent. 35 U.S.C. § 316(d)(3); 37 C.F.R. §§ 42.121(b)(1)–(b)(2). Patent Owner asserts that the amendments in the Motion do not enlarge the scope of the claims of the patent because the Motion only “adds further limitations” to original claim 21, aside from making a “typographical correction.” *See* Mot. 2, Claims App.

Petitioner contends that the alleged typographical correction in proposed substitute claim 22 that removes the term “received”—“wherein the radio communication module is configured to receive a [[received]] radio signal” (Mot., Claims App.)—is an impermissible broadening of the claims (Opp. 7). Specifically, Petitioner asserts that proposed substitute claim 22 now covers a radio communication module that receives “*any* radio signal,” rather than radio signals the radio communication module “had actually received—e.g., signals of a compatible ‘type’ and ‘range.’” Opp. 7.

Petitioner relies on the Specification to support this argument, in particular, the disclosure that “the device can receive ‘wireless signals of various types and range.’” *Id.* (citing Ex. 1001, 13:23–29).

Patent Owner responds that proposed substitute claim 22 does not “recite anything about the type, range, or compatibility of the received signal,” and asserts that “[a]s the Board recognized in the preliminary guidance to the first [Motion to Amend], ‘receive a received radio signal’ is ‘redundant, because in order to receive a radio signal, it would have to be a received radio signal.’” Reply 7 (citing Paper 23, 5).

Petitioner asserts in reply that proposed substitute claim 22 “no longer limits the signal received by the *radio communication module* to radio signals already received by the device, its radio frequency communication antenna, or another component.” Sur-reply 9. Petitioner appears to suggest this means that original claim 21 was limited to an internal component of the device receiving a signal already received by another component, whereas proposed substitute claim 22 is not so limited. *See id.* (citing Ex. 1031, 12:19–15:14 (in which Patent Owner’s expert testified that signals may be sent between a digital signal processing unit and main controller); Ex. 2015, 18:18–19:12, Fig. 14).

We agree with Patent Owner that proposed substitute claim 22 does not impermissibly broaden the scope of the claims of the ’959 Patent. As Patent Owner suggests, there were no limitations in original claim 21 on the type of radio signal the radio communication module could receive, and so it follows that proposed substitute claim 22 does not now encompass receiving a broader set of radio signals. We see no basis for Petitioner’s argument that the past tense verb “received” limited original claim 21 to

“signals of a compatible ‘type’ and ‘range.’” Opp. 7. Moreover, the claim language (with the proposed deletion shown double brackets) provides that “the radio communication module is configured to receive a [[received]] radio signal.” Any radio signal that the radio communications module receives would necessarily be a “received” radio signal. Thus, deleting the redundant word “received” does not enlarge the scope of this claim limitation.

We also are not persuaded by Petitioner’s suggestion that removing the term “received” broadens original claim 21 by deleting a requirement that the radio signal have already been previously received by the claimed device. *See* Sur-reply 9. Original claim 21 simply recited, using redundant language, that “the radio communication module is configured to receive a received radio signal.” Ex. 1001, 18:5–7. The most natural reading of this language is that the phrase “received radio signal” is just a description of a radio signal that is received by the recited radio communications module. Petitioner has cited no persuasive evidence that one of ordinary skill in the art would have counterintuitively interpreted this language to impose an additional requirement that the “received radio signal” must have been received twice—a first time by some other component of the device, and a second time by the recited radio communication module.

Accordingly, we determine that the proposed amendment does not improperly broaden claim scope.

4. No Introduction of New Matter

An amendment may not introduce new matter. 35 U.S.C. § 316(d)(3); 37 C.F.R. §§ 42.121(b)(1)–(b)(2). New subject matter is any addition to the claims that lacks sufficient written description support in the subject patent’s

original disclosure. *See TurboCare Div. of Demag Delaval Turbomach. Corp. v. Gen. Elec. Co.*, 264 F.3d 1111, 1118 (Fed. Cir. 2001) (“When [an] applicant adds a claim . . . , the new claim[] . . . must find support in the original specification.”). Patent Owner is required to show written description support in “the original disclosure of the patent for each claim that is . . . amended,” and in “an earlier-filed disclosure for each claim for which benefit of the filing date of the earlier filed disclosure is sought.” 37 C.F.R. §§ 42.121(b)(1)–(b)(2).

The test for satisfying the written description requirement “is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.” *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). In its Motion, Patent Owner provides citations to U.S. Patent Application No. 16/215,406 (Ex. 2015, “the ’406 application”), from which the ’959 Patent issued, as well as citations to U.S. Provisional Patent Application No. 62/175,153 (Ex. 2016, “the ’153 provisional”), to which the ’406 application claims priority. *See* Mot. 2–10; Ex. 1001, codes (21), (60); Ex. 2015, 1:3–5.

In our Institution Decision, we preliminarily construed “secure identifier” as “a credential that can be used to securely verify the identity of a device, such as an airborne object or ground-based transmitter.” Paper 13, 10. We also instructed the parties that, if they disagreed with this construction, they should present their arguments during trial, or those arguments would be considered waived. *Id.* at 10–11 n. 8. Neither party disputed our preliminary construction during trial, thus we adopt this as our final construction of “secure identifier.”

Petitioner contends that Patent Owner does not identify disclosure supporting the proposed substitute claim 22 feature of “a *secure identifier* being received by an aircraft on the uplink—i.e., from a ground station (*remote portable detection system*).” Opp. 1. According to Petitioner, the only type of “secure identifier” disclosed in the Specification is a rotating Service Set Identifier (“SSID”), and the Specification describes the SSID “exclusively as transmitted from the aircraft **down** to the ground station.” *Id.* (citing Ex. 1001, 1:28–31, 1:45–2:3, 11:66–12:62, Figs. 9–13); *see also* Ex. 1001, 4:41–46 (defining the term “SSID”).

Further, Petitioner contends that Patent Owner improperly relies on embodiments in the Specification that relate to optical transmissions to support functional limitations of the claimed “*radio communication module*.” *See* Opp. 2–3. In particular, Petitioner asserts that each of the citations Patent Owner provides for the radio communication module receiving the claimed “*specified excitation*” “relates to receiving a physical beam via a **photo sensor or light array**.” *Id.* at 2.

Petitioner also contends that there is no supporting disclosure that combines a secure identifier with a light beam, despite Patent Owner’s reliance on descriptions of a transmitted light beam for supporting the secure identifier feature recited in proposed substitute claim 22. *See* Opp. 3–4. According to Petitioner, “Patent Owner relies solely on passages describing how a ‘photo sensor is excited with a high luminous beam’ to trigger a behavior change,” but “[n]othing in the patent connects the *secure identifier* or that term as construed to such an excitation and change in aircraft behavior.” *Id.*

Patent Owner responds by asserting that the '406 application does, in fact, disclose the reception of a secure identifier by an aircraft, not solely transmission of such a secure identifier. Reply 1. Patent Owner points to originally filed claim 1's recitation that the "radio communication module is configured to utilize a secure identifier, and the radio communication module is configured for two-way communication." *Id.* Patent Owner also points to portions of the '406 application describing that an "identification code" can be sent either through visible light or [radio frequency ("RF")], and that an aircraft and ground station engage in "two-way communication." *Id.* at 2–3.

Patent Owner also highlights a portion of the '406 application in which a ground station "direct[s] a specific wavelength and modulated light beam emitter to one of the aircrafts' [which] will cause 'the aircraft [to] modify its behavior allowing the data-to-vehicle association'" (Reply 3 (final alteration in original)), and argues that Petitioner's contentions "fail[] to analyze whether these disclosures satisfy the Board's construction of 'secure identifier' and thus provide possession of these limitations" (*id.* at 3–4). In particular, Patent Owner argues that one of ordinary skill in the art would have understood the '406 application "as conveying that light beam information comprises 'a credential that can be used to securely verify the identity of a device, such as an airborne object or a ground-based transmitter,' i.e. a secure identifier as construed by the Board." *Id.* at 4 (citing Paper 13, 9). According to Patent Owner, this is because the disclosed "light beam is designed specifically so that only the target [low-altitude aircraft] would respond." *Id.* at 5.

Petitioner replies by reiterating that Patent Owner has not identified a “secure identifier” received by an aircraft. *See* Sur-reply 1–5. Further, Petitioner argues that Patent Owner improperly relies upon optical embodiments for support, particularly in asserting that one of ordinary skill in the art would have understood that the described optical embodiments support an RF embodiment of a received “secure identifier,” which Petitioner views as impermissible reliance on obviousness. *See id.* at 5–6.

We find that Patent Owner has not sufficiently shown that the ’406 application reasonably conveys possession of the disputed features of proposed substitute claim 22.

In the Institution Decision, we preliminarily determined that the ’153 provisional lacks written description support for the limitation of a “secure identifier,” which remains a claimed feature of proposed substitute claim 22. *See* Paper 13, 11–14. Patent Owner has not provided additional arguments that persuasively show support for this feature in the ’153 provisional. *See* Mot.; Reply. Accordingly, it has waived the right to contest this determination (*see* Paper 13, 10–11 n. 8), and we reaffirm our preliminary determination and find that the ’153 provisional does not provide sufficient written description support for a “secure identifier.”

Turning to the ’406 application, we find that Patent Owner has failed to demonstrate that this application shows possession of a “radio communication module . . . configured to utilize a secure identifier” that “compris[es] a specified excitation,” for at least two reasons.

First, Patent Owner has not shown possession of the disputed feature of a “radio communication module [that] is configured to utilize a secure identifier, the secure identifier comprising a specified excitation.” In the

'406 application, the term "excitation" is used exclusively to refer to a light beam signal. *See* Ex. 2015, 7:8–13, 9:8–10, 23:9.² The '406 application discloses that an identification box on an aircraft may include both an RF module and a separate light sensor. *See* Ex. 2015, 7:3–11. But nowhere does the '406 application describe receiving a light beam (e.g., an excitation) with the RF module of the identification box (as opposed to the light sensor), so as to provide support for proposed substitute claim 22's recitation of a "radio communication module" configured to utilize "a secure identifier . . . comprising a specified excitation." We disagree with Patent Owner that it suffices that one of ordinary skill in the art "would recognize that these disclosures are equally applicable to the RF-only embodiments" (Reply 5). "It is not sufficient for purposes of the written description requirement . . . that the disclosure, when combined with the knowledge in the art, would lead one to speculate as to modifications that the inventor might have envisioned, but failed to disclose." *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997). On this record, and having reviewed the '959 Patent, the '153 provisional, and the '406 application, we find no evidence in those documents that the named inventor was in possession of the concept of a radio communications module "configured to utilize a secure identifier" where "the secure identifier compris[es] a specified excitation."

Second, setting aside the "radio communication module" in proposed substitute claim 22, Patent Owner also has not shown that the named inventor was in possession of the feature of a "secure identifier comprising a specified excitation." Patent Owner's argument that the '406 application describes a light beam directed to a particular aircraft (*see* Reply 4–5) is

² The same is true of the '153 provisional. *See* Ex. 2016 ¶¶ 29, 34.

unavailing. The fact that the properties of a particular light beam indicate that the light beam is intended for a particular aircraft does not demonstrate that the light beam is a “secure identifier,” as we have construed that term. Patent Owner has not identified any disclosure in the ’406 application of a “secure identifier” comprising a light beam, let alone that such light beam can be utilized by a “radio communication module.” The only references to “secure” identifiers in the ’406 application describe radio frequency signals. *See* Ex. 2015, 2:4–6, 15:21–17:12.³ Having reviewed the ’959 Patent, the ’153 provisional, and the ’406 application, we find no evidence in those documents that the named inventor was in possession of the concept of a “secure identifier comprising a specified excitation.”

For each of the above reasons, we determine that Patent Owner has not sufficiently shown written description support in the original disclosure for proposed substitute claim 22, which we thus find introduces new subject matter.

5. *Summary*

For the reasons discussed above, Patent Owner has not satisfied its burden to show that the amendments in the Motion comply with the applicable statutory and regulatory requirements. *See* 35 U.S.C. § 316(d); 37 C.F.R. § 42.121(d)(1); §§ III.C.1–III.C.4, *supra*.

D. *Unpatentability of Proposed Substitute Claims*

Petitioner contends that proposed substitute claim 22 is indefinite, and that claim 22 would have been obvious over eight separate prior art combinations. Opp. 5–25. Although we determine Patent Owner has not

³ As discussed above, the ’153 provisional does not contain any disclosure whatsoever of a secure identifier, as we have construed that term.

met its burden for adding proposed substitute claim 22, for completeness, we also address Petitioner's asserted grounds of unpatentability. For the reasons discussed below, we determine that Petitioner has demonstrated by a preponderance of the evidence that proposed substitute claim 22 is unpatentable.

1. Indefiniteness

Petitioner contends that proposed substitute claim 22 is indefinite for two reasons. First, Petitioner asserts that the term “*low-altitude aircraft*” is indefinite because “*low-altitude*” is a term of degree with no objective boundaries for ascertaining its scope and meaning described in the Specification. Opp. 5–6. Second, Petitioner asserts the term “*the received information*” is indefinite because it lacks antecedent basis. *Id.* at 6. Petitioner argues that, given there is “no prior recitation of any *information* that is *received*,” it is unclear whether “*the received information*” refers to the previously recited “*identification information*,” or some other information. *Id.* at 6. Petitioner further argues that one of ordinary skill in the art would not understand “the received information” to refer to the previously recited “*radio signal*” that is received, because “they are different terms, connoting different meanings.” *Id.* at 6–7.

Patent Owner contends that “the meaning of ‘low-altitude aircraft’ . . . is clear,” because “[t]he [S]pecification describes ‘small UASs,’ i.e., unmanned aerial systems, as ‘aircrafts up to 25 pounds flying up to 500 ft of the low altitude airspace.’” Reply 5 (citing Ex. 1001, 1:50–52, 2:35–36); *see also* Paper 46, 27:17–28:17 (Patent Owner arguing during the oral hearing that “low altitude” means “under the 500-foot level”). Patent Owner further contends that one of ordinary skill in the art “would also readily apprehend

the meaning of ‘the received information,’” namely, “that the ‘radio signal’ that is ‘receive[d]’ provides antecedent basis for the ‘received information.’” *Id.* at 5–6. That is, Patent Owner asserts, “because radio *signals* contain information, the received radio signal contains the received information.” *Id.* at 6. Patent Owner further asserts that, contrary to Petitioner’s suggestion, one would not confuse the previously recited “identification information” as the antecedent basis for “the received information,” because in proposed substitute claim 22 the “identification information” is transmitted by the radio communication module, not received by the module. *See id.* at 6.

Petitioner responds by arguing that Patent Owner has not shown the Specification clearly defines the low-altitude airspace so as to provide definiteness to the claim term “low-altitude aircraft,” in part relying on the testimony of Patent Owner’s expert that the definition of such airspace could vary greatly depending on location. Sur-reply 7–8. In short, Petitioner argues that the “ambiguity and different potential meanings in different circumstances supports indefiniteness.” *Id.* at 8. Regarding the claim term “received information,” Petitioner responds by arguing that Patent Owner’s logic that a received radio signal contains information, and thus provides antecedent basis for “received information,” is misguided. *See id.* at 8–9. Specifically, Petitioner asserts that Patent Owner’s “own evidence says noisy transmitted radio signals might need correction to account for ‘information which is missing in the received signal,’ and so “[r]adio signals thus do not necessarily contain information.” *Id.* at 9 (emphases omitted).

In *inter partes* review proceedings, the Board applies the indefiniteness standard set forth in *Nautilus, Inc. v. Biosig Instruments, Inc.*,

572 U.S. 898 (2014). *See* Memorandum: Approach to Indefiniteness Under 35 U.S.C. § 112 in AIA Post-Grant Proceedings (Jan. 6, 2021).⁴ Under *Nautilus*, a claim is indefinite if fails to “inform those skilled in the art about the scope of the invention with reasonable certainty.” 572 U.S. at 910. We agree with Patent Owner that neither of the identified terms are indefinite.

Regarding the term “low-altitude aircraft,” we determine the Specification provides a sufficient basis for understanding the scope and meaning of this term with reasonable certainty. The U.S. Court of Appeals for Federal Circuit has explained that, when a term of degree is recited in a claim, it is necessary “to determine whether the patent’s specification provides some standard for measuring that degree.” *See Seattle Box Co. v. Indus. Crating & Packing, Inc.*, 731 F.2d 818, 826 (Fed. Cir. 1984); *see also Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1350 (Fed. Cir. 2005) (“Some objective standard must be provided in order to allow the public to determine the scope of the claimed invention.”). Here, the Specification describes the related art as including “small UASs (e.g., aircrafts up to 25 pounds flying up to 500 ft of the low altitude airspace).” Ex. 1001, 1:50–52. One of ordinary skill in the art would understand from the Specification that the cited disclosure provides an objective standard for determining the scope of a low-altitude aircraft as one that is designed to fly up to a maximum altitude of about 500 feet.

The Specification also provides another indication that the claim term “low-altitude aircraft” encompasses aircraft designed to fly at a maximum altitude of about 500 feet. The Specification describes a “low altitude

⁴ Available at <https://www.uspto.gov/sites/default/files/documents/IndefinitenessMemo.pdf>.

aircraft identification system” as including “a small aircraft electronic identification box” in which “the present example implementation is directed to a light array that blinks a defined color pattern sequence for each aircraft.” Ex. 1001, 2:8–10, 2:31–33. It then explains that such a light array provides “the possibility for a person to visually identify an aircraft from a distance of about 500 feet, without the use of any special equipment.” *Id.* at 2:34–36. Proposed substitute claim 22 does not expressly recite a light array, but the embodiments described in the Specification include such a light array (*see, e.g., id.* at 5:5–8, 9:2–3), indicating that the low-altitude aircraft contemplated for the invention is one flying below about 500 feet.

Moreover, the Specification emphasizes that “[u]sing a visible light sequence, an aircraft in a low altitude flight may be visually identified,” whereas “other related art identification systems for aircraft [that] need a radar system or special devices” that do “not work for a scenario involving a person without such devices and an aircraft.” Ex. 1001, 14:57–65. As noted above, the Specification indicates the distance at which a person can visually identify an aircraft is about 500 feet.

With respect to the term “the received information,” we determine there is reasonable certainty that the information referred to as being received is the “radio signal” recited in the same clause of proposed substitute claim 22. There is no other previously recited information that is received in the claim, and we are persuaded by Patent Owner’s explanation that a radio signal includes information, and so the “radio signal” that the “radio communication module is configured to receive” provides antecedent basis for “the received information,” even though it is not a verbatim reference to the “radio signal.” Petitioner’s argument that there is confusion

as to whether the previously recited “identification information” provides antecedent basis for “the received information” (*see* Opp. 6) is unpersuasive because, as Patent Owner points out, the “identification information” is transmitted by the radio communication module, not received by it (*see* Reply 6). Petitioner’s additional argument that a received radio signal might not contain any information, and so cannot provide antecedent basis for “the received information,” is not persuasive. One of ordinary skill in the art would have readily appreciated that a radio signal carries information, and proposed substitute claim 22 does not specify that the signal must include any particular information, for example, information free of noise or other interference. *See, e.g.*, Ex. 1001, 12:23–27 (disclosing wireless signals, such as “cellular, WiFi, BlueTooth, and near field communication,” all which carry information); Ex. 2025, 2 (explaining how a general communication system transmits radio signals that carry information).

For the foregoing reasons, we determine Petitioner has not proven by a preponderance of the evidence that proposed substitute claim 22 is indefinite.

2. 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.⁵ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

In our Institution Decision, we adopted Petitioner’s proposal 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, avionics, telecommunications, or electronic device manufacturing industry, or (2) at least four years of industry experience in any of the above industries.

Paper 13, 5 (citing Pet. 21). Patent Owner has not disputed this formulation; thus, we adopt it for purposes of this Decision. *See* Paper 13, 10–11 n. 8.

a) *Obviousness over Taveira, Wang, Gong, Viggiano, and Hayes (Ground 6B)*

(1) *Overview of Taveira (Ex. 1010), Wang (Ex. 1011), and Gong (Ex. 1012)*

Taveira discloses a drone that includes “control unit 100,” which includes “a processor 120, a radio module 130, and a power module 150.” Ex. 1010 ¶ 54. Processor 120 “may provide drone information” such as “a drone identifier” (e.g., “a unique identifier (ID)”) to other devices. *Id.* ¶¶ 110, 117, 168.

Wang discloses that wireless communications between a base station and an unmanned aerial vehicle (“UAV”) may be encrypted by “suitable encryption methods,” including “SSID hiding” and “[media access control (MAC)] ID filtering.” Ex. 1011 ¶ 160, Fig. 1.

⁵ Patent Owner did not file a Patent Owner Response, and Patent Owner’s Motion and Reply do not direct us to any evidence of such secondary considerations.

Gong discloses a UAV that includes a flight control unit comprising “identification module 410,” which “may be able to uniquely identify and differentiate the UAV from other UAVs,” and “may comprise a UAV identifier and a key of the UAV.” Ex. 1012 ¶¶ 233, 235–236.

(2) Overview of Viggiano (Ex. 1024)

Viggiano relates to Automatic Dependent Surveillance-Broadcast (ADS-B) systems and describes an “authentication challenge-response methodology and encryption techniques to authenticate the identity of an ADS-B equipped aircraft, vehicle or station.” Ex. 1024 ¶¶ 2, 12. Viggiano describes that “[t]he authentication challenge 12 is transmitted from an ADS-B equipped aircraft, vehicle, vessel or ground station (hereinafter Authenticator).” *Id.* ¶ 12. This allows for “greater assurance that an ADS-B equipped aircraft, vehicle, vessel or station (hereinafter ADS-B transmitter) is who it says it is.” *Id.* The aircraft’s ADS-B transmitter generates an authentication challenge response and transmits it to Authenticator 10 in authentication response 18. *Id.* ¶ 13. In an embodiment, “if an ADS-B transmitter 20 fails two or more consecutive authentication response comparisons,” “the Authenticator 10 issues an alert that is displayed to other ADS-B equipped aircraft, vehicles, vessels or stations.” *Id.* ¶ 15.

(3) Overview of Hayes (Ex. 1030)

Hayes relates to decluttering a map, for example, based on “receiving an alert from an unmanned aerial vehicle in a region.” Ex. 1030, 2:17–20. In one embodiment, “a plurality of objects associated with one or more UAVs are displayed on a map of a region,” where the “objects may include points of interest such as a current location of a UAV,” etc. *Id.* at 5:38–46. When an alert is received, such as indicative of an emergency, “a map may

be automatically configured by the device to display on a GUI,” where “[t]he map may show just the objects related with the UAV(s) associated with the emergency alert.” *Id.* at 5:46–56.

(4) Rationale to Combine

Petitioner contends in the Petition that one of ordinary skill in the art would have been motivated to combine Taveira and Wang such that the wireless communications of Taveira’s drone were encrypted as taught by Wang. Pet. 40–42. According to Petitioner, such a person seeking to implement Taveira’s system would have looked to other references related to wireless communication involving drones such as Wang, and would have been motivated to incorporate Wang’s encryption into Taveira’s system because Taveira teaches that drones are vulnerable to tampering and interference, and that encoding identification information might advantageously prevent or discourage tampering or spoofing. *Id.* at 41. According to Petitioner, such a system also would have been a combination of prior art elements according to known methods to yield a predictable result. *Id.* at 41–42.

Petitioner also contends in the Petition that one of ordinary skill in the art would have been motivated to incorporate the capabilities of Gong’s remote device (which is configured to display information associated with detected UAVs) into Taveira’s wireless communication device. Pet. 42–45. According to Petitioner, such a person would have realized that this combination would have furthered Taveira’s goal of controlling drone access to restricted spaces by allowing an operator to more easily monitor restricted space and respond to unauthorized drones. *Id.* at 44. Petitioner asserts that

such a system also would have been a combination of prior art elements according to known methods to yield a predictable result. *Id.* at 44–45.

Petitioner contends in its Opposition that one of ordinary skill would have been motivated to further incorporate the teachings of Viggiano and Hayes. Opp. 17. In particular, Petitioner contends that such a person would have had reason to further modify the Taveira/Wang/Gong combination discussed above to incorporate the following: (i) Viggiano’s technique of authenticating aircraft by transmitting challenge to the aircraft to provoke a response and generating an alert when authentication fails, and (ii) Hayes’s technique of highlighting a UAV associated with such an alert by removing other displayed UAVs from the interface so that the UAV associated with an alert is more visible. *Id.* at 9–10. According to Petitioner, such a person would have been motivated to do so because the use of false or fraudulent identification information was a known problem, Viggiano and Hayes provide specific and known techniques for resolving this problem, and incorporating the techniques of Viggiano and Hayes would have provided an additional layer of security. *Id.* at 11–12. Petitioner asserts that such a combination would have been straightforward and routine to implement. *Id.* at 11–12.

(5) *Analysis*

Petitioner asserts that the combination of Taveira, Wang, and Gong discussed above would have satisfied limitations [22.pre] – [22.d], [22.g], and [22.h] of proposed substitute claim 22. *See* Opp. 12 (discussing limitation [22.a], 17–20 (discussing the remaining limitations).

Petitioner contends that this combination, if further modified as discussed above to incorporate the teachings of Viggiano and Hayes, would

have satisfied limitations [22.e], [22.f], and [22.i] of proposed substitute claim 22. *See* Opp. 18–21; *see also id.* at 13–16 (discussing these limitations in the context of ground 5B); Reply 7 (confirming that Petitioner only relies on Viggiano and Hayes with respect to these three limitations).

Patent Owner does not dispute Petitioner’s contentions that one of ordinary skill in the art would have had reason to combine the teachings of Taveira, Wang, Gong, Viggiano, and Hayes in the manner described in the Petition and Opposition. *See* Reply 7–10. We agree with Petitioner’s contentions regarding the reasons for combining these references that are explained in the briefs and supported by testimony from Dr. Chowdhary. *See* Pet. 40–45, Opp. 9–12, Ex. 1027, Ex. 1003 ¶¶ 138–146; Ex. 1027 ¶ 64. On this record, we determine that Petitioner has persuasively demonstrated that one of ordinary skill in the art would have had reason to combine the teachings of Taveira, Wang, Gong, Viggiano, and Hayes in the manner described in the Petition and Opposition.

Patent Owner also does not dispute Petitioner’s contention that the resulting combination would have satisfied limitations [22.pre] – [22.e], [22.g] and [22.h] of proposed substitute claim 22. *See* Reply 7–9. We agree with Petitioner’s contentions with respect to these claim limitations that are also explained in the briefs and supported by declaration testimony from Dr. Chowdhary. *See* Pet. 47; Ex. 1003 ¶¶ 150–151; Opp. 17–21; Ex. 1027 ¶¶ 65–70, 72. On this record, we find that Petitioner has persuasively demonstrated that the asserted combination of prior art references would have satisfied limitations [22.pre] – [22.e], [22.g] and [22.h] of proposed substitute claim 22. We now turn to the disputed limitations—limitations [22.f] and [22.i].

With respect to limitation [22.f], Patent Owner argues that “Viggiano’s challenge 12 does not cause an aircraft to ‘change a behavior,’” “because in such challenge-response systems, responding to a challenge is the default and expected behavior, not a changed behavior.” Reply 7–8. Further, Patent Owner argues that it is not challenge 12 that enables disambiguation in Viggiano, but rather “the *absence* of adequate responses after ‘two or more’ transmissions of challenge 12 that permits Viggiano to conclude that the challenge-response has failed.” *Id.* at 8.

With respect to limitation [22.i], Patent Owner argues that Petitioner’s proposed combination in which “the twice failure to respond to Viggiano’s challenge 12 would, based on Hayes’s disclosures, cause the removal of all detected aircraft other than the one that failed to respond,” would not satisfy limitation [22.i]. Reply 8. According to Patent Owner, this aspect of Petitioner’s combination “discloses simply *isolating* the non-responding aircraft,” where limitation “[22.i] requires a ‘user interface configured to provide to a user, information associated with a *plurality* of different [low-altitude aircraft].’” *Id.*

Finally, Patent Owner argues that the proposed combination of Viggiano and Hayes does not result in “‘disambiguat[ing] the first low-altitude aircraft from the other detected low-altitude aircraft of the plurality *based on* the changed behavior of the first low-altitude aircraft’ as recited in [limitation] [22.i].” Reply 9. Specifically, Patent Owner asserts that despite Petitioner’s contention that “the aircraft’s provision of a *response* to Viggiano’s challenge 12 is the ‘changed behavior,’” “in Viggiano’s challenge-response system, as well as Petitioner’s theory, it is only the *absence* of an adequate response that generates an alert identifying the target

aircraft as non-authenticated.” *Id.* According to Patent Owner, it is thus the invalid nature of the response that results in disambiguation, and not “the alleged ‘change behavior’ (i.e. the provision of a response).” *Id.*

In response to Patent Owner’s assertion that the challenge response of Viggiano’s ADS-B transmitter is the “default and expected behavior,” Petitioner argues that this “is still a *change* in behavior because at least immediately before receiving any challenge the aircraft is not transmitting a response, and the aircraft changes behavior to prepare and transmit a response when challenged.” Sur-reply 10 (citing Ex. 1031, 11:15–12:4). Regarding Patent Owner’s position that, in the proposed combination, it is the absence of a response that causes the disambiguation from other aircraft, Petitioner explains that “the second response causes multiple failed authentications and issuance of an alert, that would have been caused by the individually transmitted [second] challenge.” *Id.* at 11. Petitioner further explains that, “[w]hen failed authentication results due to this response, modification of a displayed user interface occurs causing other detected and displayed aircraft to be removed so the first aircraft is more clearly displayed,” where “this modification is thus based on the triggered response, meeting [limitations] [22.f] and [22.i].” *Id.*

In response to Patent Owner’s arguments regarding the disambiguation of the aircraft having changed behavior, Petitioner asserts that Patent Owner “appears to adopt an unsupported, overly narrow *disambiguate* definition requiring simultaneously displaying a first aircraft and other aircraft at all times and throughout disambiguation.” Sur-reply 12. Petitioner asserts that the combination meets the claim language of limitation [22.i] whereby “[t]he user interface displays multiple detected

aircraft simultaneously, including a first aircraft, and upon consecutive authentication failures for the first aircraft, the user interface is modified such that other detected and displayed aircraft are removed and the first aircraft is thus more clearly displayed.” *Id.*

On the record before us, we agree with Petitioner’s contentions that the combination of Taveira, Wang, Gong, Viggiano, and Hayes would have satisfied disputed limitations [22.f] and [22.i]. In limitation [22.f] of proposed substitute claim 22, the “the specified excitation causes the first low-altitude aircraft to change a behavior,” which in turn forms the basis for the remote portable detection system “to disambiguate the first low-altitude aircraft from the other detected low-altitude aircraft” in limitation [22.i]. The Specification of the ’959 Patent describes a change in behavior as encompassing, among other things, “adding or changing extra data information to the transmitted RF signal.” Ex. 1001, 5:30–31. Petitioner asserts that Viggiano’s aircraft sending a response to a challenge teaches the recited “change a behavior.” Opp. 15–16. We agree. Viggiano’s ADS-B transmitter uses information received from the Authenticator in the disclosed “authentication scheme and optional encryption,” in order to transmit a challenge response. Ex. 1024 ¶ 12. More specifically, the ADS-B transmitter receives a unique identifier generated by the Authenticator and included in authentication challenge 12, and “inputs the unique identifier, the ADS-B transmitter’s ID 22 and specific data 24 into the authentication processing to generate its authentication challenge response” (*id.* ¶ 13), which amounts to changed data being transmitted by the ADS-B transmitter, and therefore “changed behavior,” as claimed.

Limitation [22.i] in proposed substitute claim 22 requires that the “changed behavior” forms the basis for the disambiguation. Viggiano discloses that an aircraft failing “two or more consecutive authentication response comparisons” triggers the sending of an alert. Ex. 1024 ¶ 15. Thus, where incorporating the Authenticator’s unique identifier into a response constitutes a change in behavior, as noted above, Viggiano’s system would trigger an alert based on this behavior change when the response is invalid a second time. In other words, it is the validity of the responses, not the fact that the aircraft sent a response at all, that leads to an alert. Accordingly, Petitioner has shown that the proposed combination teaches “disambiguat[ing] the first low-altitude aircraft from the other detected low-altitude aircraft of the plurality based on the changed behavior of the first low-altitude aircraft.” Moreover, we agree with Petitioner that suppressing the display of aircraft that did *not* trigger an alert, as taught by Hayes (*see* Ex. 1030, 5:38–5:67), would disambiguate the displayed aircraft that triggered an alert from other aircraft.

(6) Conclusion regarding Ground 6B

For the reasons set forth above, we conclude that Petitioner has proven by a preponderance of the evidence that proposed substitute claim 22 would have been obvious over Taveira, Wang, Gong, Viggiano, and Hayes.

(7) Remaining Grounds

Petitioner also contends that proposed substitute claim 22 would have been obvious over the other combinations listed above (Grounds 5B and 7B–12B). Opp. 9–25. Patent Owner notes that each of these additional grounds “asserts a combination of Viggiano and Hayes as to limitations [22.e], [22.f],

and [22.i],” and does not present additional arguments beyond those discussed above with respect to Ground 6B. *See* Reply 7.

On the record before us, for the reasons set forth in the Petition and Opposition and supporting declarations from Dr. Chowdhary (Exs. 1003, 1027), and for the additional reasons explained above with respect to Petitioner’s reliance on Viggiano and Hayes for limitations [22.e], [22.f], and [22.i], we determine that Petitioner has proven by a preponderance of the evidence that proposed substitute claim 22 would have been obvious over each of additional Grounds 7B, 8B, and 10B–12B.

The remaining two grounds (Grounds 5B and 8B) rely on the Beard reference, and Patent Owner disputes Petitioner’s contention that Beard qualifies as prior art to the ’959 Patent. *See* Paper 45. As discussed above, we have already determined that Patent Owner’s Motion should be denied because Patent Owner has failed to show that the amendments in the Motion comply with the applicable statutory requirements, and because Petitioner has demonstrated by a preponderance of the evidence that proposed substitute claim 22 is unpatentable over six separate prior art combinations. In view of these determinations, we need not—and we do not—reach these two remaining grounds.

IV. CONCLUSION⁶

For the foregoing reasons, we deem original claim 21 canceled in view of the revised, non-contingent Motion filed by Patent Owner. We *deny* Patent Owner's request to add proposed substitute claim 22 to the '959 Patent. The result of this Decision is summarized by the following tables.

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
21	103 ⁷	Beard		
21	103 ⁷	Taveira, Wang, Gong		
21	103 ⁷	Taveira, Qi, Gong		
21	103 ⁷	Gong, Wang-II		
Overall Outcome				

⁶ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

⁷ Because original claim 21 is cancelled, we do not reach the grounds of unpatentability for this claim raised in the Petition.

Motion to Amend Outcome	Claims
Original Claims Cancelled by Amendment	21
Substitute Claims Proposed in Amendment	22
Substitute Claims: Motion to Amend Granted	
Substitute Claims: Motion to Amend Denied	22
Substitute Claims: Not Reached	

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that original claim 21 of the '959 Patent is canceled;

FURTHER ORDERED that Patent Owner's Motion is *denied* as to adding proposed substitute claim 22 to the '959 Patent; and

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

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