

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AXON ENTERPRISE, INC. AND DEDRONE HOLDINGS, INC.
Petitioners

v.

AIRSPACE DEFENSE, INC.
Patent Owner

Case No. IPR2025-00525
Patent 10,713,959

**DECLARATION OF DR. GIRISH CHOWDHARY IN SUPPORT OF
PETITIONERS' OPPOSITION TO PATENT OWNER'S NON-
CONTINGENT REVISED MOTION TO AMEND**

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Third Declaration of Dr. Girish Chowdhary

I. INTRODUCTION

1. My name is Dr. Girish Chowdhary. I make this declaration based upon my own personal knowledge and, if called upon to testify, would testify competently to the matters contained herein.

2. I had previously authored and then signed a declaration on January 28, 2025, which I understand was submitted as Exhibit 1003 to the Patent Trial and Appeal Board (“PTAB”) of the United States Patent and Trademark Office in case number IPR2025-00525. I may alternatively refer to the January 28, 2025, declaration as “Exhibit 1003” or “Original Declaration.”

3. I previously authored a declaration on March 9, 2026, which I understand was submitted as Exhibit 1023 to PTAB in case number IPR2025-00525. I may alternatively refer to the March 9, 2026, declaration as “Exhibit 1023” or “Second Declaration.”

4. In this Third Declaration, I incorporate the facts and opinions provided in my Original Declaration and in my Second Declaration.

II. EXPERIENCE AND QUALIFICATIONS

5. My experience, qualifications, CV, and consulting fee are outlined in my Original Declaration.

III. TASK SUMMARY AND MATERIALS REVIEWED

6. My Original Declaration addressed U.S. Patent No. 10,713,959 (Ex. 1001, “’959 Patent”).

7. I have been informed that Airspace Defense, Inc. (“Patent Owner” or “PO”) submitted Non-Contingent Revised Motion to Amend for the ’959 Patent (Paper 26, “Revised Motion to Amend” or “RMTA”) in case number IPR2025-00525 on April 20, 2026, in which it has proposed a “Substitute Claim” 22 to replace “Original Claim” 21 of the ’959 Patent. Counsel has informed me that the Revised Motion to Amend was filed as “non-contingent,” which I understand means that the Board will issue a final decision on the patentability of the Substitute Claim rather than determining the patentability of the corresponding Original Claim.

8. I have been asked to review the RMTA filed by PO regarding the ’959 Patent, the proposed Substitute Claim, and the exhibits cited by PO. I have been asked to provide an understanding of the technology relevant to the RMTA, to review certain prior-art references, and analyze whether or not those references disclose or teach limitations of the proposed Substitute Claims. The opinions stated in this declaration are from the perspective of a person of ordinary skill in the art (“POSITA”).

IV. LIST OF EXHIBITS

9. In forming my opinions, I have reviewed the ’959 Patent, its prosecution history and references cited by the Examiner, the materials cited in the

List of Exhibits, and the materials cited throughout my Original Declaration, and this declaration.

Ex. No. ¹	Description
1001	U.S. Patent No. 10,713,959 to Foina <i>et al.</i> , “Low Altitude Aircraft Identification System” (the “’959 Patent”)
1002	File History for U.S. Patent No. 10,713,959
1003	Declaration of Dr. Girish Chowdhary
1004	Complaint for Patent Infringement, <i>Airspace Systems, Inc. v. Dedrone Holdings, Inc.</i> , Case No. 1-24-cv-01625 (E.D. VA), September 16, 2024
1005	U.S. Patent No. 10,192,451 to Foina <i>et al.</i> , “Low Altitude Aircraft Identification System,” (the “’451 Patent”) filed December 12, 2017
1006	International Publication No. WO2016/201359 A1 filed on June 10, 2016 as International Application No. PCT/US2016/037071 (the “’071 Application”)
1007	U.S. Provisional Application No. 62/175,153 to Foina <i>et al.</i> , “A low altitude aircraft identification system” (the “’153 Provisional”), filed June 12, 2015
1008	U.S. Patent No. 10,733,894 to Beard <i>et al.</i> , “Direct-Broadcast Remote Identification (RID) Device for Unmanned Aircraft Systems (UAS),” (“ <i>Beard</i> ”) filed February 26, 2018 and issued August 4, 2020

¹ Citations to patents are made by column and line cite; citations to patent publications are made by paragraph number; citations to Exhibits 1002, 1007, 1016, and 1028 are made with reference to the Bates-stamped pagination; citations to other exhibits are made to the page number of the document itself.

1009	U.S. Provisional Application No. 62/480,031 to Beard, “Remote Identification” (“ <i>Beard Provisional</i> ”), filed March 31, 2017
1010	U.S. Patent Application Publication No. 2016/0253907 to Taveira, “Systems and Method for Restricting Drone Airspace Access,” (“ <i>Taveira</i> ”) filed January 29, 2015 and published September 1, 2016
1011	International Publication No. WO2016/078093 A1 to Wang <i>et al.</i> , “System and Methods for Managing Unmanned Aerial Vehicles,” (“ <i>Wang</i> ”) filed November 21, 2014 and published May 26, 2016
1012	International Publication No. WO2016/154949 A1 to Gong <i>et al.</i> , “Authentication Systems and Methods for Generating Flight Regulations,” (“ <i>Gong</i> ”) filed March 31, 2015 and published October 6, 2016
1013	U.S. Patent Application Publication No. 2016/0127890 to Qi <i>et al.</i> , “Apparatus, System and Method of Protecting a Service Identifier,” (“ <i>Qi</i> ”) filed December 24, 2014 and published May 5, 2016
1014	International Publication No. WO2015/043123 A1 to Wang <i>et al.</i> , “Data Communication Systems and Methods,” (“ <i>Wang-IP</i> ”) filed January 14, 2014 and published April 2, 2015
1015	Claim Listing of Challenged Claim
1016	File History for U.S. Patent No. 10,192,451
1017	First Amended Complaint for Patent Infringement, <i>Airspace Systems, Inc. v. Dedrone Holdings, Inc.</i> , Case No. 1-24-cv-01625 (E.D. VA), October 30, 2024
1018	Airspace Systems, Inc.’s Opposition to Defendants’ Rule 12(b)(6) Motion to Dismiss, <i>Airspace Systems, Inc. v. Dedrone Holdings, Inc.</i> , Case No. 1-24-cv-01625 (E.D. VA), January 13, 2025
1019	U.S. Patent Application Publication No. 2014/0337633 <i>et al.</i> , “System and Method for Indicating a Service Set Identifier,” filed May 7, 2014 and published November 13, 2014

1020	U.S. Patent Application Publication No. 2006/0236376 to Liu <i>et al.</i> , “Wireless Security Using Media Access Control Address Filtering with User Interface,” filed April 1, 2005 and published October 19, 2006
1021	Kayton, Myron and Fried, Walter, <i>Avionics Navigation Systems</i> , John Wiley and Sons, 1997.
1022	Stipulation email on May 29, 2025
1023	Second Declaration of Dr. Girish Chowdhary
1024	U.S. Patent Application Publication 2007/0239986 to Viggiano <i>et al.</i> , “Secure ADS-B Authentication System and Method,” (“ <i>Viggiano</i> ”) filed April 7, 2006 and published October 11, 2007
1025	U.S. Patent No. 9,875,660 to Byers <i>et al.</i> , “Multi-Modal UAV Certification,” (“ <i>Byers</i> ”) filed March 28, 2016 and issued January 23, 2018
1026	Transcript of Deposition of Dr. Nikolaos Papanikolopoulos
1028	<i>Who goes there: Friend or Foe?</i> , Office of Technology Assessment, Congress of the United States, Washington, DC, U.S. Government Printing Office, June 1993 (“FF”)
1029	Declaration of Dr. Sylvia Hall-Ellis
1030	U.S. Patent No. 10,380,775 to Hayes, “Map Declutter,” (“Hayes”), filed August 6, 2014, issued August 13, 2019

V. TECHNICAL BACKGROUND

10. See Section IX of my Original Declaration (Ex. 1003) for a technology background pertinent to the ’959 Patent.

VI. OVERVIEW OF THE CHALLENGED PATENT

11. See Section VI of my Original Declaration (Ex. 1003) for an overview of the '959 Patent.

VII. LEGAL STANDARDS

12. The Legal Standards provided to me were described in my Original Declaration.²

13. In addition to those legal standards, I have been informed by counsel as to a legal background on indefiniteness. I have been informed that, in order to be valid, the claims of a patent must be sufficiently definite that one skilled in the art can determine the metes and bounds of the claimed invention. I have been informed that a patent claim is deemed “indefinite” if the claim, read in light of the patent’s specification and prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. I understand that a claim must be precise enough to afford clear notice of what is claimed, thereby apprising the public of what is still open to them.

14. In addition to these legal standards, I have been informed by counsel as to the legal background on lack of written description. I have been informed that, in order for claims to be valid, the claims of a patent must provide written description support for each limitation of the claims. I have been informed that a patent claim lacks written description if the specification fails to convey with reasonable clarity

² EX1003 (Original Declaration), § V.

to a POSITA that the inventor was in possession of the invention as of the filing date sought. I have been informed that this requirement relies on an objective inquiry into what is contained within the specification, and that while the precise terms appearing in the claims need not necessarily appear in the specification, there must be sufficient detail in the specification that a POSITA can clearly conclude that the invention described in the claims had been invented as of the filing date sought.

15. I have been informed that to satisfy the written description requirement, the specification must actually or inherently disclose each element of the claims.

16. I have been informed that for the disclosure to be inherent, the missing descriptive matter must necessarily be present in or unavoidably be taught by the specification, such that a POSITA would recognize such disclosure.

17. I have been informed that subject matter that is not disclosed, but would be obvious over what is expressly disclosed, does not satisfy the written description requirement.

18. I have been further informed that a claim is not patentable if the claimed invention was otherwise available to the public before the effective filing date of the claimed invention.

VIII. OVERVIEW OF THE SUBSTITUTE CLAIMS

A. TABLE CORRELATING ORIGINAL CLAIM TO SUBSTITUTE CLAIM

19. I understand that in Patent Owner’s Revised Motion to Amend, Patent Owner has sought to amend the independent claim by proposing a new substitute claim. The table below compares the Original Claim to the Substitute Claim, with the independent claim emphasized in bold italics.

Original Claim	Dependency	Substitute Claim	Dependency
<i>21</i>	None	<i>22</i>	None

B. LIST OF SUBSTITUTE CLAIM

20. Patent Owner also provided annotations showing the changes it made to the Original Claim 21 of the ’959 Patent. This is found in “Claims Appendix” of the Revised Motion to Amend. These changes are shown below.

21. Substitute Claim 22:

[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.

IX. PRIORITY DATE OF THE SUBSTITUTE CLAIM

22. In its Revised Motion to Amend, PO asserts that the priority date of Substitute Claim 22 is June 12, 2015. MTA at 2-12 (purporting that the earliest written description support for the Substitute Claim is Exhibit 2016, which is U.S. Provisional Application No. 62/175,153). I disagree. For the same reasons discussed in the Petition and my original declaration, the Substitute Claim is not adequately supported by the '153 Prov. (EX2016), and Substitute Claim 22 is not entitled to claim priority to the '071 Application. Pet. at 7-16; EX1003, ¶¶70-78. At best, the '959 Patent's priority date is October 1, 2017, which is the filing date of U.S. Provisional Application No. 62/566,450.³ *Id.*

X. CLAIM CONSTRUCTION

23. I understand that “claim construction” is the process of determining a patent claim's meaning. I also understand that, during an *inter partes* review, a claim construction analysis begins with the plain meaning of the claim term, which is the ordinary and customary meaning given to the term by those of ordinary skill in the

³ I do not concede that U.S. Provisional Application No. 62/566,450 provides written description support for the Substitute Claim. Moreover, as I discuss below, the Substitute Claim is not even supported by the '959 Patent's underlying application which was filed on December 10, 2018.

art at the time of the invention. I also understand that the claims of a patent must be interpreted in light of the specification—that is, the claim language itself, the written description, and the figures in the patent—as well as the patent’s prosecution history and/or any reexamination history.

24. As I noted in my original declaration, a POSITA would understand all the claim terms to have their plain and ordinary meaning. EX1003, ¶80. I applied the plain and ordinary meaning, in the context of the ’959 Patent, for all claim terms in my original declaration, and I apply the plain meaning to the substitute claim terms as well. Additionally, I understand that the Board 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” in the Institution Decision (Paper 13). Paper 13 at 10. I have also applied this construction to my analysis as well.

XI. SUMMARY OF CONCLUSIONS AND GROUNDS FOR CHALLENGE

25. Based upon my review of the Petition, the Revised Motion to Amend, the materials cited in my Original Declaration, Second Declaration, and this Third Declaration, and the materials listed in the LIST OF EXHIBITS above, it is my opinion that Substitute Claim 22 of the ’959 Patent is rendered obvious by the Grounds listed in the table below:

Ground	Substitute Claim	Basis (35 U.S.C. §)	Prior Art
5B	22	103	Beard, Viggiano, and Hayes
6B	22	103	Taveira, Wang, Gong, Viggiano, and Hayes
7B	22	103	Taveira, Qi, Gong, Viggiano, and Hayes
8B	22	103	Gong, Wang-II, Viggiano, and Hayes
9B	22	103	Beard, Viggiano, Hayes, and FF
10B	22	103	Taveira, Wang, Gong, Viggiano, Hayes, and FF
11B	22	103	Taveira, Qi, Gong, Viggiano, Hayes, and FF
12B	22	103	Gong, Wang-II, Viggiano, Hayes, and FF

26. It is further my opinion that Substitute Claim 22 is invalid as indefinite because a POSITA lacks reasonable certainty as to the scope of “*low altitude aircraft*” and “*the received information*” as recited in this claim.

27. It is additionally my opinion that Substitute Claim 22 is invalid for lack of written description because the specification of the ’959 Patent does not reasonably convey to a POSITA that the inventor had possession of a “*secure identifier comprising a specified excitation*” that is “*receiv[ed] by the radio communication module [of the low-altitude aircraft] . . . from a remote portable detection system.*”

28. Moreover, it is additionally my opinion that Substitute Claim 22 is invalid for lack of written description because the specification of the '959 Patent does not reasonably convey to a POSITA that the inventor had possession of a “*secure identifier comprising a specified excitation enabling disambiguation of the first low-altitude aircraft*” and that “*causes the first low-altitude aircraft to change a behavior thereof.*”

XII. THE SUBSTITUTE CLAIM ENLARGES CLAIM SCOPE

29. Original claim 22 recited *[a] device configured to communicate identification information comprising a radio communication module configured to receive a **received** radio signal.* EX1001, Claim 22 (emphasis added). PO amended substitute claim 22 to remove “received,” such that SC recites “*the radio communication module is configured to receive a radio signal.*” RMTA, 4 (emphasis added) In my opinion, this amendment changes meaning and impermissibly broadens the SC. The modifier “*received*” in the original claim limited the *radio communication module* to receiving only those radio signals that the claimed *device* had actually received. *Id.* For example, these were signals of a compatible “type” and “range” receivable by the *device*. *Id.* Indeed, the '959 Patent explains that the device can receive “wireless signals of various types and range (e.g., cellular, WiFi, BlueTooth, and near field communication i.e. NFC).” EX1001, 13:23–29 (parenthetical in original). By deleting *received*, the amendment removes that

limitation. The substitute claim now covers the *radio communication module* receiving *any* radio signal—including signals of a type that the *device* could not have received under original claim 22 because, for example, the signal was incompatible with the *device*. RMTA, 4. PO characterizes the amendment as “a typographical correction,” but, in my opinion, nothing in the record supports that. RMTA, 2

XIII. THE SUBSTITUTE CLAIM LACKS WRITTEN DESCRIPTION SUPPORT

A. SUBSTITUTE CLAIM 22: ELEMENTS [22.E] AND [22.F]

1. **No support for a “*secure identifier comprising a specified excitation*” that is “*receiv[ed] by the radio communication module [of the low-altitude aircraft] . . . from a remote portable detection system*”**

30. In my opinion, PO cannot show sufficient support for these limitations, because they (1) seek to reverse the only described directional flow of the *secure identifier* and (2) rely upon **light array** embodiments that do not support the claimed requirement that the *secure identifier* be received by the **radio communication module**. First, the specification lacks any description of a *secure identifier* being received by an aircraft on the uplink (i.e., from a ground station). The term *secure identifier* does not even appear in the specification. See EX1001. The patent’s dependent claim 3 states that the *secure identifier* comprises a *rotating SSID*. *Id.*, Claim 3. But when the specification describes this SSID, it describes it exclusively as transmitted from the aircraft **down** to the ground station. EX1001, 1:28-31, 1:45-2:3, 11:66-12:62, Figs. 9-13. Nowhere does the patent describe the SSID, or any

other *secure identifier*, as transmitted from a *remote portable detection system* **up** to the *aircraft*, as PO now tries to claim. RMTA, 5-7. Thus, PO cannot show possession of a *secure identifier comprising a specified excitation* that is *received by the radio communication module [of the low-altitude aircraft] . . . from a remote portable detection system*. *Id.*

31. I also note that PO improperly relies on **optical embodiments** to satisfy limitations tied to a **radio receiver**. Element [22.f] requires the *radio communication module* to receive the *specified excitation*. RMTA, 5-7. However, every disclosure PO cites in its RMTA to support this element relates to receiving a physical beam via a **photo sensor or light array**. RMTA, 5. Specifically, PO cites to EX2015 at 3:22-26 (“The identification box has *a photo sensor* configured to receive **external signals**. In case *the photo sensor* is **excited with a high luminous beam** . . . such as *a laser beam*, the identification box may change its behavior...”), 3:31-4:4 (“it is just a matter of directing a **specific wavelength and modulated light beam emitter** to one of the aircrafts . . . and receive directional data *through the light sensor*”), 9:6-12 (“In order to activate (e.g., **excite**) the *identification box light sensor 19* . . . This *beam*, when captured by *the light sensor 19* . . .”), 9:15-21 (“The **identification box light emitters 3 and light sensor 4** of the identification box . . .”) (emphases added in bold italics, non-italic bold in original). All of those excerpts describe

receiving *excitation* through a **photo or light sensor**, not a *radio communication module* as claimed.

32. I also note that the cited reference at 9:15-21 to generate “exchange [of] information” through RF via a “duplex communication” does not provide written description support of receiving the claimed *specified excitation enabling disambiguation . . . wherein the specified excitation causes the first low-altitude aircraft to change a behavior thereof*. This general reference to exchanging general information over RF does not disclose receiving the specifically-claimed *secure identifier comprising a specified excitation*....

33. In sum, the patent describes a system where the **photo sensor** receives an excitation, but it does not describe the **radio module itself** receiving the excitation.

2. No support for a “*secure identifier comprising a specified excitation enabling disambiguation of the first low-altitude aircraft*” and that “*causes the first low-altitude aircraft to change a behavior thereof*”

34. This amendment requires a *secure identifier* that comprises a *specified excitation* and that *causes the first low-altitude aircraft to change a behavior thereof*. RMTA, 5-7. PO points solely to descriptions of a **light beam**—disconnected from any discussion of a *secure identifier*—as providing support. *Id.* In my opinion, this new combination of concepts appears nowhere in the specification, and PO’s attempt to stitch it together fails.

35. In my opinion, the patent never describes a *secure identifier* as comprising *an excitation enabling disambiguation* of the aircraft and that “causes the first low-altitude aircraft to change a behavior thereof.” The Board’s Institution Decision (“ID,” Paper 13) construed *secure identifier* as a “credential that can be used to securely verify the identity of a device.” ID, 6-10. Nothing in the patent connects the *secure identifier* or that term as construed to such an excitation and change in aircraft behavior.

36. Further, PO’s citations to generic light beams do not support the claimed *secure identifier*. PO relies solely on passages describing how a “photo sensor is excited with a high luminous beam” to trigger a behavior change. RMTA, 5 (citing EX2015 at 3:22-26 (describing that the sensor is excited with a “**high luminous beam**” without any connection to a *secure identifier*), 3:31-4:4 (same), 9:6-12 (same), 9:15-21 (providing a general description of two-way communication) (emphasis added). But an aircraft receiving a laser beam or light beam to provoke a physical reaction does not provide support for the reception, by the claimed *radio communication module*, of a *secure identifier* or, as construed, a “credential that can be used to securely verify the identity of a device.” *Id.* By stitching the *secure identifier* limitation together with the *specified excitation enabling disambiguation* and that *causes the first low-altitude aircraft to change a behavior thereof*, PO introduces new matter that lacks written description support.

37. I also note that for the same reasons discussed in the Petition, element [22.e] is not adequately supported by the '153 Prov. (EX2016), and the SC is not entitled to claim priority to PCT/US2016/037071 (“the '071 Application”). Petition (Paper 1, “Pet.”), 7-16. The Board recognized this in the ID, stating that “the '153 Provisional and '071 Application lack adequate written description support for the ‘secure identifier’ limitation of claim 21,” which is also recited in the SC. ID, 11-14. The RMTA does not properly address the Board’s analysis of the ID or the priority issues raised by the Petition. Instead, the RMTA generically states that the “secure identifier” recited by the SC “is fully supported by both the '406 App. and the '153 provisional” and refers to Section IV of the RMTA. RMTA, 11. But PO misses the mark, and none of that changes the Board’s correct determination in the ID. ID, 11-14. The SC recites the same “secure identifier” as original claim 21 and limitations [22.e] and [22.f] describe what the secure identifier also “comprises” and how it is “utilized”—not what the term itself means (as construed in the ID). RMTA, 5-7. As such, the SC still suffers from the same written description issues recognized by the Board with respect to original claim 21. I also note that PO’s reference to RMTA Section IV is without merit because, as discussed above, the RMTA’s cited specification portions for [22.e] and [22.f] (contained in Section IV) do not provide adequate support. In my opinion, PO has failed to demonstrate that [22.e] and [22.f] have sufficient written description support.

XIV. THE SUBSTITUTE CLAIM IS INDEFINITE

A. THE TERM “LOW ALTITUDE AIRCRAFT” IS INDEFINITE

38. Elements [22.pre], [22.b], [22.d], [22.e], [22.f], [22.h] and [22.i] recite *low-altitude aircraft*. RMTA, 3-10. The term “*low-altitude*” in that phrase is a term of degree, and the specification does not provide an objective standard for determining what constitutes *low altitude*. Thus, the SC is indefinite.

39. “*Low altitude*” aircraft is a classic term of degree, because whether an altitude is *low* or not is a matter of degree. The specification, however, does not provide any objective boundaries for determining when an altitude is “*low*” or not in the context of aircraft. For example, the patent mentions “airborne objects at a low altitude,” but does not describe any objective boundary for a “low” altitude. EX1001, 1:29-31, 4:37-40. No objective standard exists for determining whether an aircraft qualifies as a “low altitude” aircraft, which renders the term *low-altitude aircraft* indefinite.

B. THE TERM “THE RECEIVED INFORMATION” IS INDEFINITE

40. The SC is further indefinite due to element [22.c], which recites *wherein the radio communication module is configured to receive a radio signal and store the received information in a storage*. RMTA, 4 (emphasis added). The term *the received information* lacks antecedent basis. The claim does not include a prior recitation of any *information* that is *received*. To the extent it is argued that the *radio signal* that is *receive[d]* is the claimed *received information*, I do not agree and this

is incorrect. These are different terms. A POSITA would not have considered the received *signal* to be the same as received “*information*” because they are different terms, connoting different meanings. Moreover, use of *the received information* causes confusion within the SC to POSITAs, because the SC previously recites *identification information*, and it is unclear whether these pieces of *information* are the same or different. RMTA, 3-4. Thus, a POSITA would not have ascertained the scope of PO’s alleged invention, rendering the SC indefinite.

XV. THE SUBSTITUTE CLAIM IS OBVIOUS

41. In my opinion, the Substitute Claim would have been obvious under 35 U.S.C. §103 in view of the following grounds. In the grounds, I address the limitations from the Substitute Claim added by PO in the RMTA and certain other relevant limitations; limitations from the original claim not addressed below are addressed in the Petition and in my original declaration. I note that elements that are indefinite and/or lack written description support are addressed based on my understanding of PO’s position and as best understood by a POSITA.

42. I have reproduced the unpatentability grounds under 35 U.S.C. §103 below.

Ground	Substitute Claim	Basis (35 U.S.C. §)	Prior Art
5B	22	103	Beard, Viggiano, and Hayes
6B	22	103	Taveira, Wang, Gong, Viggiano, and Hayes

7B	22	103	Taveira, Qi, Gong, Viggiano, and Hayes
8B	22	103	Gong, Wang-II, Viggiano, and Hayes
9B	22	103	Beard, Viggiano, Hayes, and FF
10B	22	103	Taveira, Wang, Gong, Viggiano, Hayes, and FF
11B	22	103	Taveira, Qi, Gong, Viggiano, Hayes, and FF
12B	22	103	Gong, Wang-II, Viggiano, Hayes, and FF

43. Grounds 5B-8B rely on the Petition's original grounds and add Viggiano and Hayes, and grounds 9-12 rely on the Petition's original grounds and add Viggiano, Hayes, and FF.

44. PO asserts a priority date of June 12, 2015. RMTA, 2-11. I do not agree. *See supra* Section XIII.A.2. Pet., 7-16. At best, the '959 Patent's priority date is October 1, 2017, the filing date of U.S. Provisional Application No. 62/566,450 (which Petitioner assumes but does not concede). *Id.*

45. I understand that FF (publicly available by at least December 13, 1993) is prior art under 35 U.S.C. §102(a)(1), Viggiano (published October 11, 2007; filed April 7, 2006) is prior art under 35 U.S.C. §102(a)(1) and (a)(2), and Hayes (filed August 6, 2014) is prior art under 35 U.S.C. §102 (a)(2). EX1024, Cover; EX1028, Cover; EX1029; EX1030, Cover.

46. As FF, Viggiano, and Hayes address aircraft identification techniques, in my opinion, they are highly relevant to the '959 Patent. EX1001, 1:28-31, 2:27-29; EX1024, Abstract, ¶¶0002, 0012-0018, 0024-0027, Figs. 1, 3; EX1028, 49, 62-66; EX1030, 5:38-67, Fig. 6.

A. OVERVIEW OF VIGGIANO (EX. 1024)

47. Viggiano discloses a “system for authenticating the identity of ADS-B systems.” EX1024, Abstract. Viggiano discloses that, to authenticate the identity of an aircraft, a challenge 12 is transmitted from an authenticator 10 to an aircraft, to provoke an authentication response from the aircraft. EX1024, ¶¶0012-0015, Fig. 1. The challenge 12 is formed from a “unique identifier” that is “generated by unique identifier generator 14 that is part of the system of the authenticator 10.” *Id.*, ¶0012, Fig. 1. “[U]nique identifier generator 14 comprises a random number generator” and the “unique identifier can be random values.” *Id.*, ¶0013. Because the unique identifier is “unique,” as well as because it is formed by random values, an attacker “cannot ‘learn’ a valid response by observing the challenges 12” and corresponding response. *Id.* After receiving the challenge 12, the aircraft forms an “authentication challenge response 18” that includes a message authentication code (MAC) 38, and the aircraft’s ADS-B transmitter transmits the response 18 to authenticator 10. *Id.*, ¶¶0013-0014. The authenticator 10 receives response 18 and its message

authentication code 38, and forms its own message authentication code 58 using, among other information, the locally generated unique identifier. *Id.*, ¶¶0013-0015. The authenticator 10 then uses comparator 60 to compare the message authentication code 38 and message authentication code 58, to determine whether the “identity of the ADS-B transmitter” (and thus, the transmitting UAV’s identity) is authenticated, where matching MACs indicates an authenticated identity. *Id.* If two or more consecutive authentication response comparisons fail, then authenticator 10 “notifies a responsible higher command authority of the authentication failures” so the authority can “respond appropriately.” *Id.* Authenticator 10 can also issue an “alert” that is displayed on other “aircraft, vehicles, vessels or stations.” *Id.*

B. OVERVIEW OF *HAYES* (EX. 1030)

48. Hayes discloses that a UAV associated with an “alert” is caused to be more clearly displayed on a user interface. EX1030, 5:38-67, Fig. 6. This is performed by removing other detected and displayed UAVs from the interface so that the UAV associated with the alert is more visible. *Id.*

C. OVERVIEW OF *FF* (EX. 1028)

49. FF discloses “identification friend or foe” authentication techniques that are used to identify aircraft. EX1028, 31, 49, 62-66. An encrypted “query” is transmitted to an aircraft, asking the aircraft to identify itself, and the aircraft

provides a response. *Id.* This technique allows for a determination of which aircraft are friendly. *Id.*

D. GROUND 5B: BEARD, VIGGIANO, AND HAYES

1. Motivation to Combine

50. A POSITA would have been motivated to combine Beard with Viggiano and Hayes, with a reasonable expectation of success.

51. Viggiano discloses that, to authenticate the identity of an aircraft, a challenge 12 is transmitted from an authenticator 10 to an aircraft, to provoke an authentication response from the aircraft. EX1024, ¶¶0012-0015, Fig. 1. The challenge 12 is formed from a “unique identifier” that is “generated by unique identifier generator 14 that is part of the system of the authenticator 10.” *Id.*, ¶0012, Fig. 1. “[U]nique identifier generator 14 comprises a random number generator” and the “unique identifier can be random values.” *Id.*, ¶0013. Because the unique identifier is “unique,” as well as because it is formed by random values, an attacker “cannot ‘learn’ a valid response by observing the challenges 12” and corresponding response. *Id.* After receiving the challenge 12, the aircraft forms an “authentication challenge response 18” that includes a message authentication code (MAC) 38, and the aircraft’s ADS-B transmitter transmits the response 18 to authenticator 10. *Id.*, ¶¶0013-0014. The authenticator 10 receives response 18 and its MAC 38, and forms its own MAC 58 using, among other information, the locally generated unique

identifier. *Id.*, ¶¶0013-0015. The authenticator 10 then uses comparator 60 to compare MACs 38 and 58, to determine whether the “identity of the ADS-B transmitter” (and thus, the transmitting UAV’s identity) is authenticated, where matching MACs indicates an authenticated identity. *Id.* If two or more consecutive authentication response comparisons fail, then authenticator 10 “notifies a responsible higher command authority of the authentication failures” so the authority can “respond appropriately.” *Id.* Authenticator 10 can also issue an “alert” that is displayed on other “aircraft, vehicles, vessels or stations.” *Id.* Hayes teaches that a UAV associated with an “alert” is caused to be more clearly displayed on a user interface—by removing other detected and displayed UAVs from the interface so that the UAV associated with the alert is more visible. EX1030, 5:38-67, Fig. 6.

52. As combined, the Beard-Viggiano-Hayes system would have provided the predictable result in which Beard’s first unmanned aerial system (UAS) RF transceiver (1) receives from Beard’s receiver a challenge 12, (2) determines to transmit a challenge response, and (3) transmits the challenge response, and Beard’s receiver receives the response and—based on the response and a subsequent consecutive authentication failure alert—modifies its displayed user interface, causing other detected and displayed UASs to be removed from the interface so that the first UAS is more clearly displayed. EX1024, ¶¶0002, 0011-0015, Figs. 1-3, Claims 1, 5, 8, 21, 39; EX1030, 5:38-67, Fig. 6; Pet., 29-39; EX1008, Abstract, 3:9-

19, 3:30-36, 5:9-10, 5:33-51, 5:41-57, 6:23-25, 6:56-60, 7:11-17, 7:34-51, 8:28-32, 8:39-42, 9:8-12, 9:67-10:12, 10:12-20, Fig. 4B; EX1009, 2-9, 11, 14, 15, Fig. 2.

53. A POSITA would have been so motivated because the use of false or fraudulent identity information by aircrafts was a known problem. EX1024, ¶¶0003-0007. Viggiano addresses this problem and furthers Beard's own verification teachings, providing a specific technique for aircraft identity verification that prevents "unauthorized third parties" from "enter[ing] a given air traffic control region by broadcasting false identification data." EX1024, ¶0004. Beard already discloses the general verification of UAS identity using transmitted identification information, and Viggiano and Hayes provide implementation details for performing such verification using a challenge-response technique, and displaying subsequent results, which would have been straightforward and routine to implement. EX1008, 3:30-36, 5:41-57, 8:39-42, 9:8-12, 10:12-20; EX1009, 5-8, 11; EX1024, ¶¶0002, 0011-0028, Figs. 1-3, Claims 1, 5, 8, 21, 39; EX1030, 5:38-67, Fig. 6. These teachings provide additional layer of security, benefiting the combination. *Id.*

54. Moreover, Beard and Viggiano determine accurate aircraft identity and utilize ADS-B for aircraft data transmissions, further demonstrating their compatibility and complementary nature. EX1008, 2:22-49, 2:66-3:36, 4:61-5:7, 6:20-29, 7:11-26; EX1009, 2-5, 7-11, 12-14; EX1024, ¶¶0002, 0011-0028, Figs. 1-3, Claims 1, 5, 8, 21, 39. Moreover, Viggiano explains that consecutively failed

authentications causes issuance of an “alert that is displayed” by a station. EX1024, ¶¶0014-0015. Hayes teaches that a UAV associated with an “alert” is caused to be more clearly displayed on an interface—by removing other detected and displayed UAVs from the interface so that the UAV associated with the alert is more visible. EX1030, 5:38-67, Fig. 6. As such, Viggiano and Hayes teach that Beard’s receiver, which detects multiple UASs and displays their identification and position data on a user interface (Pet., 35-39), would have had a modifiable user interface that more clearly displays a UAV associated with a failed authentication alert by removing other detected and displayed UAVs from the interface. *Id.*; EX1030, 5:38-67; EX1024, ¶¶0014-0015. And due to the compatibility of these teachings, the straightforward nature of the combination, and the routine modifications that would have been necessary (e.g., providing the known challenge-response protocol as taught by Viggiano, and the modification of user interface as taught by Hayes), there would have been a reasonable expectation of success. *Id.*

2. Elements[22.pre], [22.b], [22.d], [22.h]

55. Beard describes multiple UAS 102 (102a, 102b, 102c, etc) are present in an airspace and are detected by Beard’s receiver, and a first of these UAS forms a *first low-altitude aircraft* as claimed. EX1008, 2:22-23, 7:52-8:51, 8:51-61, 9:3-58, Fig. 4B; EX1009, 1, 2, 4-7, 14-15, Fig. 2; Pet. 24-28, 29-31, 34, 37-39. The

remaining aspects of elements [22.pre], [22.b], [22.d], [22.h] are taught as in the Pet. and in the sections of this ground below. *Id.*; Section XV.D, *infra*.

3. Element [22.c]

56. Beard's remote identification (RID) device attached to an unmanned aircraft system (UAS) includes an RF transceiver (*radio communication module*). Pet., 29-31. Beard's RF transceiver (*radio communication module*) can "'listen' for other proximate UAS within range, receiving identifier signals transmitted by another RID device (100a) aboard the proximate UAS and relaying the received signals throughout the RID coverage area of the RID device 100." EX1008, 7:34-42; EX1009, 14; Pet., 31-34. The RID devices can communicate on different radio frequencies. Pet., 28-31. Accordingly, Beard teaches "*wherein the radio communication module is configured to receive a radio signal.*" Beard discloses to "*store the received information in a storage.*" *Id.*

57. If "*the received information*" is interpreted to refer to the "*identification information associated with the first low-altitude aircraft*" recited in [22.b], Beard discloses that the RID device can "store[] to memory" the "current position of the UAS 102 and identification data" of the UAS associated with the RID device. Pet., 28-31; EX1008, 5:44-46, 7:45-47; EX1009, 11, 15; EX1003, ¶125; Pet. at 31-34. If "*the received information*" is interpreted to refer to information associated with the "*radio signal*" recited in [22.c], Beard discloses that "memory 106 of the RID device

100 may serve as an ad hoc black box data recorder, storing data regarding the UAS
102 *as well as other nearby UAS, based on received identifier signals.*” *Id.*;
EX1008, 7:45-48 (emphasis added), 7:48-51; EX1009, 15; EX1003, ¶126; Pet., 31-
34; *see Supra* Section XV.D.3 ([22.c]).

4. Element [22.e]

58. Beard’s RF transceiver forms the “*radio communication module.*” Pet.,
29-31. The Beard-Viggiano-Hayes combination teaches that Beard’s RF transceiver
(*the radio communication module*) of the first UAS receives from Beard’s receiver
(“*remote portable detection system*”) an “authentication challenge 12” comprising a
“unique identifier” having “random values” generated by a random number
generator, where the “unique” aspect of the unique identifier and random values
provide security such that “an attacker cannot ‘learn’ a valid response by observing
the challenges 12,” and the RF transceiver further uses challenge 12 (and its unique
identifier) to prepare an authentication challenge response (*the radio communication
module is configured to utilize a secure identifier*). *Id.*; Section XV.D.1 (MTC);
EX1024, ¶¶0012-0013; Pet., 35-39. Indeed, by using a unique identifier (e.g., a
random number) for each challenge, each challenge 12 is continually different and
an attacker cannot learn it, which provides that the challenge 12 is *secure*. EX1024,
¶¶0012-0013. The challenge 12 (*secure identifier*) is or includes an excitation
because it causes Beard’s RF transceiver to prepare and transmit the challenge

response (*secure identifier comprising a specified excitation*). EX1024, ¶¶0012-0013; Section XV.D.1 (MTC); Pet., 29-31. This is because the challenge is part of Viggiano’s taught “challenge-response methodology” that is used to authenticate aircraft identity. EX1024, ¶¶0012-0013.

59. Moreover, the challenge response that is transmitted by Beard’s RF transceiver allows for the first UAS to be distinguished from among multiple detected UAVs and highlighted for display (*enabling disambiguation of the first low-altitude aircraft from other detected low-altitude aircraft*), as taught by Hayes. EX1024, ¶¶0012-0013; Pet., 29-31; EX1030, 5:38-67, Fig. 6; Section XV.D.1 (MTC). Specifically, the combination teaches that the challenge response is transmitted by Beard’s RF transceiver to Beard’s receiver, and the receiver attempts authentication of the first UAS’s identity based on the response. EX1024, ¶¶0012-0015; Pet., 29-31, 35-39; Section XV.D.1 (MTC). Consecutive failures of the authentication causes issuance of “an alert” that triggers a modification of the displayed user interface of Beard’s receiver, causing other detected and displayed UASs to be removed from the interface and the first UAS to thus be more clearly displayed. *Id.*; EX1030, 5:38-67, Fig. 6. As discussed in the Petition, Beard’s receiver detects multiple UASs and displays their identification and position data. Pet., 35-39.

60. Because the challenge 12 (*secure identifier*) includes the “unique identifier” having “random values” generated by a random number generator, where the “unique” aspect of the unique identifier provides that “an attacker cannot ‘learn’ a valid response by observing the challenges 12, and challenge 12 is used to verify the identity of the first UAS, it satisfies the Board’s *secure identifier* construction of “a credential that can be used to securely verify the identity of a device, such as an airborne object or ground-based transmitter.” EX1024, ¶¶0012-0015; Paper 13 at 10; Pet., 29-31, 35-39; Section XV.D.1 (MTC).

5. Element [22.f]

61. Beard’s receiver forms a “*remote portable detection system*.” Pet., 35-39. As discussed for Section XV.D.4 ([22.e]), the Beard-Viggiano-Hayes combination teaches *utilizing the secure identifier* comprises Beard’s RF transceiver receiving challenge 12 that includes the excitation (*comprises receiving by the radio communication module the specified excitation*) from Beard’s receiver (*from the remote portable detection system*). See Section XV.D.4 ([22.e]). As discussed for Section XV.D.4 ([22.e]), this excitation (*the specified excitation*) causes the first UAS to change a behavior in that the first UAS is triggered to prepare and transmit a challenge response (*wherein the specified excitation causes the first low-altitude aircraft to change a behavior thereof*). See Section XV.D.4 ([22.e]).

6. Element [22.g]

62. Beard's receiver forms "*the remote portable detection system*" as discussed in the Petition, and the remaining aspects of [22.g] are also addressed in the Petition. Pet., 35-39.

7. **Element [22.i]**

63. As discussed in Section XV.D.2 ([22.pre] et al.) and the Petition at 37-39, multiple UAS 102 are present in an airspace and are detected by Beard's receiver (forming *the plurality of different low-altitude aircrafts*), and one of these UAS forms the *first low-altitude aircraft*, teaching that *the plurality [is] comprising the first low-altitude aircraft* as claimed. Section XV.D.2 ([22.pre] et al.) ; Petition, 37-39. Beard's receiver forms "*the remote portable detection system.*" Section XV.D.6 ([22.g]); Pet., 35-39. As discussed in Sections XV.D.4-5([22.e]) and ([22.f])), upon consecutive authentication failures for the first UAS, Beard's receiver (*the remote portable detection system*) modifies its user interface display such that other detected and displayed UAS are removed from the interface and the first UAS is thus more clearly displayed (*is configured to disambiguate the first low-altitude aircraft from the other detected low-altitude aircraft of the plurality*). Sections XV.D.1, 4, 5 ([22.e], [22.f], MTC). Moreover, this changing of the form of display such that first UAS is more clearly displayed relative to the other detected UASs (*disambiguate the first low-altitude aircraft from the other detected low-altitude aircraft of the plurality*) is based on the first UAS's triggered authentication response (*based on the*

changed behavior of the first low-altitude aircraft) to the authentication challenge that causes the first UAS to have failed consecutive authentications. Section XV.D.1, 4, 5 ([22.e], [22.f], MTC). The remaining aspects of [22.i] are addressed in the Petition. Pet., 37-39.

E. GROUND 6B (TAVEIRA, WANG, GONG, VIGGIANO, AND HAYES) AND 7B (TAVEIRA, QI, GONG, VIGGIANO, AND HAYES)

1. Motivation to Combine

64. A POSITA would have been motivated to combine Taveira, Wang, and Gong/Taveira, Qi, and Gong as discussed in the Petition, and would have further been motivated to combine each combination with Viggiano and Hayes with a reasonable expectation of success for the same reasons discussed for Viggiano and Hayes in Section XV.D.1 (MTC). Pet. at 40-45, 60-62. The combinations would have provided the predictable result in which Taveira's first drone 100 having radio module 130 (1) receives from Taveira's wireless communication device 170 a challenge 12, (2) determines to transmit a challenge response, and (3) transmits the challenge response, and Taveira's wireless communication device 170 receives the response and—based on the response and a subsequent consecutive authentication failure alert —modifies its displayed user interface, causing other detected and displayed drones 100 to be removed from the interface so that the first drone 100 is more clearly displayed. EX1024, ¶¶0002, 0011-0015, Figs. 1-3, Claims 1, 5, 8, 21,

39; EX1030, 5:38-67, Fig. 6; Pet. at 40-45, 49-60, 60-64; EX1003, ¶¶138-146, 172-176

2. Element [22.pre], [22.b], [22.d], [22.h]

65. Taveira and Gong teaches multiple drones 100 that are detected and displayed by Taveira's wireless communication device 170, and a first of these drones 100 forms a *first low-altitude aircraft* as claimed. Pet. 45-50, 53, 55-60, 62. The remaining aspects of elements [22.pre], [22.b], [22.d], [22.h] are taught as in the Pet. and in the sections of this ground below. *Id.*; See Section XV.E, *infra*.

3. Element [22.c]

66. Taveira's radio module 130 forms a *radio communication module*. Pet. at 49-50, 62. Radio module 130 receives RF signals from other devices (*wherein the radio communication module is configured to receive a radio signal*). Pet., 50-53, 62. The combinations each teach to “*store the received information in a storage.*” *Id.* If “*the received information*” refers to the “*identification information associated with the low-altitude aircraft*” of [22.b], the combinations disclose storing identification data associated with the drone. *Id.*; Pet., 50-53, 62. If “*the received information*” refers to information associated with the “*radio signal*” of [22.c], the combinations disclose such information is stored in memory unit 121 of drone 100. *Id.*

4. Element [22.e]

67. Taveira's radio module 130 forms the *radio communication module*. Pet. at 49-50, 62. The combinations teach that radio module 130 (*the radio communication module*) of the first drone 100 receives from wireless communication device 170 ("*remote portable detection system*") an "authentication challenge 12" comprising a "unique identifier" having "random values" generated by a random number generator, where the "unique" aspect of the unique identifier provides that "an attacker cannot 'learn' a valid response by observing the challenges 12, and the radio module 130 further uses challenge 12 (and its unique identifier) to prepare an authentication challenge response (*the radio communication module is configured to utilize a secure identifier*). *Id.*; Section XV.E.1 (MTC); EX1024, ¶¶0012-0013; Pet., 40-45, 49-60, 60-64.

68. The challenge 12 (*secure identifier*) includes an excitation that causes radio module 130 to prepare and transmit the challenge response (*secure identifier comprising a specified excitation*). EX1024, ¶¶0012-0013; Section XV.E.1 (MTC); Pet. at 40-45, 49-60, 60-64. This is because the challenge is part of Viggiano's taught "challenge-response methodology" that is used to authenticate aircraft identity. EX1024, ¶¶0012-0013. Moreover, the challenge response that is transmitted by radio module 130 allows for the first drone 100 to be distinguished from among multiple detected drones 100 and highlighted for display (*enabling disambiguation of the first*

low-altitude aircraft from other detected low-altitude aircraft), as taught by Hayes. *Id.*; Pet. at 40-45, 49-60, 60-64; EX1030, 5:38-67, Fig. 6; Section XV.E.1 (MTC).

69. Specifically, the combination teaches that the challenge response is transmitted by radio module 130 to wireless communication device 170, and the wireless communication device 170 attempts authentication of the first drone 100's identity based on the response. EX1024, ¶¶0012-0015; Pet. at 40-45, 49-60, 60-64; Section XV.E.1 (MTC). Consecutive failures of the authentication causes issuance of "an alert" that triggers a modification of the displayed user interface of wireless communication device 170, causing other detected and displayed drones 100 to be removed from the interface and the first drone 100 to thus be more clearly displayed. *Id.*; EX1030, 5:38-67, Fig. 6. As discussed in the Petition, wireless communication device 170 detects multiple UASs and displays their identification and position data. Pet. at 40-45, 49-60, 60-64.

70. Because the challenge 12 (*secure identifier*) includes the "unique identifier" having "random values" generated by a random number generator, where the "unique" aspect of the unique identifier provides that "an attacker cannot 'learn' a valid response by observing the challenges 12, and challenge 12 is used to verify the identity of the first drone 100, it satisfies the Board's *secure identifier* construction of "a credential that can be used to securely verify the identity of a

device, such as an airborne object or ground-based transmitter.” EX1024, ¶¶0012-0015; Paper 13 at 10; Pet. at 40-45, 49-60, 60-64; Section XV.E.1 (MTC).

5. Element [22.f]

71. Wireless communication device 170 forms a “*remote portable detection system*.” Pet., 55-60, 64. As discussed for Section XV.E.4 ([22.e]), the combinations teach *utilizing the secure identifier* comprises radio module 130 (*the radio communication module*) of the first drone 100 receiving challenge 12 that includes the excitation (*comprises receiving by the radio communication module the specified excitation*) from wireless communication device 170 (*from the remote portable detection system*). See Section XV.E.4 ([22.e]). As discussed for Section XV.E.4 ([22.e]), this excitation (*the specified excitation*) causes the first drone 100 to change a behavior in that the first drone 100 is triggered to prepare and transmit a challenge response (*wherein the specified excitation causes the first low-altitude aircraft to change a behavior thereof*). See Section XV.E.4 ([22.e]).

6. Element [22.g]

72. Wireless communication device 170 forms “*the remote portable detection system*.” Pet., 55-60, 64. The remaining aspects of [22.g] are also addressed in the Petition. *Id.*

7. Element [22.i]

73. As discussed in Section XV.E.2 ([22.pre] et al) and the Petition at 45-50, 53, 55-60, 62, multiple drones 100 are detected by Taveira’s wireless

communication device 170 (forming *the plurality of different low-altitude aircrafts*), and one of these drones 100 forms the *first low-altitude aircraft*, teaching that *the plurality [is] comprising the first low-altitude aircraft* as claimed. Section XV.E.2 ([22.pre] et al); Petition, 45-50, 53, 55-60, 62. Wireless communication device 170 forms “*the remote portable detection system.*” Pet., 55-60, 64; Section XV.E.6 ([22.g]). As discussed in Section XV.E.4, 5 ([22.e], [22.f]), upon consecutive authentication failures for the first drone 100, wireless communication device 170 (*the remote portable detection system*) modifies its user interface display such that other detected and displayed drones 100 are removed from the interface and the first drone 100 is thus more clearly displayed (*is configured to disambiguate the first low-altitude aircraft from the other detected low-altitude aircraft of the plurality*). Section XV.E.1, 4, 5 ([22.e], [22.f], MTC). Moreover, this changing of the form of display such that first drone 100 is more clearly displayed relative to the other detected drones 100 (*disambiguate the first low-altitude aircraft from the other detected low-altitude aircraft of the plurality*) is based on the first drone 100’s triggered authentication response (*based on the changed behavior of the first low-altitude aircraft*) to the authentication challenge that causes the first UAS to have failed consecutive authentications. Section XV.E.1, 4, 5 ([22.e], [22.f], MTC). The remaining aspects of [22.i] are addressed in the Petition. Pet., 58-60, 64

F. GROUND 8B (GONG, WANG-II, VIGGIANO, AND HAYES)

1. Motivation to Combine

74. A POSITA would have been motivated to combine Gong and Wang-II as discussed in the Petition, and would have further been motivated to combine with Viggiano and Hayes with a reasonable expectation of success for the same reasons discussed for Viggiano and Hayes in Section XV.D.1 (MTC). Pet., 64-66. The Gong-Wang-II-Viggiano-Hayes combination would have provided the predictable result in which Gong's first UAV communication module/unit (1) receives from Gong's geofencing device a challenge, (2) determines to transmit a challenge response, and (3) transmits the challenge response, and Gong's geofencing device receives the response and—based on the response and a subsequent consecutive authentication failure alert—modifies its displayed user interface, causing other detected and displayed UAVs to be removed from the interface so that the first UAV is more clearly displayed. EX1024, ¶¶0002, 0011-0015, Figs. 1-3, Claims 1, 5, 8, 21, 39; EX1030, 5:38-67, Fig. 6; Pet. at 64-66, 70-78; EX1003, ¶¶188-191.

2. Element [22.pre], [22.b], [22.d], [22.h]

75. Gong teaches multiple UAVs are detected and displayed by a geofencing device, and a first of these UAVs forms a *first low-altitude aircraft* as claimed. Pet. 64-66, 70-78. The remaining aspects of elements [22.pre], [22.b], [22.d], [22.h] are taught as in the Pet. and in the sections of this ground below. *Id.*; See Section XV.F, *infra*.

3. Element [22.e]

76. Gong's communication module/unit is a *radio communication module*. Pet. at 70-72. The communication module/unit (*the radio communication module*) of the first UAV receives from Gong's geofencing device ("*remote portable detection system*") an "authentication challenge 12" comprising a "unique identifier" having "random values" generated by a random number generator, where the "unique" aspect of the unique identifier provides that "an attacker cannot 'learn' a valid response by observing the challenges 12, and the communication module/unit further uses challenge 12 (and its unique identifier) to prepare an authentication challenge response (*the radio communication module is configured to utilize a secure identifier*). *Id.*; Section XV.F.1 (MTC); EX1028, 63; Pet., 70-78. The challenge 12 (*secure identifier*) includes an excitation that causes the communication module/unit to prepare and transmit the challenge response (*secure identifier comprising a specified excitation*). EX1024, ¶¶0012-0013; Section XV.F.1 (MTC); Pet. at 70-78. This is because the challenge is part of Viggiano's taught "challenge-response methodology" that is used to authenticate aircraft identity. EX1024, ¶¶0012-0013. Moreover, the challenge response that is transmitted by the communication module/unit allows for the first UAV to be distinguished from among multiple detected UAVs and highlighted for display (*enabling disambiguation of the first low-altitude aircraft from other detected low-altitude*

aircraft), as taught by Hayes. *Id.*; Pet. at 70-78; EX1030, 5:38-67, Fig. 6; Section XV.F.1 (MTC).

77. Specifically, the combination teaches that the challenge response is transmitted by the communication module/unit to the geofencing device, and the geofencing device attempts authentication of the first UAV's identity based on the response. EX1024, ¶¶0012-0015; Pet. at 70-78; Section XV.F.1 (MTC). Consecutive failures of the authentication causes issuance of "an alert" that triggers a modification of the displayed user interface of the geofencing device, causing other detected and displayed UAS to be removed from the interface and the first UAS to thus be more clearly displayed. *Id.*; EX1030, 5:38-67, Fig. 6. As discussed in the Petition, the geofencing device detects multiple drones. Pet., 75-78.

78. Because the challenge 12 (*secure identifier*) includes the "unique identifier" having "random values" generated by a random number generator, where the "unique" aspect of the unique identifier provides that "an attacker cannot 'learn' a valid response by observing the challenges 12, and challenge 12 is used to verify the identity of the first UAV, it satisfies the Board's *secure identifier* construction of "a credential that can be used to securely verify the identity of a device, such as an airborne object or ground-based transmitter." EX1024, ¶¶0012-0015; Paper 13 at 10; Pet., 70-78; Section XV.F.1 (MTC).

4. Element [22.f]

79. Geofencing device forms a “*remote portable detection system*.” Pet., 75-78. As discussed for Section XV.F.3 ([22.e]), the combination teaches *utilizing the secure identifier* comprises communication module/unit (*the radio communication module*) of the first UAV receiving challenge 12 that includes the excitation (*comprises receiving by the radio communication module the specified excitation*) from geofencing device (*from the remote portable detection system*). See Section XV.F.3 ([22.e]). As discussed for Section XV.F.3 ([22.e]), this excitation (*the specified excitation*) causes the first UAV to change a behavior in that the first UAS is triggered to prepare and transmit a challenge response (*wherein the specified excitation causes the first low-altitude aircraft to change a behavior thereof*). Section XV.F.3 ([22.e]).

5. Element [22.g]

80. The geofencing device forms “*the remote portable detection system*.” Pet., 75-78. The remaining aspects of [22.g] are also addressed in the Petition. *Id.*

6. Element [22.i]

81. As discussed in Section XV.F.2 ([22.pre] et al) and the Petition at 64-66, 70-78, multiple UAVs are detected by Gong’s geofencing device (forming *the plurality of different low-altitude aircrafts*), and one of these UAVs forms the *first low-altitude aircraft*, teaching that *the plurality [is] comprising the first low-altitude aircraft* as claimed. Section XV.F.2 ([22.pre] et al); Petition, 64-66, 70-78. The

geofencing device forms “*the remote portable detection system.*” Pet., 75-78; Section XV.F.5 ([22.g]). As discussed in Section XV.F.3 ([22.e]) and Section XV.F.4 ([22.f]), upon consecutive authentication failures for the first UAV, the geofencing device (*the remote portable detection system*) modifies its user interface display such that other detected and displayed UAV are removed from the interface and the first UAV is thus more clearly displayed (*is configured to disambiguate the first low-altitude aircraft from the other detected low-altitude aircraft of the plurality*). Section XV.F.3 ([22.e]), Section XV.F.4 ([22.f]), Section XV.F.1 (MTC). Moreover, this changing of the form of display such that first UAV is more clearly displayed relative to the other detected UAVs (*disambiguate the first low-altitude aircraft from the other detected low-altitude aircraft of the plurality*) is based on the first UAV’s triggered authentication response (*based on the changed behavior of the first low-altitude aircraft*) to the authentication challenge that causes the first UAV to have failed consecutive authentications. Section XV.F.3 ([22.e]), Section XV.F.4 ([22.f]), Section XV.F.1 (MTC). The remaining aspects of [22.i] are addressed in the Petition. Pet., 75-78

G. GROUND 9B (BEARD, VIGGIANO, HAYES, AND FF)

1. Motivation to Combine

82. A POSITA would have been motivated to combine Beard, Viggiano, and Hayes (GND 5B) with a reasonable expectation of success for the reasons

discussed in Section XV.D.1 (MTC). A POSITA would have also been motivated to combine FF with these references, with a reasonable expectation of success. FF discloses “identification friend or foe” authentication techniques that are used to identify aircraft. EX1028, 31, 49, 62-66. An encrypted “query” (i.e., challenge) is transmitted to an aircraft, asking the aircraft to identify itself, and the aircraft provides a response. *Id.* This technique allows for a determination of which aircraft are friendly. *Id.* As combined, the Beard-Viggiano-Hayes-FF system would have thus provided the predictable result in which authentication challenge 12 is encrypted, and Beard’s first unmanned aerial system (UAS) RF transceiver receives from Beard’s receiver an encrypted authentication challenge 12. *See* Section XV.D.1 (MTC); EX1028, 49, 63-66.

83. A POSITA would have been so motivated to provide an additional layer of security to the already secure challenge 12 taught by Viggiano, furthering the teachings of Beard-Viggiano-Hayes. Indeed, the Beard-Viggiano-Hayes system discloses that authentication challenge 12 comprises a “unique identifier” having “random values” generated by a random number generator, where the “unique” aspect of the unique identifier provides security such that “an attacker cannot ‘learn’ a valid response by observing the challenges 12.” Section XV.D.1 (MTC); EX1024, ¶¶0012-0013; Pet., 29-31, 35-39. FF furthers this system, teaching that the challenge 12 is encrypted, which provides that the challenge 12 is made further secure. *Id.*;

EX1028, 49, 63-66. FF's teachings would have thus benefitted the Beard-Viggiano-Hayes system by providing such enhanced security. *Id.*

84. The combination would have further helped ensure that authentication is not fraudulent. Indeed, because the challenge is encrypted, an enemy would have been prevented from imitating a challenge 12 and "fool[ing] friendly forces into responding." EX1028, 49. A POSITA would have made the combination due to its routine nature. A POSITA would have used well-known programming and cryptography techniques to encrypt the challenge 12, which would have been straightforward and easy to implement. *Id.* Moreover, the result would have been predictable and is contemplated by FF itself—a challenge 12 (e.g., query) that is encrypted, and that changes for each challenge instance (due to the randomly generated unique identifier of each challenge taught by Viggiano). *Id.*; EX1028, 49, 63-66; EX1024, ¶¶0012-0013. FF explains that both encrypting a query and making it changeable enhances security. EX1028, 49, 63-66. Finally, a POSITA would have had a reasonable expectation of success in making the combination due to its straightforward nature and use of well-known security techniques (encryption). The FF teachings were very well-known in the art and were not restricted to a particular hardware configuration, making the combination easily implementable by a POSITA and with a reasonable expectation of success. *Id.*; EX1028, 62-66.

2. SC 22

85. The Beard-Viggiano-Hayes-FF combinations teach SC 22 for the same reasons discussed in Section XV.D, and with respect to elements [22.e] and [22.f], further teach that challenge 12 is encrypted, thus forming a *secure identifier*. Section XV.G.1 (MTC), *supra*. Additionally, for the same reasons discussed in Section XV.D.4 ([22.e]) and because challenge 12 is encrypted, the encrypted challenge 12 (*secure identifier*) satisfies the Board's *secure identifier* construction. Sections XV.G.1 (MTC), XV.D.4 ([22.e]).

**H. GROUND 10B (TAVEIRA, WANG, GONG, VIGGIANO, HAYES, AND FF)
AND 11B (TAVEIRA, QI, GONG, VIGGIANO, HAYES, AND FF)**

1. Motivation to Combine

86. A POSITA would have been motivated to combine Taveira, Wang, Gong, Viggiano, and Hayes (GND 6B)/Taveira, Qi, Gong, Viggiano, and Hayes (GND 7B) with a reasonable expectation of success for the reasons discussed in Section XV.E.1, and would have further been motivated to combine each combination with FF with a reasonable expectation of success, for the same reasons discussed for FF in Section XV.G.1. The combinations would have provided the predictable result in which Taveira's first drone 100 having radio module 130 receives from Taveira's wireless communication device 170 an encrypted challenge 12. *See* Sections XV.E.1 (MTC), XV.G.1 (MTC).

2. SC 22

87. The Taveira-Wang-Gong-Viggiano-Hayes-FF/Taveira-Qi-Gong-Viggiano-Hayes-FF combinations teach SC 22 for the same reasons discussed in Section XV.E, and with respect to elements [22.e] and [22.f], further teach that challenge 12 is encrypted, thus forming a *secure identifier*. Section XV.H.1 (MTC), *supra*. Additionally, for the same reasons discussed in Section XV.E.4 ([22.e]) and because challenge 12 is encrypted, the encrypted challenge 12 (*secure identifier*) satisfies the Board's *secure identifier* construction. Sections XV.H.1 (MTC), XV.E.4 ([22.e]).

I. GROUND 12B (GONG, WANG-II, VIGGIANO, HAYES, AND FF)

1. Motivation to Combine

88. A POSITA would have been motivated to combine Gong, Wang-II, Viggiano, and Hayes with a reasonable expectation of success for the reasons discussed in Section XV.F.1, and would have further been motivated to combine each combination with FF with a reasonable expectation of success, for the same reasons discussed for FF in Section XV.G.1. The Gong-Wang-II-Viggiano-Hayes-FF combination would have provided the predictable result in which Gong's first UAV communication module/unit receives from Gong's geofencing device an encrypted authentication challenge 12. *See* Sections XV.F.1 (MTC), XV.G.1 (MTC).

2. SC 22

89. The Gong-Wang-II-Viggiano-Hayes-FF combination teaches SC 22 for the same reasons discussed in Section XV.F, and with respect to elements [22.e] and [22.f], further teach that the authentication challenge 12 is encrypted, thus forming a *secure identifier*. Section XV.I.1 (MTC), *supra*. Additionally, for the same reasons discussed in Section XV.F.3 ([22.e]) and because challenge 12 is encrypted, the encrypted challenge 12 (*secure identifier*) satisfies the Board's *secure identifier* construction. Sections XV.I.1 (MTC), XV.F.3 ([22.e]).

XVI. CONCLUSION

90. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. I further understand that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code. I declare under penalty of perjury that the foregoing is true and correct.

Executed on June 1, 2026.



Dr. Girish Chowdhary