

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Axon Enterprise, Inc., Dedrone Holdings, Inc., and Skydio, Inc.

Petitioners,

v.

Airspace Defense, Inc.

Patent Owner

Case No. IPR2025-00525

U.S. Patent No. 10,713,959

**PATENT OWNER REPLY TO OPPOSITION
TO REVISED MOTION TO AMEND**

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List of Patent Owner Exhibits

Exhibit No.	Description
EX2001	PCT Request, International (PCT) Application No. PCT/US16/37071, filed on June 10, 2016
EX2002	PDF Copies of MPEP Editions and Revisions 1948 – 2023, https://www.uspto.gov/web/offices/pac/mpep/old/index.htm .
EX2003	Chapter 200 Types, Cross-Noting, and Status of Application, Manual of Patent Examining Procedure (MPEP) (1994)
EX2004	Chapter 200 Types and Status of Application; Benefit and Priority Claims, Manual of Patent Examining Procedure (MPEP) (2018)
EX2005	J. Ablon (Airmap), “Remote Identification,” https://www.icao.int/Meetings/UAS2017/-Documents/Jared%20Ablon_Stream%20A.pdf .
EX2006	Recommendation ITU-T X.509 (2016)
EX2007	P. Syverson, “A Taxonomy of Replay Attacks [cryptographic protocols],” Proceedings of the Computer Security Foundations Workshop VII, pp. 187-191 (1994), doi: 10.1109/CSFW.1994.315935.
EX2008	A.M. Espinoza, W.J. Tolley, and J.R. Crandall, “Alice and Bob, Who the FOCI Are They?: Analysis of End-to-End Encryption in the LINE Messaging Application,” 7th USENIX Workshop on Free and Open Communications on the Internet (FOCI 17) (2017), https://www.usenix.org/system/files/conference/foci17/foci17-paper-espinoza.pdf .
EX2009	M.A. Harris and K. Patten, “Mobile Device Security Considerations for Small-and Medium-Sized Enterprise Business

Exhibit No.	Description
	Mobility,” INFORMATION MANAGEMENT & COMPUTER SECURITY 22(1) 97-114 (2014), https://www.researchgate.net/profile/Mark-Harris-10/publication/263245514_Mobile_device_security_considerations_for_small-and_medium-sized_enterprise_business_mobility/links/5697cc4108ae1c427905200b/Mobile-device-security-considerations-for-small-and-medium-sized-enterprise-business-mobility.pdf.
EX2010	M. Cunche, M.A. Kaafar, and R. Boreli, “I Know Who You Will Meet this Evening! Linking Wireless Devices using Wi-Fi Probe Requests,” IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM) (2012).
EX2011	J. Lindqvist et al., “Privacy-Preserving 802.11 Access-Point Discovery,” Microsoft Research Technical Report, MSR-TR-2009-7 at (2009), https://aaltodoc.aalto.fi/server/api/core/bitstreams/7c421d1b-9ecd-45ee-8481-52f24ca272e5/content.
EX2012	M. Cunche, “I Know Your MAC Address: Targeted Tracking of Individual Using Wi-Fi,” 10 J. COMPUT. VIROL. HACK TECH. 219–227 (2014), https://doi.org/10.1007/s11416-013-0196-1.
EX2013	W.S. Bhaya and S.A. AlAsady, “Prevention of Spoofing Attacks in the Infrastructure Wireless Networks,” J. COMPUTER SCIENCE, 8(10) 1769-1779 (2012), https://web.archive.org/web/20150621205916id_- /http://novintarjome.com/wp-

Exhibit No.	Description
	content/uploads/2014/10/Prevention-of-Spoofing-Attacks.pdf.
EX2014	Declaration of Nikolaos Papanikolopoulos, Ph.D., in support of this First Motion to Amend
EX2015	U.S. Patent Application No. 16/215,406 (from which U.S. Patent No. 10,713,959 issued) (annotated to include line nos.) (the “’406 App.”)
EX2016	U.S. Provisional Patent Application No. 62/175,153 (annotated to include page and paragraph nos.) (the “’153 Prov.”)
EX2017	Curriculum Vitae of Dr. Nikolaos Papanikolopoulos
EX2018	Second Declaration of Nikolaos Papanikolopoulos, Ph.D.
EX2019	Declaration of June Munford
EX2020	Curriculum Vitae of June Munford
EX2021	NIST, Electronic Authentication Guideline, Special Publication 800-63-2 (2013), <i>available at</i> https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-63-2.pdf
EX2022	Definition of “disambiguate,” Oxford Advanced Learner’s Dictionary, as obtained from the Internet Archive’s Wayback Machine, <i>available at</i> https://web.archive.Org/web/20140513174533/http://www.oxfordlearnersdictionaries.com:80/us/definition/english/disambiguate
EX2023	Definition of “isolate,” Oxford Advanced Learner’s Dictionary, as obtained from the Internet Archive’s Wayback Machine, <i>available at</i> https://web.archive.org/web/20140401114908

Exhibit No.	Description
	/http://www.oxfordlearnersdictionaries.com /us/definition/english/isolate
EX2024	Definition of “credentials,” Oxford Advanced Learner’s Dictionary, as obtained from the Internet Archive’s Wayback Machine, <i>available at</i> https://web.archive.org/web/20150616091333 /http://www.oxfordlearnersdictionaries.com /us/definition/english/credentials
EX2025	Shannon, Claude E., and Warren Weaver. "A mathematic theory of communication." <i>Bell Syst. Tech. J</i> 27.3 (1948): 379-423.
EX2026	NIST, Electronic Authentication Guideline, Special Publication 800-63-2 (2013), <i>available at</i> https://web.archive.org/web/20140330034434/http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-63-2.pdf
EX2027	Definition of “disambiguate,” Oxford Advanced Learner’s Dictionary, as obtained from the Internet Archive’s Wayback Machine, <i>available at</i> https://web.archive.Org/web/20140513174533 /http://www.oxfordlearnersdictionaries.com:80/us /definition/english/disambiguate
EX2028	Definition of “isolate,” Oxford Advanced Learner’s Dictionary, as obtained from the Internet Archive’s Wayback Machine, <i>available at</i> https://web.archive.org/web/20140401114908 /http://www.oxfordlearnersdictionaries.com /us/definition/english/isolate

Exhibit No.	Description
EX2029	Definition of “credentials,” Oxford Advanced Learner’s Dictionary, as obtained from the Internet Archive’s Wayback Machine, <i>available at</i> https://web.archive.org/web/20150616091333/http://www.oxfordlearnersdictionaries.com/us/definition/english/credentials
EX2030	A library catalog MARC record describing <i>Bell Systems Technical Journal</i> , available from Penn State University Library at https://catalog.libraries.psu.edu/catalog/51521158
EX2031	Shannon, Claude E., and Warren Weaver. "A mathematic theory of communication." <i>Bell Syst. Tech. J</i> 27.3 (1948): 379-423, <i>as sourced from Penn State University Library’s collection.</i>

I. PO HAS MET ITS BURDEN FOR ALL PROPOSED SUBSTITUTE CLAIMS

A. The specification describes the secure identifier received by an aircraft

Originally filed claim 1 recites the aircraft's "radio communication module is configured to utilize a secure identifier, and the radio communication module is configured for two-way communication." Ex. 2015, 24. Petitioner acknowledges that disclosure and that the "secure identifier" is an SSID in originally filed claim 3. Paper 33, 1; EX1002, 231. But it argues the specification only shows possession of a secure identifier transmitted *from* the aircraft, rather than *to* the aircraft.

To the contrary, there are numerous disclosures of various directions of transmission. EX2018, ¶¶ 51-52, 59-64. For example, the specifications disclose transmitting an "identification code" from an aircraft to a ground station via RF or visible light. EX2015, 2:11-17, 3:14-15; EX2016, ¶¶ 29, 31, 34, 36. And, the specification discloses "data-to-vehicle association" established by "*directing a specific wavelength and modulated light beam emitter to one of the aircrafts*, and the aircraft will thus modify its behavior and its transmitted data." EX2015 at 3:31-4:4; EX2016, ¶¶ 9, 29. And, they disclose that a "light beam excitation flow 82" sent from the "ground device" will "change the data transmitted by the [aircraft's] identification box RF module 16." EX2015 at 9:6-12, Figs. 4, 7, 8; EX2016, ¶34, Fig. 4 (p. 10), Fig. 7 (p. 15, flow 72), Fig. 8 (p. 16). These disclosures show possession of transmitting the secure identifier *to* the aircraft. EX2018, ¶¶ 59-64.

B. The specification describes transmitting identification information via radio

Originally filed claim 1 recited that “the radio communication module is configured to utilize a secure identifier.” EX1002, 231. And, the specifications teach that:

The identification box light emitters 3 and light sensor 4 create a *two-way communication* system. Similarly, the ground device camera 22 and light beam emitter 23 also create the *same kind of communication*. The *RF receiver and transmitter 16 and 37* in both devices *also create[] a duplex communication*. Therefore, the identification box 1 and ground device 21 together can *exchange information through light or RF*.

EX2015 at 9:18-21; EX2016 ¶ 36. A POSITA would understand the reference to “or RF” as conveying embodiments which solely use RF. EX2018 ¶ 65.

Petitioner argues that the Revised Motion to Amend (“RMTA”) is defective for citing to disclosures about the “optical” embodiments rather than only citing to “radio” embodiments. But the specifications disclose that “[t]he transponder may transmit a code similar to the one generated (e.g., blinked) by the light arrays but through the RF frequency, allowing automatic identification by any RF receiver on land, or installed in other aircrafts.” EX2015, 3:14-15; EX2016, ¶8. And, as noted, the specifications disclose transmitting an “identification code” from an aircraft to a ground station via RF or visible light. EX2015, 2:11-17; EX2016 ¶¶ 9, 36. Indeed, as noted, they generally disclose “two-way communication” where the “RF receiver and transmitter 16 and 37 in both devices” engage in “a duplex communication” and

“exchange information,” including an excitation transmitted to the aircraft “through ... RF.” EX2015 at 9:18-21; EX2016 ¶¶ 9, 36. These disclosures show possession of transmission of the secure identifier via RF. EX2018, ¶¶65-68.

C. The specification describes a secure identifier comprising an excitation enabling disambiguation of an aircraft by causing the aircraft to change a behavior

Finally, Petitioner argues that the RMTA “conflates” “the claimed secure identifier and disclosures about a generic light beam” rather than a “secure identifier that comprises a specified excitation and that causes the first low-altitude aircraft to change a behavior thereof.” However, Petitioner simply declines to read the cited portions of the specification together for all they teach.

As noted, the specifications disclose that when “more than one aircraft may be flying close to each other” “a receiver on the ground” may not “know[] which UAV is transmitting each identification code,” and thus “directing a specific wavelength and modulated light beam emitter to one of the aircrafts” will cause “the aircraft [to] modify its behavior allowing the data-to-vehicle association.” EX2015 at 3:31-4:4; EX2016, ¶9; EX2018, ¶¶ 63, 75. Petitioner does not dispute that this discloses a signal sent to the UAV to cause disambiguation via change of the UAV’s behavior.¹ However, Petitioner fails to analyze whether these disclosures satisfy the Board’s

¹ In the RF-only embodiments (discussed above), this transmission will occur via RF rather than optical. EX2018, ¶¶ 69-76, 83-84.

construction of “secure identifier” and thus provide possession of these limitations.

A POSITA would readily recognize that they do. In particular, it is the provision of a signal at a “*specific wavelength and modulation*” that causes the change in the UAV’s “operational behavior,” i.e., a specified excitation. EX2015 at 3:22-4:4; EX2016 ¶¶ 9, 29, 34, 38, p. 15; Ex 2018 ¶ 79. Using “modulation” means that specific information is being sent to the aircraft in that signal. EX2018 ¶79; *see also* EX2015, 13:1-10 (referring to “light beam *information*”). Moreover, in flow 72 of Figure 7—relating to the change in “behavior”—the LAA first “verifie[s]” the signal before changing the behavior (i.e. before adding an RF field or changing the light code pattern). EX2016, p. 15, ¶29; *see also* EX2015, Fig. 7, 13:2-10. Indeed, the provisional claims a method of “detecting” a “*defined wavelength and intensity light beam to change*” behavior. EX2016 at 7, cl. 13.

A POSITA would understand these disclosures 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. Paper 13, 9. That is, the light beam is specifically designed to only cause the targeted LAA to change behavior, i.e. the LAA “verif[ies]” the identity of that LAA with the ground station. EX2018 ¶80; EX2016 ¶¶ 9, 29 (causing a change in behavior by “directing a specific wavelength light beam emitter to one of the aircrafts”), p. 15. Indeed, the primary purpose of

the change of behavior disclosures is to “allow[] data-to-vehicle association” and “duplex communication” with the specific LAA. EX2016 ¶ 9. That necessarily requires that the light beam is designed specifically so that only the target LAA would respond, i.e. so the LAA only changes behavior in response to the information in the signal and only after the LAA uses the signal to “verif[y]” that it is *for that aircraft*. EX2018 ¶¶78, 81-82; EX2016 ¶¶ 9, 29, p. 15; EX2015, 13:2-6.

A POSITA would recognize that these disclosures are equally applicable to the RF-only embodiments. EX2018 ¶¶83-84. In particular, like light, RF signals convey information via modulated excitations at specific wavelength(s)/frequenc(ies). *Id.* Thus, the written description provides disclosure of limitations [22.e] and [22.f].

II. SC 22 IS NOT INDEFINITE

A. The meaning of “low altitude aircraft” is clear to a POSITA

A POSITA would readily apprehend the meaning of “low altitude aircraft.” EX2018, ¶92. The specification describes “small UASs,” i.e., unmanned aerial systems, as “aircrafts up to 25 pounds flying up to 500 ft of the low altitude airspace.” EX1001, 1:50-52; *see also id.*, 2:35-36. Thus, the meaning of “low-altitude aircraft” as recited in SC 22, is clear. *See also* 14 C.F.R. § 91.119(c).

B. The meaning of “received information” is clear to a POSITA

A POSITA would also readily apprehend the meaning of “the received information.” EX2018, ¶¶93-97. A POSITA would understand that the “radio

signal” that is “receive[d]” provides antecedent basis for the “received information.” There is no legal requirement that the terminology of the antecedent be a verbatim match, as the antecedent may be present “by implication.” *Cross Med. Prods., Inc. v. Medtronic Sofamor Danek, Inc.*, 424 F.3d 1293, 1319 (Fed. Cir. 2005). And, a POSITA would readily understand that because radio *signals* contain information, the received radio signal contains the received information. EX2018, ¶94. Moreover, a POSITA would not confuse “a transmitted radio signal” with “a radio signal” that is *received* or the “received information” within that radio signal. EX2018, ¶96. Similarly, because the “identification information” is “transmit[ed]” by the “radio communication module” within the “transmitted radio signal,” a POSITA would not confuse the “identification information” with the *received* radio signal and/or *received* information, received by the *same* module. *Id.*

III. SC 22 DOES NOT ENLARGE THE SCOPE OF THE CLAIM

Petitioner argues that changing “receive a received radio signal” to “receive a radio signal” constitutes impermissible broadening. Nonetheless, Petitioner argues the change is broadening, asserting that “[R]eceived’ limited the radio communication module to receive only radio signals the claimed device had actually received—e.g., signals of a compatible ‘type’ and ‘range’ receivable by the device” and that its deletion would permit “receiving any radio signal, including signals of a type the device could not have received in the original claim because they were

incompatible.” Opp. at 7. But neither the original claim 21 or SC 22 recite anything about the type, range, or compatibility of the received signal. EX2018 ¶¶ 56-57. As the Board recognized in the preliminary guidance to the first MTA, “receive a received radio signal” is “redundant, because in order to receive a radio signal, it would have to be a received radio signal.” Paper 23, 5; EX2018 ¶¶ 54-55.

IV. SC 22 IS PATENTABLE OVER ALL CITED COMBINATIONS

Petitioner asserts eight grounds (5B-12B), but each ground asserts a combination of Viggiano and Hayes as to limitations [22.e], [22.f], and [22.i]. Opp. at 8-25; EX1027, ¶¶ 42, 58-61, 63, 67-71, 73, 76-79, 81, 85, 87, 89. In particular, Petitioner asserts that Viggiano’s challenge 12 is part of a challenge-response methodology used to authenticate an aircraft identity. Opp. at 14. Petitioner argues that Viggiano’s challenge 12 is a secure identifier because challenge 12 is formed from a “unique” “random” identifier. Opp. at 9, 14. And it argues that challenge 12 enables disambiguation of an aircraft by change of behavior because it causes the aircraft to issue a response to the challenge. And, it argues Hayes provides implementation details by teaching modification of a user interface, asserting that Hayes satisfies [22.i] because Hayes’ UAV becomes clearly displayed on a user interface by removing other detected and displayed UAVs from the interface. Opp. at 10, 14.

Petitioner’s Viggiano-Hayes based obviousness theories contain a number of flaws. EX2018 ¶¶ 98-108. First, Viggiano’s challenge 12 does not cause an aircraft

to “change a behavior” as recited in [22.f]. That is because in such challenge-response systems, responding to a challenge is the default and expected behavior, not a changed behavior. EX2018 ¶ 102.

Second, challenge 12—the alleged secure identifier—does not “enable[] disambiguation.” Rather it is the *absence* of adequate responses after “two or more” transmissions of challenge 12 that permits Viggiano to conclude that the challenge-response has failed. EX1024, ¶15; EX2018 ¶ 103. Thus, no individual transmission of challenge 12 can constitute [22.f]’s “specified excitation [that] causes the first low-altitude aircraft to change a behavior thereof” where the behavior is the “changed behavior” that the disambiguation is “based on” in [22.i]. *Id.*

Third, Petitioner’s theory is that the twice failure to respond to Viggiano’s challenge 12 would, based on Hayes’ disclosures, cause the removal of all detected aircraft other than the one that failed to respond. Opp at 20. But that, at most, discloses simply *isolating* the non-responding aircraft such that user interface no longer shows a plurality of aircraft, not disambiguating the first aircraft *from the plurality of other aircraft* as recited in [22.i]. EX2018 ¶ 104. Indeed, [22.i] requires a “user interface configured to provide to a user, information associated with a *plurality* of different” LAAs. But removing the other LAAs to *only* show the LAA that failed to respond to the challenges is not a “user interface” with a “*plurality* of different” LAAs where the LAA whose behavior changed is “disambiguate[d]” from

the other LAAs. EX2018 ¶ 104; *see also* '959 Patent at 6:50-53 (the “excited aircraft is presented in a distinguishable form” such as “bold-text”), Fig. 5 (element 555).

Fourth, Petitioner’s proposed combination does not satisfy “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 [22.i]. In particular, as discussed, Petitioner asserts that the aircraft’s provision of a *response* to Viggiano’s challenge 12 is the “changed behavior.” Opp. at 15-16. But, as noted, in Viggiano’s challenge-response system, as well as in Petitioner’s theory, it is only the *absence* of an adequate response that generates an alert identifying the target aircraft as non-authenticated. EX2018 ¶ 105; EX1024, ¶15; Ex. 1027 ¶¶ 51, 61, 63, 73. But not properly responding to challenges encompasses the target aircraft simply *continuing* to not broadcast anything, which is plainly not a *change* in its behavior. EX2018 ¶ 105. Indeed, opposite of the requirements of the claim, it is the changed behavior of *other* UAVs (i.e. those successfully responding to the authentication challenge)—that causes any disambiguation in Petitioner’s proposed combination (i.e. their removal from the user interface). *Id.* Thus, because any alleged disambiguation of the target aircraft in Petitioner’s combination is based on something *different* (i.e. the *absence* of adequate responses) than the alleged “change behavior” (i.e. the provision of a response), the combination does not satisfy the claim.

All of these deficiencies apply to *all* of Petitioner's grounds for SC 22. EX2018

¶¶ 107-108. Accordingly, Petitioner fails to show that SC 22 is unpatentable.

V. CONCLUSION

For the foregoing reasons, and for the reasons set forth in Patent Owner's Revised Motion to Amend, Patent Owner's motion should be granted.

Respectfully submitted,

Dated: June 22, 2026

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), I hereby certify that about June 22, 2026, a copy of the foregoing Patent Owner's Reply to Petitioners' Opposition to Patent Owner's Revised Motion to Amend, and its exhibits, are being served electronically (per counsel's consent) to lead and backup counsel of record for Petitioners as follows:

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