

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

AIRSPACE SYSTEMS, INC.
Patent Owner

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

PETITION FOR *INTER PARTES* REVIEW OF CLAIM 21 OF
U.S. PATENT NO. 10,713,959

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LIST OF EXHIBITS

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
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

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, and 1016 are made with reference to the Bates-stamped pagination; citations to other exhibits are made to the page number of the document itself.

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	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
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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.

I. MANDATORY NOTICES

Real Party in Interest: Axon Enterprise, Inc. and Dedrone Holdings, Inc. (collectively, “Axon” or “Petitioners”) are the real parties in interest.

Related Matters: The '959 Patent is involved in a pending lawsuit between Petitioners and Airspace Systems, Inc. (“Patent Owner,” or “PO”) entitled *Airspace Systems, Inc. v. Dedrone Holdings, Inc.*, Case No. 1-24-cv-01625 (E.D. VA) (“Airspace Litigation”). The '959 Patent was first asserted in the Airspace Litigation on September 16, 2024. EX1004.

Lead Counsel and Back-Up Counsel: Petitioners designate lead and back-up counsel as noted below. A Power of Attorney is filed concurrently herewith under 37 C.F.R. §42.10(b).

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II. STANDING AND FEES

Standing: Petitioners certify under 37 C.F.R. §42.104(a) that the '959 Patent is eligible for *inter partes* review and that Petitioners are not barred or estopped from requesting *inter partes* review on the grounds set forth herein.

Fees: The Office is authorized to charge the fee set forth in 37 C.F.R. §42.15(a) to Deposit Account No. 02-0384 as well as any additional fees that might be due in connection with this Petition.

III. OVERVIEW OF THE '959 PATENT

A. *Subject Matter of the '959 Patent*

The '959 Patent generally relates to “a low altitude aircraft identification system” comprising “a small aircraft electronic identification box with an embedded logger,” and “a ground identification equipment to automatically identify the aircraft just pointing at it.” EX1001, Abstract. The '959 Patent

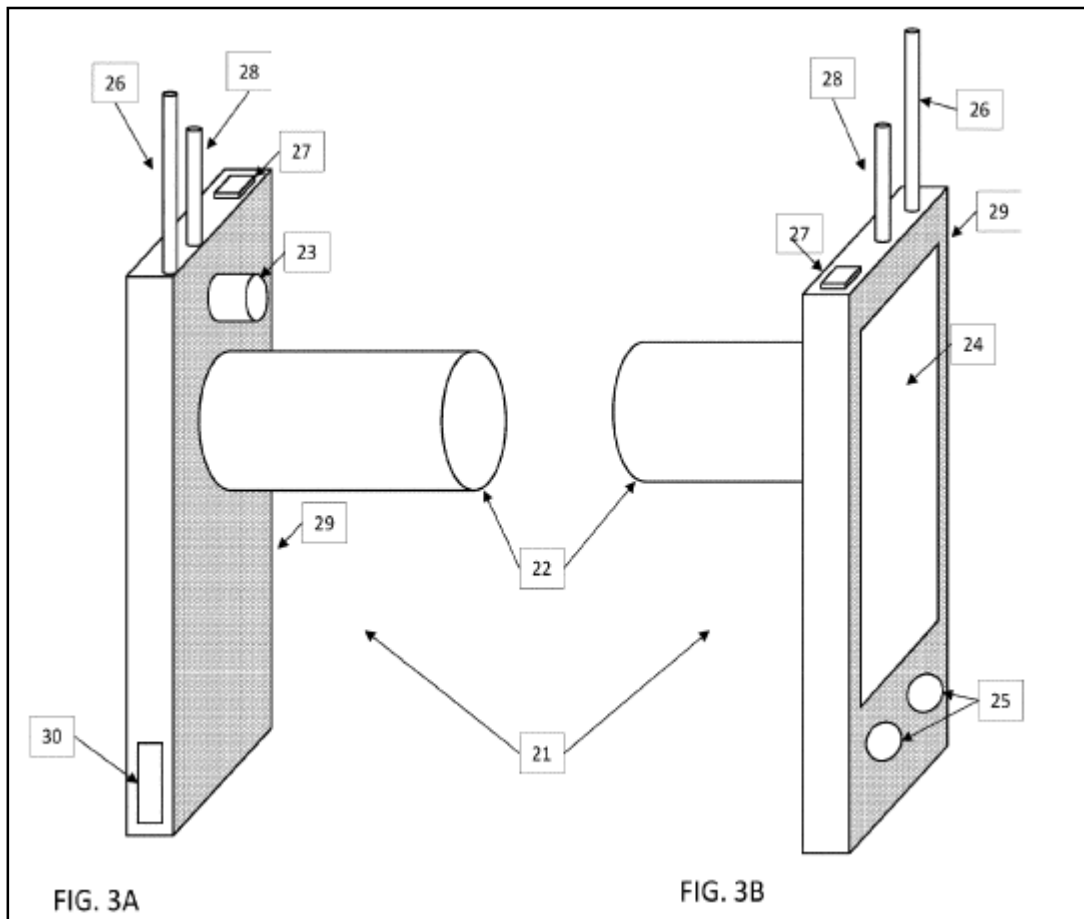
identifies a “drone” as an example of a “low altitude aircraft” (*id.*, 12:61-62), and generally explains that its disclosed system is directed to solve issues related to identifying “unmanned aerial vehicles (UAVs) or unmanned aircraft systems (UASs)” (*id.*, 1:35-2:3).

The electronic identification box generates an “identification code” that is used to identify an associated aircraft. *Id.*, 2:18-67. The identification code is implemented in two embodiments—“a visible light color sequence or by a radio frequency signal”—both of which are recognized by the ground identification device. *Id.*, 2:14-17.

When the identification code is implemented as a color sequence, the electronic identification box uses a “light array” to “blink[] a defined color pattern sequence for each aircraft” such that the code is visually identifiable by an observer. *Id.*, 2:30-36. When the identification code is implemented as a radio frequency signal, a “transponder” included in the electronic identification box “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.” *Id.*, 2:56-59.

The “Ground Identification Device” is a “remote (e.g., ground) device” that is used to “assist the aircraft identification.” *Id.*, 3:28-38. “[T]he ground device is equipped with a camera, lens and image processing algorithms to capture the color

sequence” generated by the identification box, and the ground device has an RF receiver capable of receiving the identification box RF signal.” *Id.*, 3:39-43. Upon detecting an aircraft and checking the aircraft’s identification code, the ground device may display on its screen information about the aircraft. *Id.*, 3:47-62. Figures 3A and 3B, copied below, depict the ground device:



Id., Figs. 3A, 3B.

Further, the disclosed system “implements a rotating SSID,” whereby the SSID (“Service Set Identifier”) used to identify packets sent by an identification

box are “frequently chang[ed],” which “greatly reduce[s]” the probability of the SSID “being discovered or spoofed.” *Id.*, 11:20-24.

Claims 1-20 of the ’959 Patent incorporate elements related to both the light array and radio frequency embodiments; these claims are not challenged in this Petition. *See, e.g.*, EX1001, 15:53-65. Claim 21—the only challenged claim—relates only to the radio frequency embodiment. *See id.*, 17:17-18:17.

B. *Prosecution History of the ’959 Patent*

The application leading to the ’959 Patent was filed on December 10, 2018, as U.S. Application 16/215,406 (the “’406 Application”). EX1001, items (21), (22). On its face, the ’959 Patent purports to be a “[c]ontinuation of application No. 15/839,661, filed on Dec. 12, 2017, now Pat. No. 10,192,451 [(the “’451 Patent,” EX1005)], which is a continuation of application No. PCT/US2016/037071 [(the “’071 Application,” EX1006)] filed on Jun. 10, 2016.” *Id.*, item (63). The ’959 Patent claims priority to provisional application No. 62/175,153 (the “’153 Provisional,” EX1007), which was filed on June 12, 2015, and provisional application No. 62/566,450, which was filed on October 1, 2017. *Id.*, item (60).

The Patent Office issued a first Non-Final Office Action on August 7, 2019, rejecting Claims 1-20² on the ground of nonstatutory double patenting based on claims 1-20 of U.S. Patent No. 10,192,451. EX1002, 114. As noted above, the '959 Patent discloses two primary mechanisms for generating and transmitting its “identification code”: (1) through a visible light sequence (*e.g.*, as generated by a light array) and (2) as a radio frequency (RF) signal. *See supra*, III.A. The examiner’s prior art search history, however, indicates that the examiner’s primary focus was on the visible light embodiment (which, as discussed above, is captured in Claims 1-20, but not Claim 21, *see supra*, III.A), as nearly all of the examiner’s search queries directed to the subject matter of the application (as opposed to searches directed to related patent numbers, relevant priority dates, or inventors) include the term “light” or “color.” *See* EX1002, 138-142 (showing only subject matter searches S7 and S8 as not including the terms “light” or “color”). And the only two subject matter searches that do not include the terms “light” or “color” are directed to generic search terms that would apply to all claims (*e.g.*, “drone or UAV or UAS” and “communicate and antenna and sensor”), and not Claim 21 specifically. *See id.*

² Claim 21 was originally numbered as Claim 20 before being corrected during prosecution. *See* EX1002, 40-41 (5/28/202 Notice of Allowance detailing examiner’s amendment to correct claim numbering).

On February 7, 2020, the applicant filed a terminal disclaimer to obviate the double patenting rejection. *Id.*, 98. On March 25, 2020, the Patent Office issued a notice of allowance. *Id.*, 61.

C. *Priority Date for Claim 21 of the '959 Patent*

Challenged Claim 21 is entitled to claim priority no earlier than October 1, 2017, because Claim 21 is not entitled to claim priority to either the '153 Provisional or the '071 Application.

1. *Claim 21 is not entitled to claim priority to the '153 Provisional.*

The '959 Patent's priority claim to the '153 Provisional, which was filed on June 12, 2015, must be disregarded because the subject matter of Claim 21 was not disclosed in the manner required by 35 U.S.C. §112 in the '153 Provisional. *See SAP America, Inc. v. Pi-Net International, Inc.*, IPR2014-00414, Paper 11 at 11-16 (P.T.A.B. Aug. 18, 2014) (finding patent claims not entitled to claimed priority to parent application filing date due to lack of section 112 support).

Under 35 U.S.C. §119(e), a claim in a U.S. application is entitled to the benefit of the filing date of an earlier filed provisional application if the claim's subject matter is adequately supported by the earlier filed provisional application as provided by 35 U.S.C. §112. *See, e.g., New Railhead Mfg., L.L.C. v. Vermeer Mfg. Co.*, 298 F.3d 1290, 1294 (Fed. Cir. 2002). To comply with the 35 U.S.C. §112 written description requirement, the specification "must describe the

invention sufficiently to convey to a person of skill in the art that the patentee had possession of the claimed invention at the time of the application, i.e., that the patentee invented what is claimed.” *Lizardtech, Inc. v. Earth Resource Mapping, Inc.*, 424 F.3d 1336, 1345 (Fed. Cir. 2005).

Claim 21 recites the limitation, “the radio communication module is configured to utilize a secure identifier.” The ’153 Provisional does not provide adequate written description for this limitation because it contains no disclosure of a “secure identifier,” let alone any disclosure of the use of a “secure identifier” as claimed. As an initial matter, the ’153 Provisional does not use the term “identifier” at all. *See generally* EX1007. Instead, the ’153 Provisional discloses the use of an “identification code” that is used by an unmanned aerial vehicle (UAV) or unmanned aircraft system (UAS) to identify itself. *Id.*, 9-10, 16. The ’153 Provisional teaches that an “electronic identification box” associated with the UAV/UAS communicates the identification code in two formats: (1) “a unique color pattern sequence for each aircraft” as generated by a blinking light array and/or (2) a “code” that is transmitted through an “RF frequency similar to the one generated (e.g., blinked) by the light arrays.” *Id.* The color pattern and/or the code are then transmitted from the electronic identification box on the UAV/UAS to a “ground identification device.” *Id.*, 9-11, 13.

To the extent the “identification codes” and associated device identities may be considered “identifiers,” which Petitioners do not concede, the ’153 Provisional fails to describe the use of a “*secure* identifier,” as there is no discussion by the ’153 Provisional of “securing” anything, let alone “identifiers.” Indeed, the ’153 Provisional suggests that its identification codes are *not* secure, providing that comprehending the identifiers is achieved simply by looking at the correct UAV/UAS (when the identification code is a light sequence) or receiving the correct radio frequency (when the identification code is a code transmitted in an RF signal). *Id.*, 9-11, 13; *see also id.*, 15 (acknowledging that “*any person* can visually identify an aircraft in a low altitude flight”) (emphasis added).

The ’153 Provisional provides no discussion of securing the identification codes (*e.g.*, by using encryption) or any other piece of information. Accordingly, the ’153 Provisional does not provide written description support of Claim 21’s recitation of “the radio communication module is configured to utilize a secure identifier,” so Claim 21 is not entitled to the ’153 Provisional’s June 12, 2015 priority date.

2. The ’959 Patent is not entitled to claim priority to the ’071 Application.

The ’959 Patent is not entitled to claim priority to the ’071 Application’s June 10, 2016 filing date for at least two reasons. First, the ’959 Patent fails to meet 35 U.S.C. §120’s requirement of containing a specific reference to the ’071

Application. Second, the subject matter of Claim 21 was not disclosed in the '071 Application in the manner required by 35 U.S.C. §112.

a) The '959 Patent's priority chain is broken because the intermediate '451 Patent is incorrectly identified as a continuation of the '071 Application.

The '959 Patent's priority claim to the '071 Application, which was filed on June 10, 2016, must be disregarded, because the '959 Patent does not meet the requirements of 35 U.S.C. §120 for claiming priority thereto. To claim the benefit of an earlier filing date, Section 120 provides that a later-filed application is entitled to the benefit of the filing of an earlier-filed application if the later-filed application “contains or is amended to contain **a specific reference to the earlier filed application.**” 35 U.S.C. §120 (emphasis added). “‘Although §120 might appear to be a technical provision,’ courts have long-recognized that ‘it embodies an important public policy,’ and thus have required strict adherence to its requirements.” *Id.* at 1316 (quoting *Sampson v. Ampex Corp.*, 463 F.2d 1042, 1045 (2d Cir. 1972)).

37 C.F.R. §1.78—the regulation issued by the Patent and Trademark Office that implements 35 U.S.C. §§119 and 120—provides that the application claiming the benefit of one or more prior-filed co-pending nonprovisional applications must include “a reference to each such prior-filed application,” and indicate “the relationship of the applications, namely, whether the later-filed application is a

continuation, divisional, or continuation-in-part of the prior-filed nonprovisional application, international application, or international design application.” 37 C.F.R. 1.78 (d)(2). The Federal Circuit has interpreted this language to “require[] that the specific reference include each prior-filed application’s (1) application number; and (2) familial relationship.” *Droplets*, 887 F.3d at 1315 (interpreting similar language from the 2009 version of 37 C.F.R. §1.78). Further, the “specific reference” must state “the *correct* relationship between the applications.” See *Apple Inc. v. e-Watch, Inc.*, IPR2015-00414, Paper 34 at 16-18 (P.T.A.B. June 22, 2016) (emphasis added) (rejecting a priority claim in part because the priority claim misidentified itself as a divisional of the prior-filed application when it was not).

Finally, the Federal Circuit has held “that the ‘specific reference’ requirement mandates ‘each [intermediate] application in the chain of priority to refer to the prior applications.’” *Medtronic CoreValve, LLC v. Edwards Lifesciences Corp.*, 741 F.3d 1359, 1363 (Fed. Cir. 2014) (quoting *Encyclopaedia Britannica, Inc. v. Alpine Elecs. of Am., Inc.*, 609 F.3d 1345, 1352 (Fed. Cir. 2010)) (rejecting priority claim because intermediate applications failed to specifically reference earlier-filed applications in the priority chain).

The '959 Patent's priority chain contains a fatal error: it identifies the '451 Patent as a continuation of the '071 Application when it is in fact a continuation-in-part.

As discussed above, the '959 Patent purports to be a "[c]ontinuation of application No. 15/839,661, filed on Dec. 12, 2017, now Pat. No. 10,192,451 [(the "'451 Patent," EX1005)], which is a *continuation* of application No. PCT/US2016/037071 [(the "'071 Application," EX1006)] filed on Jun. 10, 2016." *Id.*, item (63) (emphasis added). Applicant made this benefit claim in the Application Data Sheet and Preliminary Amendment filed on December 10, 2018 as part of the '959 Patent's application package. *See* EX1002, 193 (December 10, 2018 Application Data Sheet), 204-205 (December 10, 2018 Preliminary Amendment); *see also* 37 C.F.R. 1.78 (d)(2) (requiring that benefit claims under 35 U.S.C. §120 "must be included in an application data sheet"). The '451 Patent is identified as a continuation of the '071 Application on its face (EX1005, item (63)), pursuant to Applicant's claim in the Application Data Sheet filed along with its application package (EX1016, 164), and in the supplemental Application Data Sheets filed during prosecution (*id.*, 106, 146). However, the '451 Patent should have been identified by applicant as a continuation-in-part of the '071 Application, because the '451 Patent introduces new material, such as that related to the use of a rotating service set identifier (SSID) for improving the security of communications

between the electronic identification box and the ground identification device. *See* 37 C.F.R. §1.121(f) (“No amendment may introduce new matter into the disclosure of an application.”); *see also PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1304 n.3 (Fed. Cir. 2008) (defining a continuation-in-part application).

The ’451 Patent discloses the use of “SSIDs conforming to the 802.11 standard as the mechanism of network packet identification” and explains that its disclosed system “implements a rotating SSID” to improve system security. EX1005, 11:10-17; *see also id.*, 1:48-57 (explaining underlying security concerns). The ’451 Patent dedicates more than a column of text to detail the design and implementation of the rotating SSID scheme. *See id.*, 10:64-12:10.

However, there is no disclosure of using SSIDs—or any other security mechanism—in the ’071 Application. The ’071 Application largely mirrors the ’153 Provisional. That is, the ’071 Application describes the use of an “electronic identification box” that (1) generates an identification code in the form of a color pattern sequence (as blinked by a light array) and/or a code transmitted as an RF signal and (2) communicates that code to a “ground identification device” for identifying a UAV/UAS associated with the electronic identification box. *See* EX1006, [7]-[17]. But it does not discuss using an SSID, or any other security mechanism or technique, to protect communications between the electronic identification box and the ground identification device. *See generally*, EX1006.

Accordingly, the '451 Patent's disclosure regarding the use of rotating SSIDs is new matter that was not present in the prior '071 Application, rendering the '451 Patent a continuation-in-part of the '071 Application. *See PowerOasis*, 522 F.3d at 1304 n.3. Thus, applicant's identification in the relevant application data sheets of the '959 and '451 Patents of the '451 Patent as a continuation, rather than a continuation-in-part, of the '071 Application is incorrect, so '959 and '451 Patents do not satisfy Section 120's "specific reference" requirement with regard to their priority claims to the '071 Application and cannot claim the '071 Application's June 10, 2016 priority date. *See Medtronic*, 741 F.3d at 1363; *see also Apple*, IPR2015-00414, Paper 34 at 16-18.

b) Claim 21 is not entitled to claim priority to the '071 Application.

Even if the '959 Patent's priority chain was not broken by the incorrect identification as a continuation of the '071 Application, the '959 Patent's priority claim as a continuation to the '071 Application must be disregarded because the "secure identifier" subject matter of Claim 21 was not disclosed in the manner required by 35 U.S.C. §112 in the '071 Application for the same reasons discussed above with reference to the '153 Provisional. That is, like the '153 Provisional, the '071 Application:

- does not use the term "identifier" at all (*see generally* EX1006);

- merely discloses the use of an “identification code” implemented as either a color pattern or a code transmitted via RF signals (*id.*, [7]-[17]);
- includes no discussion of “securing” anything, let alone identifiers, and even suggests that the disclosed identification codes (to the extent these are interpreted as “identifiers,” which Petitioners do not concede) are *not* secure (*see* EX1006, [9] (explaining that when the identification code is implemented as a color pattern, “a person [can] visually identify an aircraft from a distance of about 500 feet, without the use of any special equipment”). *See also supra*, III.C.1.

Thus, the ’071 Application provides no discussion of securing the identification codes (*e.g.*, by using encryption) or any other piece of information. Accordingly, the ’071 Application does not provide written description support of Claim 21’s recitation of “*the radio communication module is configured to utilize a secure identifier*,” so Claim 21 is not entitled to the ’071 Application’s June 10, 2016 priority date.

Because (1) the ’153 Provisional and the ’071 Application lack adequate support for the “secure identifier” limitation recited in Claim 21 of the ’959 Patent and (2) the ’959 and ’451 Patents do not adequately claim priority to the ’071 Application, the earliest possible priority date for this claim is October 1, 2017, the

filing date of U.S. Provisional Application No. 62/566,450, to which the '959 and '451 Patents claim priority.³

IV. SUMMARY OF PRIOR ART

A. *Beard (EX1008)*

Beard is a U.S. Patent filed February 26, 2018, as App. No. 15/905,340, and issued on August 4, 2020. EX1008. *Beard* claims priority to U.S. Provisional Application No. 62/480,031 (EX1009, “*Beard Provisional*”) filed on March 31, 2017. *Beard* properly claimed benefit to (EX1008, item (60)), was filed copending with (*id.*, item (22)), and shared a common inventor with (*id.*, item (72)) *Beard Provisional*. See AIA 35 U.S.C. §102(d); MPEP §2154.01(b). Also, the subject matter relied upon in *Beard* is disclosed in *Beard Provisional*. See MPEP §2154.01(b).

Dynamic Drinkware does not apply. See *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1379-80 (Fed. Cir. 2015). The Board has determined that, “for prior-art determinations under AIA §102, ‘there is no need to evaluate whether any claim of [a reference] patent document is *actually entitled to priority* or benefit under 35 U.S.C. 119, 120.’” See, e.g., *Penumbra, Inc. v.*

³ While Petitioners apply the priority date of U.S. Provisional Application No. 62/566,450, Petitioners do not concede that it supports the SSID-related disclosures of the '959 and '451 Patents.

RapidPulse, Inc., IPR2021-01466, Paper 34 (P.T.A.B. March 20, 2023) (precedential), at 32 (emphasis original; citing MPEP §2154.01(b); holding that the requirement in *Dynamic Drinkware* (that under pre-AIA 35 U.S.C. §102(e), a reference patent’s claims must have written description support in its provisional application in order to be entitled to the filing date of the provisional application) does not apply to AIA 35 U.S.C. §102(d)); *see also Apple Inc. v. Telefonaktiebolaget LM Ericsson*, IPR2022-00341, Paper 10 (P.T.A.B. Sept. 14, 2022), at 19.

Thus, for prior art purposes, *Beard* was effectively filed on March 31, 2017. As discussed above, the ’959 Patent is entitled to a priority date no earlier than October 1, 2017. *Supra*, III.C. Accordingly, *Beard* qualifies as prior art under AIA §102(a)(2). Like the ’959 Patent, *Beard* describes a “remote identification (RID) device attachable to an unmanned aircraft system (UAS) [that] encodes identifier signals based on a unique identifier of the UAS and position data, e.g., the current and originating (launch) positions of the UAS, and transmits encoded data signals receivable and decodable by specially configured receiver devices in range.” EX1008, Abstract; EX1009, 3 (describing overall functionality of RID device), 7-8, 11 (describing use of “digital signature” to secure communications against spoofing). Thus, *Beard* is from the same field of art as the ’959 Patent and

describes an identification device that is similar to the device described in the '959 Patent. EX1003, ¶122.

B. *Taveira (EX1010)*

Taveira is a U.S. Patent Application Publication filed on January 29, 2015 and published on September 1, 2016. *Taveira* is thus prior art to the '959 Patent at least under 35 U.S.C. §102(a)(2) even if Claim 21 of the '959 Patent is entitled to the '153 Provisional's June 12, 2015 priority date (which it is not).

Taveira discloses “drone 100” that has a “control unit 110” that includes “a processor 120, a radio module 130, and a power module 150.” EX1010, [0054]. “[T]he processor of the drone 100 may provide drone information,” such as “a drone identifier,” to other devices. *Id.*, [0110], [0117]. The drone identifier can be a “unique identifier (ID)” that “may allow the drone to be identified by network components, such as servers..., beacons..., other drones, and so on.” *Id.*, [0168]. Thus, *Taveira* is from the same field of art as the '959 Patent and describes an identification device that is similar to the device described in the '959 Patent. EX1003, ¶103.

C. *Wang (EX1011)*

Wang is an international application published under the Patent Cooperation Treaty filed on November 21, 2014 and published on May 26, 2016. *Wang* is thus prior art to the '959 Patent at least under 35 U.S.C. §102(a)(2) even if Claim 21 of

the '959 Patent is entitled to the '153 Provisional's June 12, 2015 priority date (which it is not).

Wang discloses that wireless communications between a base station 300 and a UAV 201 are encrypted, and that “suitable encryption methods” include “SSID hiding” and “MAC ID filtering.” EX1011, [0160], Fig. 1. Thus, *Wang* is in a field of art—encrypting wireless communications between a UAV and remote device—that is highly relevant to the '959 Patent, which describes securing wireless communications between a drone/UAV and other device. EX1003, ¶105.

D. *Gong* (EX1012)

Gong is an international application published under the Patent Cooperation Treaty filed on March 31, 2015 and published on October 6, 2016. *Gong* is thus prior art to the '959 Patent at least under 35 U.S.C. §102(a)(2) even if Claim 21 of the '959 Patent is entitled to the '153 Provisional's June 12, 2015 priority date (which it is not).

Gong discloses a UAV that includes a “flight control unit 410,” which comprises “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.” EX1012, [0233], [0235]-[0236].

Thus, *Gong* is highly relevant to the '959 Patent, as it describes a system for identifying a drone/UAV to external devices, as is taught by the '959 Patent. EX1003, ¶109.

E. *Qi (EX1013)*

Qi is a U.S. Patent Application Publication published on filed on December 24, 2014 and published on May 5, 2016. *Qi* is prior art at least under 35 U.S.C. §102(a)(2) even if Claim 21 of the '959 Patent is entitled to the '153 Provisional's June 12, 2015 priority date (which it is not). *Qi* teaches a system for periodically updating an SSID used in wireless communications, which may increase the security of the SSID. EX1013, [0168]-[0170]. Thus, *Qi* is in a field of art—updating SSIDs used in wireless communications to improve the security of those communications—that is highly relevant to the '959 Patent, which similarly describes rotating SSIDs over time. EX1003, ¶111.

F. *Wang-II (EX1014)*

Wang-II is an international application published under the Patent Cooperation Treaty filed on January 14, 2014 and published on April 2, 2015. *Wang-II* is thus prior art to the '959 Patent at least under 35 U.S.C. §§ 102(a)(1) and 102(a)(2) even if Claim 21 of the '959 Patent is entitled to the '153 Provisional's June 12, 2015 priority date (which it is not). *Wang-II* discloses a “communication terminal 1200” capable of bi-directional wireless communication

that “includes an uplink receiver 1204, a downlink transmitter 1202, and an antenna 1206.” EX1014, [00141].

G. Summary of Grounds

Ground	Claim	Basis (35 U.S.C. §)	Prior Art
1	21	103	<i>Beard</i>
2	21	103	<i>Taveira, Wang, Gong</i>
3	21	103	<i>Taveira, Qi, Gong</i>
4	21	103	<i>Gong, Wang-II</i>

EX1003, ¶37; EX1015 (listing challenged claim elements).

V. LEVEL OF ORDINARY SKILL

A POSITA would have either (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. EX1003, ¶47.

VI. CLAIM CONSTRUCTION

Claim terms in IPR are construed according to their “ordinary and customary meaning” to those of skill in the art. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*); 37 C.F.R. §42.100(b). Constructions are proposed “only to the extent necessary.” *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*,

868 F.3d 1013, 1017 (Fed. Cir. 2017). For the purposes of this proceeding and the grounds presented herein, Petitioners do not present any constructions. EX1003, ¶80.

VII. INSTITUTION IS PROPER

A. *The Fintiv Factors Favor Institution under §314(a)*

The factors described in *Apple, Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (P.T.A.B. May 13, 2020) (Precedential) (“*Fintiv-I*”) favor institution. Notably, the merits of this Petition are particularly strong, with compelling art and arguments.

A stay motion has not yet been filed in the Airspace Litigation, but Petitioners intend to file one. The Board has treated related factors as neutral after declining to speculate on the outcome of a stay motion. *See, e.g., HP Inc. v. Slingshot Printing LLC*, IPR2020-01084, Paper 13 at 9 (P.T.A.B. Jan. 14, 2021).

The Airspace Litigation is just beginning. The district court has not set a trial date—or any deadlines—in the Airspace Litigation, which “weighs significantly against” exercising the Board’s discretion to deny institution. *Google LLC v. Uniloc 2017 LLC*, IPR2020-00755, Paper 14 (P.T.A.B. Oct. 15, 2020) (citing *Oticon Med. AB v. Cochlear Ltd.*, IPR2019-00975, Paper 15 (P.T.A.B. Oct. 16, 2019) (precedential).

Relatedly, the parties’ and the district court’s investment in the Airspace Litigation has been minimal. *Fintiv-I*, Paper 11 at 11. The district court has yet to

rule on plaintiff's Rule 12(b)(6) motion to dismiss, no part of claim construction has occurred, no claim-by-claim infringement contentions have been provided, and the related district court litigation does not yet have scheduling order.

“[I]t is often reasonable for a petitioner to wait to file its petition until it learns which claims are being asserted against it in the parallel proceeding.” *Fintiv-I* at 11. Here, Petitioners promptly filed this Petition against Claim 21 of the '959 Patent before receiving infringement contentions. The “diligent” filing favors institution. *See, e.g., Corning v. Dali Wireless*, IPR2021-00762, Paper 8 at 9-10 (P.T.A.B. October 31, 2021) (crediting petitioner's diligent filing of the petition approximately four months after receiving infringement contentions).

B. *Institution is Proper under §325(d)*

None of the prior art references relied on herein appear on the face of the '959 Patent. One reference identified on the face is “WO 20160154948” in item (56), and applicant identified this foreign application as issued to “GONG MING” in a March 26, 2019 Information Disclosure Statement. *See* EX1002, 151-152. But this patent number appears to be in error, as Petitioners are unable to locate a document with that identification number. It is one digit off from *Gong*'s publication number (“WO 20160154948” compared with “WO 20160154949”). Thus, there is no clear indication that *Gong* was considered by the Examiner. But even if it was considered, *Gong* was not used in a rejection of the claims, as the

only Office Action issued against the '959 Patent did not include a prior art rejection. EX1002, 111-120; EX1003, ¶68. The Board has declined to exercise its discretion to deny institution in situations where the petitioner relied upon prior art that was cited on the face of the challenged patent, but was “not applied by the examiner ... in any rejection of claims.” *Comcast Cable Communs., LLC v. Promptu Sys. Corp.*, Case No. IPR2018-00342, Paper 13 at 17 (P.T.A.B. July 19, 2018).

VIII. THE CHALLENGED CLAIM IS UNPATENTABLE

A. *Ground 1: Beard Renders Obvious Claim 21*

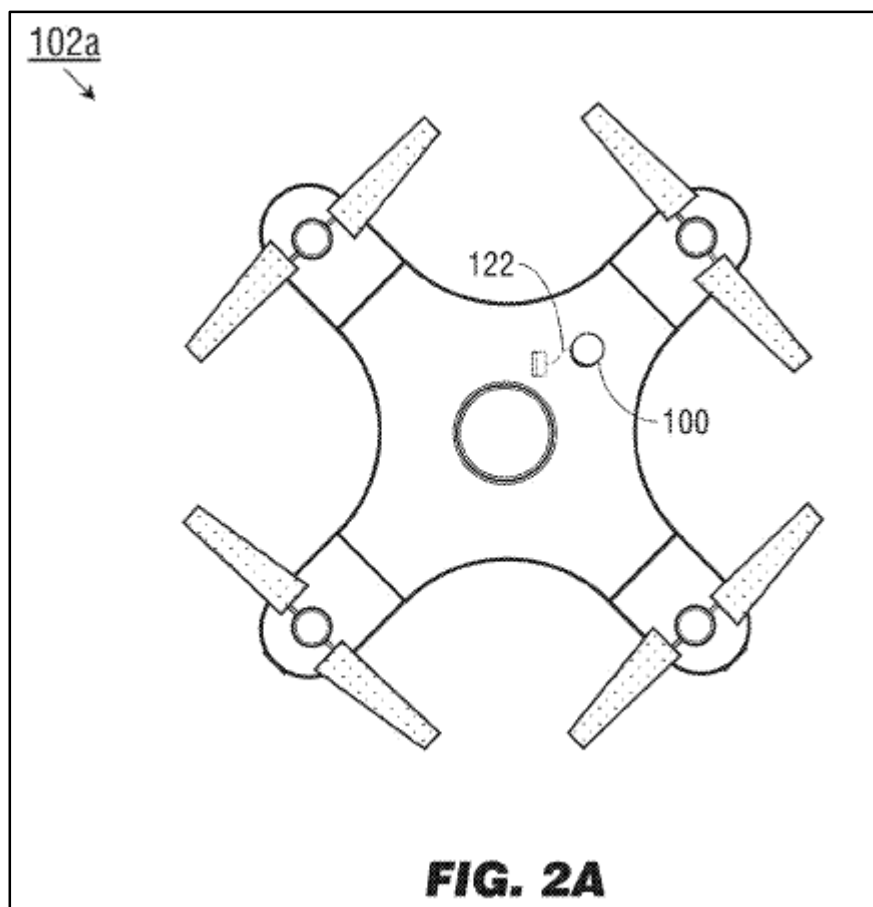
1. Claim 21

a) 21[p]: A device configured to communicate identification information associated with a low-altitude aircraft, the device comprising:

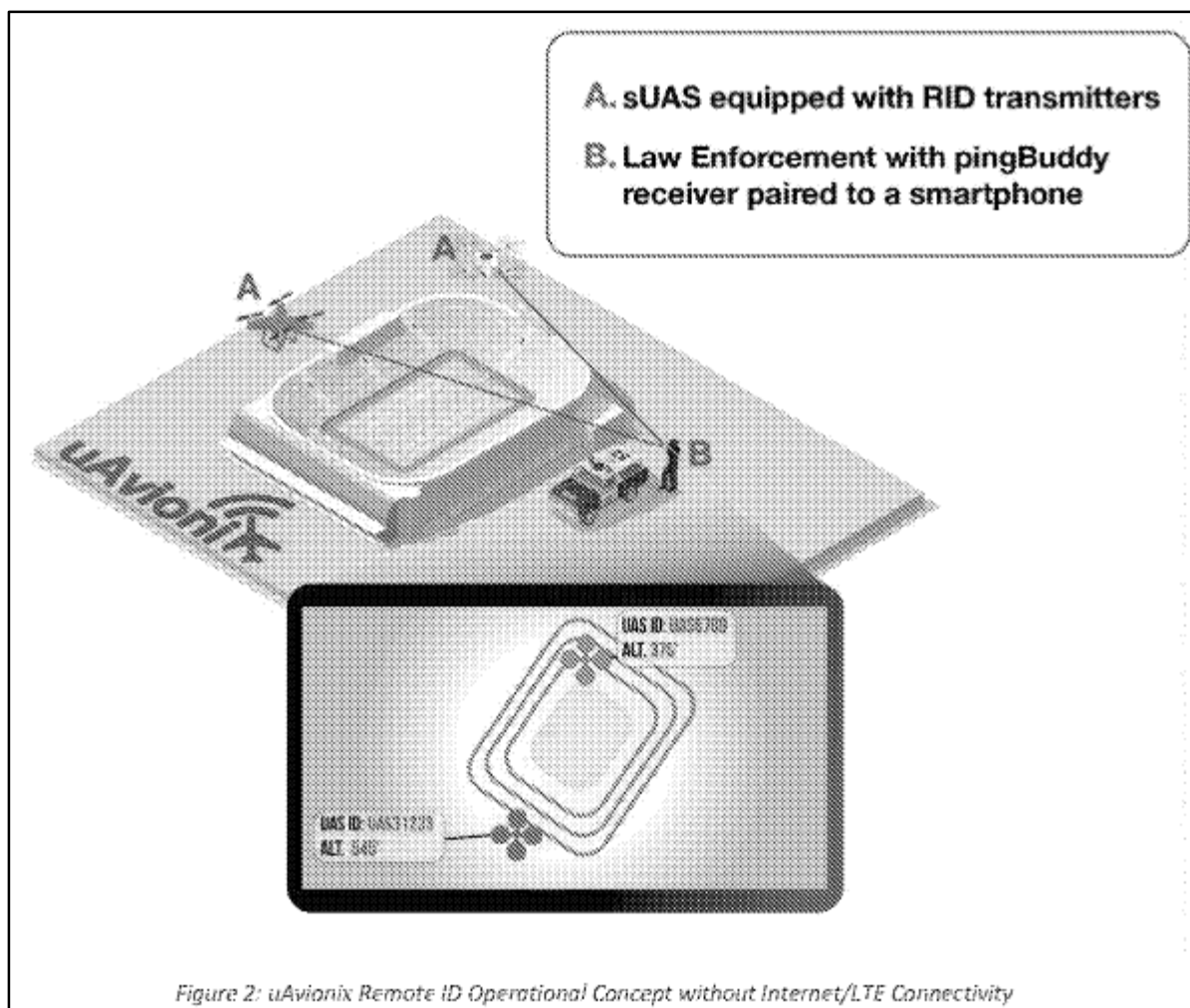
To the extent the preamble is limiting, *Beard* discloses the preamble. *Beard* describes “a direct-broadcast remote identification (RID) device attachable to an unmanned aircraft system (UAS) encodes identifier signals based on a unique identifier of the UAS and position data, . . . and transmits encoded data signals receivable and decodable by specially configured receiver devices in range.” EX1008, Abstract; *see also id.*, 4:61-5:7; EX1009, 3 (“The primary purpose of the RID solution is for law enforcement or security personnel to remotely identify the sUAS aircraft and operator through a number of key parameters to be transmitted from an RID transmitter onboard the sUAS and received by receivers which may

be handheld, permanently mounted, onboard other aircraft, or anywhere within range of the RID transmitter. . . . Data items transmitted from the sUAS RID would include at a minimum the FAA UAS registration number and sUAS position.”), 4 (“Airborne RID transmitter which broadcasts sUAS position and operator identifying data.”).

Further, *Beard*’s “UASs” are “low-altitude aircraft.” First, *Beard*’s device is directed to solving the challenge of “[r]egulating the operations of drones, rotorcraft, multicopters, and other unmanned aircraft systems (UAS; also small UAS, or sUAS),” and generally depicts the UASs as drones, all of which are devices well-known to be “low altitude aircraft.” EX1008, 2:22-23; EX1009, 2 (describing development of “components for sUAS communications, navigation, and surveillance (CNS)”); EX1003, ¶115.



EX1008, Fig. 2A (depicting UAS 102a as a 4-rotor drone); *see also id.*, Fig. 3



EX1009, Figure 2 (depicting “sUAS equipped with RID transmitters” as 4-rotor drones); *see also id.*, Fig. 3. This understanding of *Beard*’s UASs as “low altitude aircraft” is consistent with the ’959 Patent, which acknowledges that a “drone” is an example of a “low altitude aircraft.” *See* EX1001, 12:61-62.

Second, *Beard*’s system interfaces with “unified threat management (UTM) providers (150; e.g., PrecisionHawk Low Altitude Tracking and Avoidance System (LATAS),” which further shows that *low altitude aircraft* are subject to *Beard*’s

system. EX1008, 9:35-44, Fig. 5A; EX1009, 6 (describing system integration with LATAS platform).

Accordingly, *Beard*'s RID device, which communicates identification information associated with drones, rotorcrafts, and multicopters ("*low-altitude aircraft*") teaches the preamble.

b) 21[a]: a radio frequency communication antenna;

Beard's RID device may use for wireless communications "[d]esignated ADS-B frequencies, e.g., 978 MHz (Universal Access Transceiver, or UAT), 1090 MHz (Extended Squitter, or ES), and 1104 MHz," (EX1008, 6:23-25; EX1009, 2 (describing operation "within the ADS-B and Mode A/C/S protected aviation spectrum frequencies)), and "[s]elected frequencies within the United States industrial, scientific, and medical (ISM) radio bands, e.g., 315 MHz, 433 MHz, and 915 MHz (generally associated with garage-door openers, keyless entry systems, and cordless landline telephones respectively)" (EX1008, 6:56-60; EX1009, 2 (describing operation "in open industrial, scientific, and medical (ISM) radio bands applicable in the US and internationally.")). A POSITA would have understood that to communicate across these radio frequencies, *Beard*'s RID device would comprise an antenna ("*a radio frequency communication antenna*") capable of transmitting and receiving signals on these radio frequencies. EX1003, ¶118. Accordingly, *Beard* teaches "*a radio frequency communication antenna.*"

In the alternative, it would have been obvious to a POSITA that *Beard*'s RID device comprises an antenna element capable of transmitting and receiving signals on ADS-B and ISM radio bands in view of *Beard*'s disclosure of communicating on those bands, as an antenna element would have been an obvious component available to a POSITA for performing such communications. *Id.*, ¶119 (explaining that antennas were well-known components in radio communications that convert electric current into radio waves (and vice versa)). Accordingly, “a radio frequency communication antenna” is also rendered obvious by *Beard*. *Id.*

c) 21[b]: a radio communication module coupled to the radio frequency communication antenna and configured to transmit identification information associated with the low-altitude aircraft through a transmitted radio signal,

As discussed above with reference to Limitation 21[a], *Beard* discloses that its RID device utilizes various radio bands to communicate. EX1008, 6:23-25, 6:56-60; EX1009, 2; *supra*, VIII.A.1.(b). *Beard* further discloses “an RF transceiver,” which is the component that performs wireless communication for the RID device. EX1008, 3:9-19; EX1009, 2, 9 (noting that the “RID Hardware” comprises “transmitters and receivers”), 11 (“The RID product in its base form will include the following: . . . 10mW (suggested) Transmit/Receive radio on TBD frequency.”); EX1003, ¶120 (fn. 3) (explaining that a POSITA would have understood that *Beard Provisional*'s “transmitters and receivers” that make up the “RID hardware” teach *Beard*'s “transceiver,” because a “transceiver” is a

“transmitter/receiver” component of radios). Accordingly, *Beard*’s “RF transceiver” discloses “*a radio communication module*” that is “*configured to transmit...through a transmitted radio signal.*”

As discussed above with reference to Limitation 21[a], *Beard* discloses, or at least renders obvious, “*the radio frequency communication antenna*” in view of *Beard*’s disclosures regarding communicating wirelessly over various radio frequency bands. *See supra*, VIII.A.1.(b). It would have been obvious to a POSITA that *Beard*’s RF transceiver (“*radio communication module*”) is “*coupled to*” the antenna to fulfil the RF transceiver’s role in performing wireless communication for the RID device. EX1003, ¶121 (explaining that antennas were well-known components that convert electric currents to radio waves (and vice versa) and would have been electrically connected to a transceiver’s transmitter and receiver elements to facilitate radio communication). Accordingly, *Beard* renders obvious “*a radio communication module coupled to the radio frequency communication antenna.*”

Further, *Beard* teaches that its RF transceiver is “*configured to transmit identification information associated with the low-altitude aircraft*” at least through its disclosure of the transceiver transmitting identification data that identifies an associated UAS via an identifier signal. *Beard* teaches that transceiver 110 “may include processors . . . for encoding direct-broadcast

identifier signals based on . . . identification data stored to memory (106) when the RID device 100 is configured for use with a particular UAS. The stored identification data, . . . uniquely identifies the UAS 102 to any receivers (120) equipped to receive and decode transmitted identifier signals.” EX1008, 5:33-51; EX1009, 3 (disclosing that the sUAS RID device transmits “[d]ata items” that include “the FAA UAS registration number and sUAS position,” which are used to “remotely identify the sUAS aircraft and operator”). Because *Beard*’s “identification data” identifies a UAS to receivers, the identification data discloses “*identification information associated with the low-altitude aircraft.*”

Accordingly, *Beard* teaches Limitation 21[b].

d) 21[c]: wherein the radio communication module is configured to receive a received radio signal and store the information in a storage,

Beard explains that its RF transceiver (*i.e.*, “*radio communication module,*” *see supra*, VIII.A.1.(c)) 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 (describing that the RID device “is both a transmitter and a receiver” that performs “two way communications,” where the device can “act as a ‘repeater’ for other RID devices which may be out of range of a ground receiver,” where “[s]ignals from each RID

device would be intelligently rebroadcast by other airborne RID devices”). And as discussed above with reference to Limitations 21[a]-[b], *Beard* discloses that its RID devices can communicate on different radio frequencies. *See supra*, VIII.A.1.(b)-(c). Accordingly, *Beard* teaches a “*radio communication module [that] is configured to receive a received radio signal.*”

Further, *Beard* teaches “*stor[ing] the information in a storage.*” First, to the extent “*the information*” is interpreted to refer to the “*identification information associated with the low-altitude aircraft*” recited in Limitation 21[b],⁴ *Beard* discloses that its RID device can “store[] to memory” the “current position of the UAS 102 and identification data” of the UAS associated with the RID device. EX1008, 5:44-46; *see also id.*, 7:45-47 (“the memory 106 of the RID device 100

⁴ This interpretation is consistent with Patent Owner’s own interpretation of the claim, as indicated in both the complaint and Patent Owner’s briefing in the Airspace Litigation. *See* EX1017, ¶82 (“It is also configured to ‘*store the information in a storage,*’ which is to say the identification information discussed for claim element 21.b, . . .”); EX1018, 5 (“Claim 21 recites . . . (b) a radio communication module coupled to the radio frequency communication antenna and configured for (i) transmission of identification information associated with the low-altitude aircraft through a transmitted radio signal that is stored aboard the UAV; . . .”).

may serve as an ad hoc black box data recorder, storing data regarding the UAS 102”); EX1009, 11 (“The RID product in its base form will include the following: . . . Persistent memory for configuration storage”), 15; EX1003, ¶125 (explaining that a POSITA would have understood that a “black box” was a well-known term of art that refers to an electronic recording device that stores data of an aircraft, which can be used to help identify an aircraft and retrieve a sequence of events in recent flight history in the case of accidents to assess the cause of an accident).

Second, to the extent “*the information*” is interpreted to refer to information associated with the “*received radio signal*” recited in limitation 21[c], *Beard* discloses that “the 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.***” EX1008, 7:45-48 (emphasis added); *see also id.*, 7:48-51; EX1009, 15 (disclosing that the black box data recorder stores data associated with both the “host aircraft sUAS, ***as well as data regarding nearby sUAS (leveraging the onboard receiver)***” (emphasis added)); EX1003, ¶126 (explaining that a POSITA would have understood that “data regarding nearby sUAS” stored in the Black Box Data Recorder would include, for example, data identifying the nearby sUAS as received by the RID device).

Accordingly, *Beard* discloses storing information it receives from other UASs via radio signals.

Thus, *Beard* teaches Limitation 21[c].

e) 21[d]: wherein the radio frequency communication antenna is coupled to the low-altitude aircraft and

As discussed above with reference to Limitation 21[a], *Beard* discloses, or at least renders obvious, that its RID device includes an antenna for communicating across various radio frequency bands. *Supra*, VIII.A.1.(b). Further, that RID device is “attachable and connectible to a UAS 102.” EX1008, 5:9-10; EX1009, 5 (“the RID transmitter may be integrated tightly into the sUAS aircraft, or carried as a separate ‘stick on’ solution”), 11. Accordingly, *Beard* discloses, or at least renders obvious, coupling an antenna (“*the radio frequency communication antenna*”) to its UAS (“*the low-altitude aircraft*”).

f) 21[e]: the radio communication module is configured to utilize a secure identifier,

As discussed above with reference to Limitation 21[b], *Beard* discloses that its RF transceiver (“*the radio communication module*,” *see supra*, VIII.A.1.(c)) transmits position data and identification information (an “*identifier*”) in “direct-broadcast identifier signals.” *See supra*, VIII.A.1.(c). *Beard* further discloses that the identifier signals include “digital signatures encoded into the identifier signals,” which, when received by a receiving device, are validated to verify the identity of

the source of the identifier signal (*i.e.*, the transmitting UAS). EX1008, 3:30-36 (“The receiver device includes . . . cryptographic keys for verifying digital signatures encoded into the identifier signals (e.g., verifying the identity of a transmitting UAS).”), 8:39-42, 9:8-12; EX1009, 7-8 (describing that a receiving device makes available the data received in an RID transmission, “including at a minimum the FAA registration ID, digital signature, and position information of the sUAS”), 11 (describing use of “anti-spoofing digital signature”).

A POSITA would have understood that the encoded Identifier signals, and the identification information included therein, is “*secure*” because a receiving device needs a “private” or “cryptographic” key to decode the signature, which “secures” access to the identification information from parties that do not hold the appropriate private/cryptographic key. *See* EX1008, 3:30-36, 8:39-42, 9:8-12; EX1009, 7-8; EX1003, ¶130. Accordingly, *Beard* teaches that RF transceiver (“*the radio communication module*”) is configured to broadcast (“*is configured to utilize*”) the identification information as secured by the digital signature (“*a secure identifier*”).

g) 21[f]: and the radio communication module is configured for two-way communication with a remote portable detection system;

Beard’s RF transceiver (“*the radio communication module*”) transmits identifier signals to “any receivers (120) equipped to receive and decode

transmitted identifier signals.” EX1008, 5:41-57; EX1009, 5-6 (describing operation of a “portable receiver” that “allow[s] security personnel to receive the RID signal”). Such receivers can also “command a directly integrated RID device 100c (e.g., aboard the UAS 102f) to perform various functions,” by “remotely transmit[ting] commands to the control system (118, FIG. 1) of the UAS 102f.” EX1008, 10:12-20; EX1009, 5 (describing that the “portable receiver would allow security personnel to receive the RID signal”), 15 (explaining that the “RID device is both a transmitter and receiver,” which “enables authorized security personnel to send a signal to the RID to command the autopilot to perform any number of functions”).

Thus, *Beard*’s disclosure of its RF transceiver both transmitting identifier signals to and receiving command signals from a receiver teaches “*the radio communication module is configured for two-way communication with*” the receiver.

Further, *Beard*’s receiver is “*a remote portable detection system.*” The receiver can be, for example, a “portable communications or computing device (e.g., a smartphone or tablet) carried by authorized personnel.” EX1008, 7:11-17; EX1009, 3 (describing receivers as “portable in nature”), 4 (describing “Ground based RID receivers” as, for example “pocket-sized mobile receivers for roaming security personnel”). And the function of the receiver is to receive identifier

signals transmitted by RID devices and display the information contained therein, including the identification data of the associated UAS and the UAS's position data. EX1008, 9:67-10:12; EX1009, 4-6. Accordingly, *Beard*'s receiver operates as a system for detecting and identifying UASs within its range. EX1003, ¶133.

Thus, *Beard* teaches Limitation 21[f].

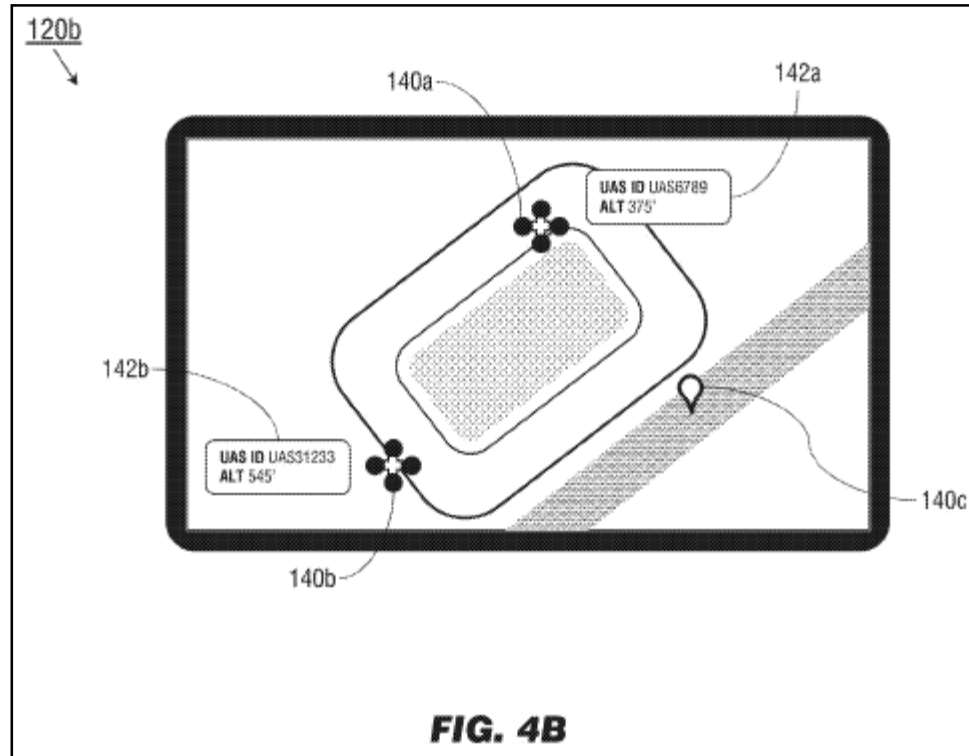
h) 21[g]: and wherein the device is coupled to the low-altitude aircraft and

As discussed above with reference to Limitation 21[d], *Beard*'s RID device (*"the device"*) is "attachable and connectible to a UAS 102" (*"is coupled to the low-altitude aircraft"*). *Supra*, VIII.A.1.(e) (citing EX1008, 5:9-10; EX1009, 5, 11). For at least the same reasons, *Beard* discloses Limitation 21[g].

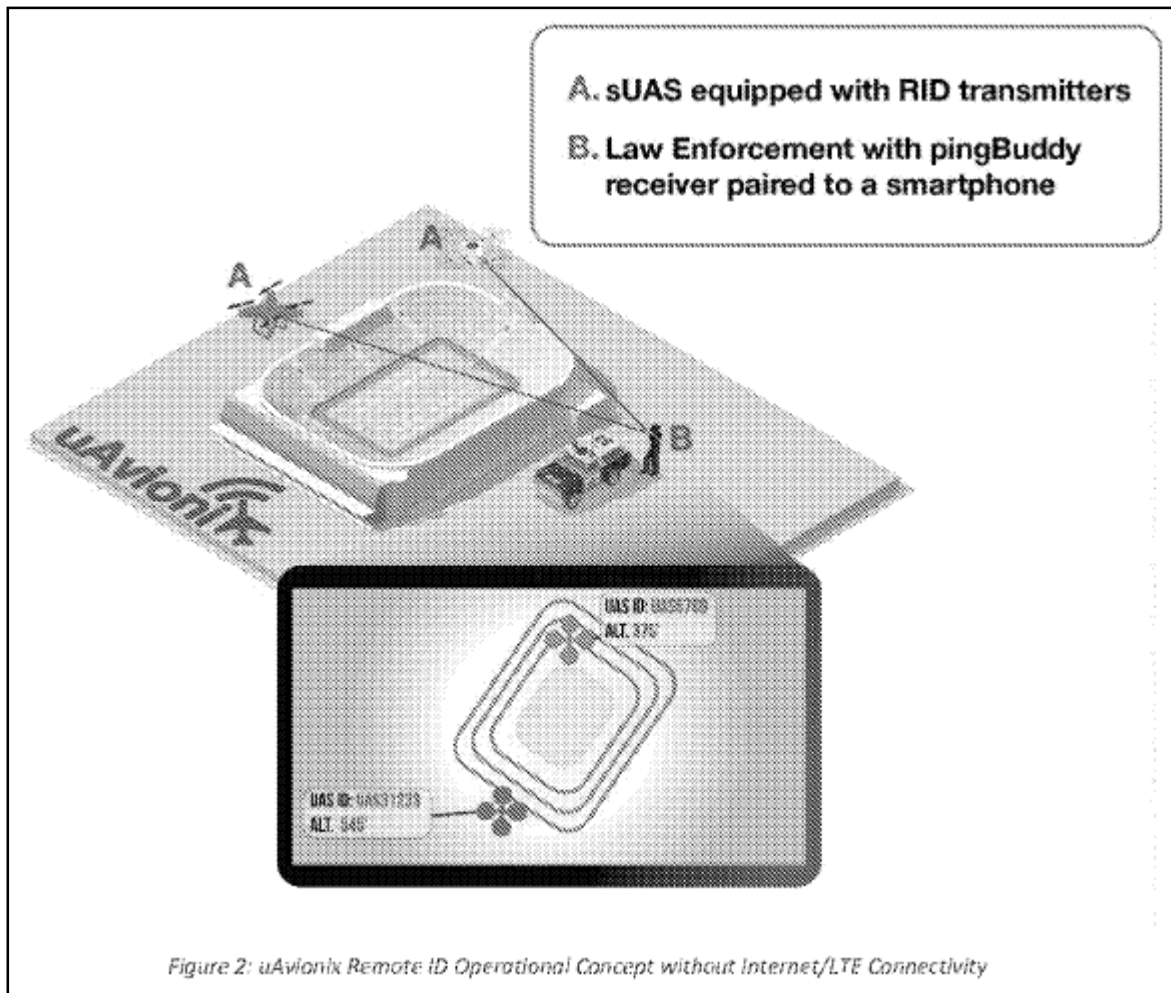
i) 21[h]: the remote portable detection system includes a user interface configured to provide to a user, information associated with a plurality of different low-altitude aircrafts detected by the remote portable detection system.

Beard discloses that "receiver device 120a may include onboard processors (130) and memory (132) as well as a display surface (134) for displaying identifier and position data decoded from identifier signals transmitted by RID device (100a) aboard a proximate UAS 102b." EX1008, 8:28-32; EX1009, 4 ("Mobile app or apps which can operate in an internet denied or internet available environments to provide sUAS position and operator identifying information to viewer"), 5-7 (describing process of transferring received sUAS data from the mobile receiver to

a mobile application for display). Figure 4B of *Beard* and Figure 2 of *Beard Provisional*, copied below, depict such display of received UAS data:



EX1008, Fig. 4B.



EX1009, Fig. 2. As shown, the mobile displays depict the device ID (e.g., “UAS ID”) and altitude (e.g., “ALT”) of multiple detected UASs.

Accordingly, *Beard*’s receivers and associated mobile devices (“*the remote portable detection system*”) display to a user (“*provide to a user*”) at least the device identification and position data of UASs whose identifier signals are received by the receivers (“*information associated with a plurality of different low-altitude aircrafts detected by the remote portable detection system*”).

B. Ground 2: The Combination of *Taveira*, *Wang*, and *Gong* Renders Obvious Claim 21

1. Motivation to Combine

a) *Taveira* with *Wang*

Taveira discloses a system for controlling drone operation wherein a drone is configured for “bi-directional” wireless communication such that the drone may transmit information to, and receive information from, other devices. *Id.*, [0057]. For example, *Taveira* teaches that the drone may transmit “drone information,” such as “a drone identifier,” to a wireless communication device. EX1010, [0110], [0117]. And the drone may receive a radio frequency (RF) signal from an “RF emitter,” where the received signal includes a “unique identifier” such as a “service sector identification (SSID), a media access control (MAC) address, radio station call sign, [or] cell ID.” EX1010, [0056]. *Wang* discloses that wireless communications between a base station 300 and a UAV 201 are encrypted, and that “suitable encryption methods” include “SSID hiding” and “MAC ID filtering,” for example. EX1011, [0160], Fig. 1. *Wang* explains that such encryption “may be advantageous for secure flight task applications.” *Id.*, [0160].

A POSITA would have been motivated to combine *Taveira* and *Wang* such that the wireless communications involving *Taveira*’s drone are encrypted as taught by *Wang* (e.g., using “SSID hiding” and “MAC ID filtering”). A POSITA would have been motivated to combine these references for several reasons.

First, both *Taveira* and *Wang* references are directed to drone technologies and wireless communication involving drones. EX1010, [0057]; EX1011, [0160]. Accordingly, a POSITA seeking to implement the system taught by *Taveira* would look to other references that describe techniques for facilitating wireless communications with a drone, such as *Wang*. EX1003, ¶140.

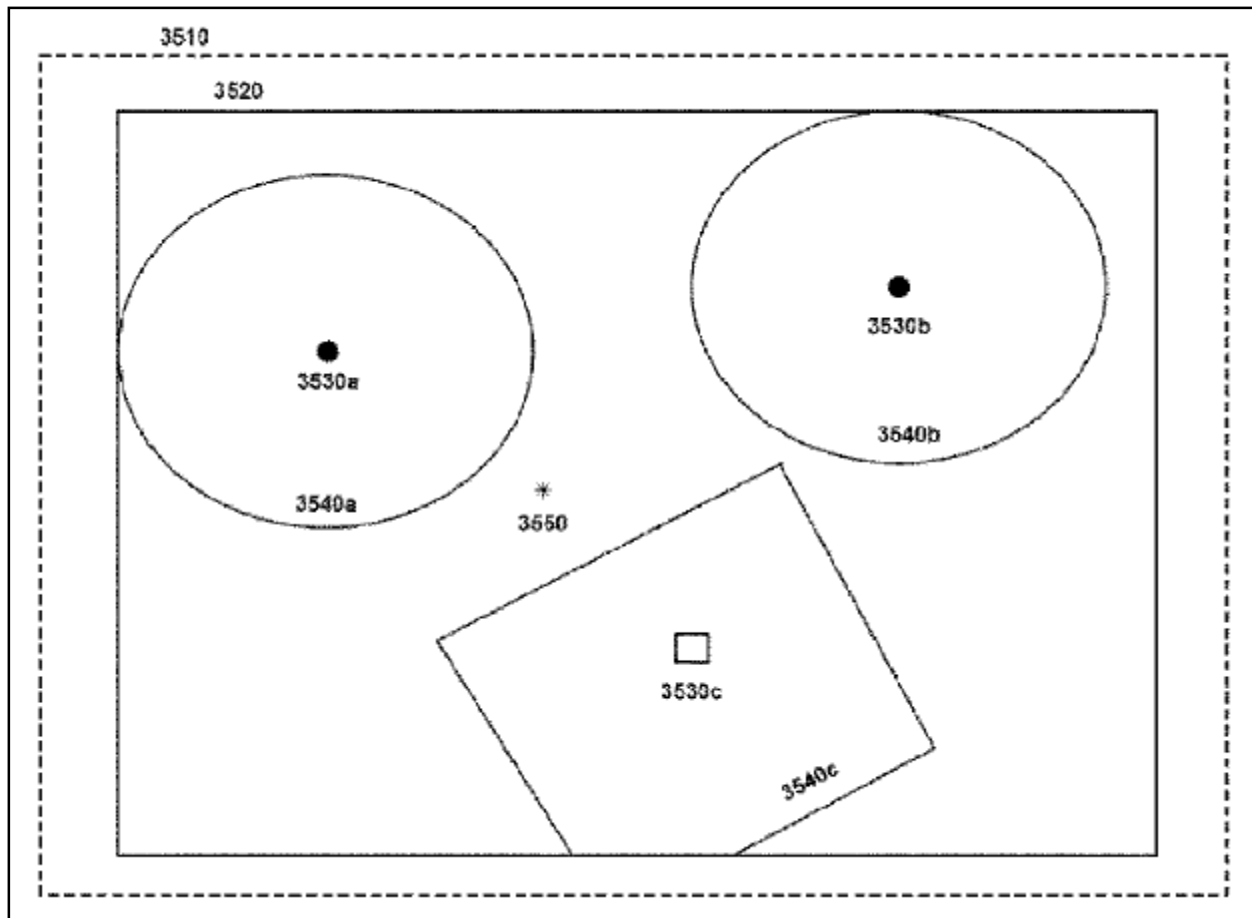
Moreover, *Taveira* itself provides a motivation to combine with *Wang*'s encryption techniques, explaining that because drones are "conspicuous," they may be "vulnerable to tampering," intercepting, interfering, or hijacking during flight. EX1010, [0002]. Further, *Taveira* suggests that "identifying information may also be encoded to prevent or discourage tampering or spoofing." See EX1010, [0091]. Thus, a POSITA would have sought out various solutions to prevent the described tampering and interfering, and an obvious and known solution would be to encrypt signals involved in wireless communications with a drone as taught by *Wang* to prevent unauthorized access to and use of the information contained in such signals. EX1003, ¶141.

Further, combining *Wang*'s teachings regarding encrypting wireless communications between a UAV and another device with *Taveira*'s drones that are configured for wireless communications is merely combining prior art elements (*i.e.*, encrypting wireless communications between a UAV and another device using techniques such as SSID hiding and MAC ID filtering, as taught by *Wang*) to

known methods (*i.e.*, *Taveira*'s wireless communications system between a drone and another device) to yield predictable results (*i.e.*, producing a wireless communication system that utilizes encrypted communications). EX1003, ¶142. Indeed, encrypting SSIDs and MAC addresses according to various encryption methods was a commonly-used technique to improve system security. *See, e.g.*, EX1018 (describing encrypting SSIDs using hash functions), EX1019 (describing the use of MAC address filtering). Accordingly, a POSITA would have been motivated to combine *Wang*'s teachings of encrypting wireless communications with *Taveira*'s wireless communication system and would have reasonably expected success in doing so. EX1003, ¶142.

b) *Taveira* with *Gong*

Taveira discloses that its drone may perform bi-directional wireless communication with a “wireless communication device,” which may be a “smartphone” or a tablet” that is controlled by a “drone operator, a third party service (e.g., package delivery, billing, etc.), or an operator of a restricted area.” EX1010, [0057]. *Gong* describes a “remote device” that may be a “remote controller” that wirelessly communicates with a UAV and shows on a display “a location of [] [a] first UAV” and “may . . . show a location of [] [a] second UAV.” EX1012, [0182], [0955]. Figure 35 of *Gong*, copied below, shows an example of such user interface that displays the location of a UAV 3550:



EX1012, Fig. 35.

A POSITA would have been motivated to incorporate the functionality of *Gong*'s "remote device," which is configured to display information associated with detected UAVs, into *Taveira*'s wireless communication device for several reasons. First, both *Taveira* and *Gong* are directed to drone technologies and wireless communication involving drones, and a POSITA would have recognized that these references are related to the same field of art and could be combined to gain functionalities and benefits discussed by either reference. EX1010, [0054]; EX1012, [0233]; EX1003, ¶144.

Second, it would have been common sense to a POSITA that *Taveira's* wireless communication device would display detected drone information as taught by *Gong* to further *Taveira's* goal of controlling drone access to restricted spaces. *Taveira's* system is configured for “providing conditional access for a drone for accessing a restricted area,” and that the operator of a wireless communication device may be, for example, an “operator of a restricted area.” EX1010, Abstract, [0057]. It would have been common sense to a POSITA that an operator of a restricted space would want to know the identity and location of drones approaching the restricted space and would have incorporated the functionality of *Gong's* remote controllers (*i.e.*, displaying information of detected drones) to improve their ability to monitor the restricted space and respond to unauthorized drones in the space. EX1003, ¶145. Indeed, *Gong* explains that “tracking UAV usage” improves safety, as corrective action can be taken when unauthorized drones are detected in a particular area. EX1012, [0004]. This common-sense implementation of *Gong* is also apparent in view of *Taveira's* teaching that the wireless communication devices can be smartphones or tablets, which are known devices that comprise displays for displaying information to users. EX1010, [0057]; EX1003, ¶145.

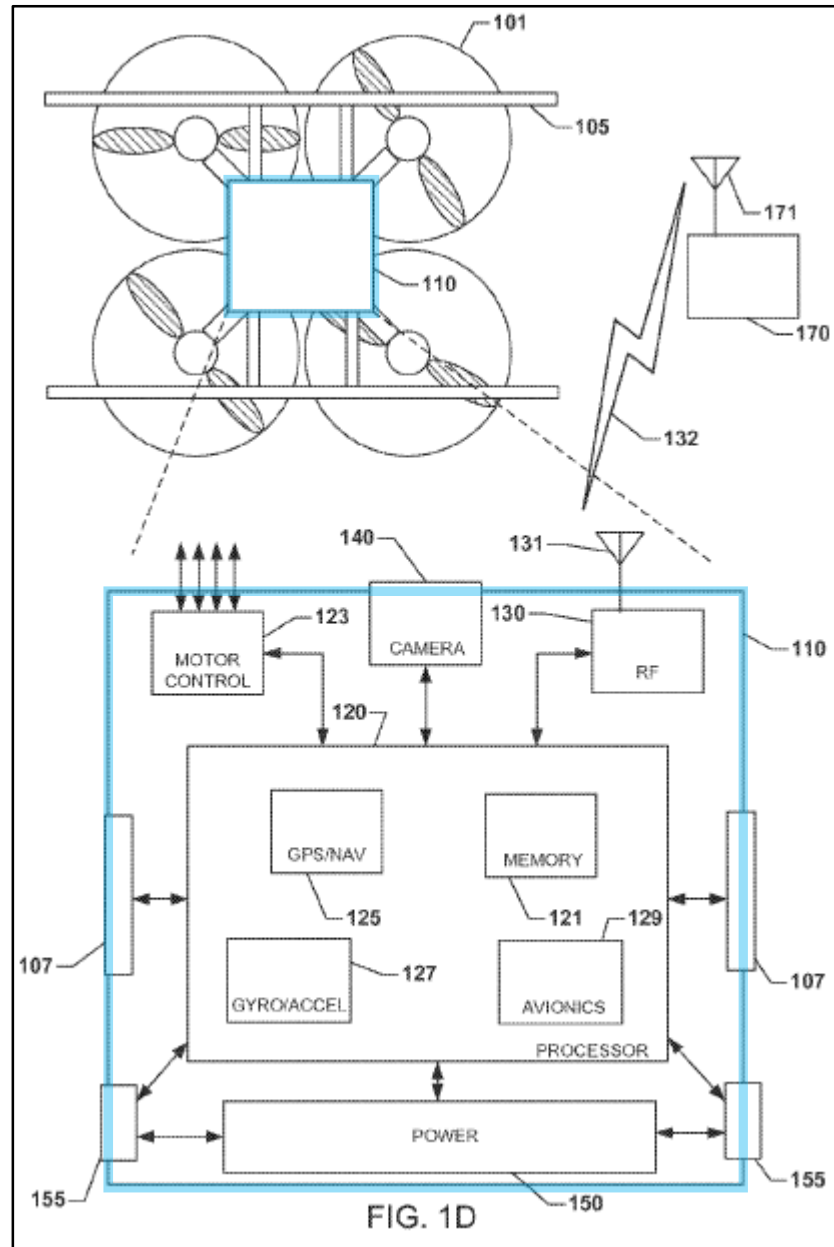
Third, combining *Taveira's* teaching regarding receiving drone information at a wireless communication device with *Gong's* disclosures of a remote controller

for displaying information of multiple detected drones involves merely combining prior art elements (*i.e.*, *Gong*'s remote controllers and associated displays) to known methods (*i.e.*, *Taveira*'s UAV identification system that involves transmitting UAV information to wireless communication devices) to yield predictable results (*i.e.*, a drone identification system that includes remote devices that can display information associated with detected drones). EX1003, ¶146. *Taveira* describes scenarios where “two or more of the drones...may approach the restricted area 312 at the same time,” so such a combination would have allowed a wireless communication device operator to be aware of multiple drones operating in a particular airspace, improving the operator's monitoring of a particular space. EX1010, [0078]; EX1003, ¶146. And implementing *Gong*'s remote controller devices would have been routine and well known, and would have been easily effectuated by a POSITA, as *Gong* describes deploying these devices in an environment similar to that of *Taveira* (*i.e.*, a wireless communication environment between drones/UAVs and external mobile devices). EX1003, ¶146. Accordingly, a POSITA would have been motivated to combine *Wang*'s teachings of encrypting unique identifiers with *Taveira*'s wireless communication system and would have reasonably expected success in doing so. *Id.*

2. Claim 21

a) 21[p]

To the extent the preamble is limiting, *Taveira* teaches the preamble. *Taveira* describes “drone 100” that has a “control unit 110” that includes “a processor 120, a radio module 130, and a power module 150.” EX1010, [0054]. Control unit 110 is depicted in Figure 1D of *Taveira*, annotated below:



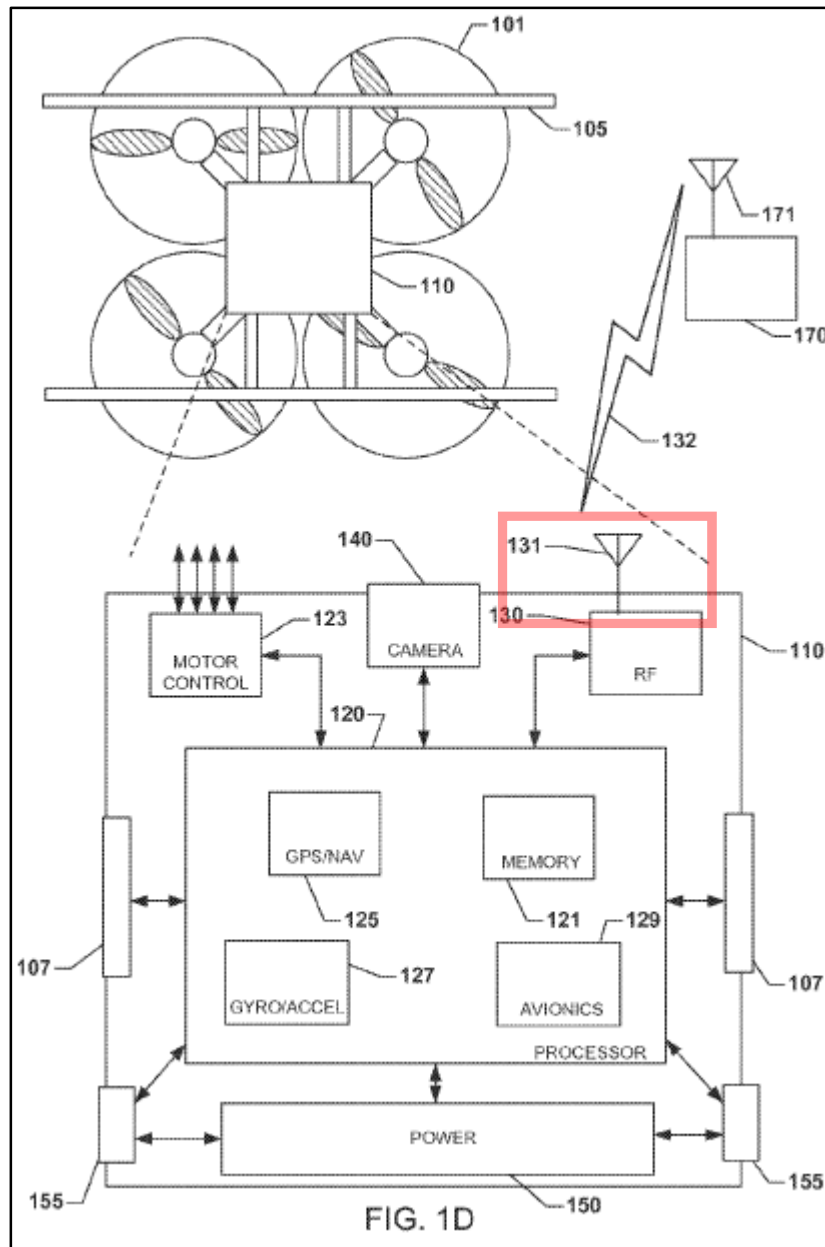
EX1010, Fig. 1D (annotated).

Taveira explains that “the processor of the drone 100 may provide drone information,” such as “a drone identifier,” to “an access server 240” (EX1010, [0110]) or a “beacon device” (*id.*, [0117]). The drone identifier can be a “unique identifier (ID)” that “may allow the drone to be identified by network components.” *Id.*, [0168]. Accordingly, *Taveira*’s control unit 110 discloses a “*device configured to communicate identification information associated with*” drone 100.

Further, *Taveira* explains that “drones may often fly at low altitude (e.g., below 400 feet).” EX1010, [0044]. Accordingly, a POSITA would have understood that drone 100 is a “*low-altitude aircraft*,” and that *Taveira*’s “drone identifier” is “*identification information associated with a low-altitude aircraft*.” EX1003, ¶149. This understanding of *Taveira*’s drone as a “*low-altitude aircraft*” is consistent with the ’959 Patent, which acknowledges that a “drone” is an example of a “low altitude aircraft.” *See* EX1001, 12:61-62.

b) 21[a]

Taveira’s “radio module 130” comprises “transmit/receive antenna 131.” EX1010, [0057]. As shown in Figure 1D of *Taveira*, annotated below, transmit/receive antenna 131 is coupled to radio module 130:



EX1010, Fig. 1D (annotated).

Radio module 130 utilizes a “bi-directional wireless communication link” to communicate with “wireless communication devices 170” using transmit/receive antenna 131. EX1010, [0057]. For example, radio module 130 facilitates the reception of “navigation signals” that are “received from recognizable RF emitters

(e.g., AM/FM radio stations, WiFi access points, and cellular network base stations) on the ground.” EX1010, [0056]; *see also id.*, [0057]. Given radio module 130’s use of various radio frequency (RF) signals to communicate, and POSITA would have understood that transmit/receive antenna 131 is a “*radio frequency communication antenna*.” EX1003, ¶151.

c) 21[b]

As discussed above with reference to Limitation 21[a], *Taveira*’s radio module 130 is coupled to transmit/receive antenna 131 and that radio module 130 communicates via radio frequency (RF) signals using transmit/receive antenna 131. *See supra*, VIII.B.2.(b). For at least the same reasons, *Taveira*’s radio module 130 discloses “*a radio communication module coupled to the radio frequency communication antenna and configured to transmit . . . through a transmitted radio signal*.”

And as discussed above with reference to Limitation 21[p], control unit 110 includes a processor that “may provide drone information” such as “a drone identifier” (“*identification information associated with the low-altitude aircraft*”) to “an access server 240” or a “beacon device.” *See supra*, VIII.B.2.(a); EX1010, [0054], [0110], [0117]. Moreover, drone 100 can transmit “identification, which may include an assigned drone access level.” EX1010, [0036]. The processor, which corresponds to processor 120 in Figure 1D, uses radio module 130 that, as

discussed above with reference to Limitation 21[a], “conducts wireless communication” using “[a] bi-directional wireless communication link 132” that is “established between transmit/receive antenna 131 of the radio module 130 and transmit/receive antenna 171 of the wireless communication device 170,” where radio frequency (RF) signals are transmitted and received. *See supra*, VIII.B.2.(b); EX1010, [0057]. Radio module 130 (“*a radio communication module*”) therefore transmits the drone identifier (“*identification information associated with the low-altitude aircraft*”) using radio frequency (RF) signals via communication link 132.

d) 21[c]

Taveira’s radio module 130 (“*the radio communication module*”) “may be configured to receive navigation signals, such as beacon signals from restricted areas, signals from aviation navigation facilities, etc., and provide such signals to the processor 120 and/or the navigation unit 125 to assist in drone navigation,” where such signals include those from “recognizable RF emitters (e.g., AM/FM radio stations, WiFi access points, and cellular network base stations) on the ground.” EX1010, [0056]. Accordingly, *Taveira* teaches a “*radio communication module [that] is configured to receive a received radio signal.*”

To the extent “*the information*” is interpreted to refer to information associated with the “*received radio signal*” recited in limitation 21[c], *Taveira* discloses that “the locations, unique identifiers, signal [sic] strengths, frequencies,

and other characteristic information of such RF emitters may be stored in a database and used to determine position (e.g., via triangulation and/or trilateration) when RF signals are received by the radio module 130,” where “such a database of RF emitters may be stored in the memory unit 121 of the drone 100.” EX1010, [0056]. Because the stored RF emitter information may be used to determine position when “RF signals are received,” a POSITA would have understood or at least found obvious that such RF signals are also stored in the memory unit 121 of drone 100 so that the received RF signals can be used with the stored RF emitter information to determine emitter position. EX1003, ¶155.

Additionally, *Taveira*’s drone 100 may have a “database 341 [that] may be stored in memory” of the drone, which may receive “updated database information [] from a server (e.g., 240).” EX1010, [0088]. As discussed above with reference to Limitation 21[p], access server 240 is one of the devices with which drone 100 may communicate. *See supra*, VIII.B.2.(a); EX1010, [0110]. Accordingly, a POSITA would have understood or at least found obvious that such database information would have been received by radio module 130 via radio signals, because radio module 130 is what receives information that is broadcasted and received by drone 100. EX1003, ¶156. Moreover, because such database information would have been received by radio module 130 and sent by radio module 130 to the processor for storage in the memory of drone 100 (*see* EX1010,

Fig. 1 (showing processor 120 comprising memory 121)), a POSITA would have understood that radio module 130 stores the received database information in the memory (“*wherein the radio communication module is configured to... store the information in a storage*”). EX1003, ¶156.

To the extent “*the information*” is interpreted to refer to the “*identification information associated with the low-altitude aircraft*” recited in Limitation 21[b]⁵, *Taveira* discloses storing identification data associated with drone 100. Drone 100 can transmit “identification, which may include an assigned drone access level,” making the drone access level “*identification information associated*” with drone 100 as discussed above with reference to Limitation [21b]. *See supra*, VIII.B.2.(c); EX1010, [0036]. This access level information of a drone may be stored in “database 341,” and that “database 341 may be stored in memory of a drone.” EX1010, [0079] (“database 341 may store various information regarding access levels 343”), [0088], Figs. 3C-3E (showing database 341 that includes “access level[s]”). As noted above, database 341 may be updated with database information received by radio module 130, such that a POSITA would have understood that radio module 130 would have sent any received access level

⁵ This interpretation is consistent with Patent Owner’s own interpretation of the claim. *See supra*, fn. 4.

information to the processor for storage in memory of drone 100. EX1010, [0088]; EX1003, ¶157.

e) 21[d]

As discussed above with reference to Limiation 21[a], *Taveira*'s "transmit/receive antenna 131" is part of control unit 110, and control unit 110 is attached to drone 100. *See supra*, VIII.B.2.(b); EX1010, [0057], Fig. 1D. Thus, transmit/receive antenna 131 ("*the radio frequency communication antenna*") is coupled to drone 100 ("*the low-altitude aircraft*").

f) 21[e]

Taveira's radio module 130 receives an RF signal from an RF emitter, where the signal includes a "unique identifier" such as a "service sector identification (SSID), a media access control (MAC) address, radio station call sign, [or] cell ID," and radio module 130 provides this signal to processor 120, which "use[s] that information to obtain the ground coordinates and signal strength of the detected RF emitter" from a database of RF emitter characteristics and in turn "estimate the location of the drone 100 relative to the coordinates." EX1010, [0056]. Therefore, radio module 130 ("*the radio communication module*") is "*configured to utilize an identifier*" of an RF emitter, such as an SSID, by providing it to processor 120 so that the processor can estimate the drone's location.

Further, in the combination of *Taveira* and *Wang*, the identifier of the RF emitter is a “*secure identifier*.” Specifically, *Wang* teaches that wireless communications between a base station 300 and a UAV 201 are encrypted, and that “suitable encryption methods” include “SSID hiding” and “MAC ID filtering.” EX1011, [0160], Fig. 1. Thus, in the combination of *Taveira* and *Wang*, *Taveira*’s received “unique identifier,” which is an SSID or MAC address, and that is utilized by radio module 130 as discussed, is a “*secure identifier*” because it would have been encrypted using SSID hiding or MAC ID filtering as taught by *Wang*. See *supra*, VIII.B.1.(a), EX1003, ¶160.

In addition, the *Taveira-Wang* combination renders obvious Limitation 21[e] through its description of transmitting drone information via encrypted signals. As discussed above with reference to Limitation 21[b], *Taveira*’s radio module 130 transmits drone information, such as a drone identifier and other identification, using RF signals. See *supra*, VIII.B.2.(c). *Taveira*’s drone information (e.g., a drone identifier) therefore discloses an “*identifier*” because it identifies the associated drone. And in the combination of *Taveira* and *Wang*, transmitted drone information is a “*secure identifier*” because, as just discussed, *Wang* teaches that wireless communications between a base station 300 and a UAV 201 are encrypted according to known encryption techniques. EX1011, [0160], Fig. 1. Thus, in the combination of *Taveira* and *Wang*, *Taveira*’s transmitted drone information is a

“*secure identifier*” because it would have been encrypted as taught by *Wang*. See *supra*, VIII.B.1.(a), EX1003, ¶161. Accordingly, the *Taveira-Wang* combination teaches that the radio module 130 (“*the radio communication module*”) is configured to transmit (“*is configured to utilize*”) encrypted drone information (“*a secure identifier*”).

In addition, *Taveira*’s processor 120 of drone 100 may receive and process “one or more respective heart beat signals...from components of the conditional access system” to “confirm that these systems are functioning properly” and “have not been compromised.” EX1010, [0091]-[0092]. The heart beat signals may be “provided with identifying information of the respective sending system, such as a device identifier other identifier,” which “may also be encoded to prevent or discourage tampering or spoofing.” *Id.* A POSITA would have understood that *Taveira*’s radio module 130, which is responsible for receiving wireless communication signals (*see supra*, VIII.B.2.(d)), would have received the heart beat signals from the conditional access system. EX1003, ¶162. Accordingly, *Taveira*’s radio module 130 (“*the radio communication module*”) is “*configured to utilize a secure identifier*” of a received heart beat signal (*i.e.*, an encrypted identifier included in the heart beat signal) by providing it to processor 120 for determining that the associated system is still operational. *Id.*

g) 21[f]

Taveira's control unit 110 includes a processor that “may provide drone information” such as “a drone identifier” to “an access server 240.” EX1010, [0110]. The processor, which is processor 120 in Figure 1D, includes radio module 130 that “conduct[s] wireless communication” using “[a] bi-directional wireless communication link 132” that is “established between transmit/receive antenna 131 of the radio module 130 and transmit/receive antenna 171 of the wireless communication device 170,” where radio frequency (RF) signals are transmitted and received, and wireless communication device 170 is, for example, a “smartphone” or a “tablet.” *Id.*, [0057]; *see also supra*, VIII.B.2.(b) (describing use of RF resources for wireless communication). Accordingly, *Taveira's* radio module 130 (“*the radio communication module*”) is configured for bi-directional communication (“*two-way communication*”) with a wireless communication device 170 (“*a . . . system*”).

A POSITA would have understood that wireless communication device 170 is *a remote portable detection system*. As noted above, communication device 170 can be a “smartphone” or “tablet,” which are well known portable devices, and wireless communication device 170 is located on the ground (“*remote*” from drone 100) and communicates with drone 100 via wireless signals. EX1010, [0045] (explaining a drone may be “remotely controlled”), [0057]. Moreover, wireless communication device 170 “*detects*” a drone 100 because it has established a bi-

directional wireless communication link 132, which a POSITA would have understood, or at least found obvious, to require detecting parameters associated with communication with drone 100. *Id.*, [0057], [0069] (describing establishment of a communication link between a drone and a wireless communication device upon the drone’s approach); EX1003, ¶165.

To the extent *Taveira*’s device 170 is not found to be a “*remote portable detection system*,” the combination of *Taveira* and *Gong* teaches this. *Gong* describes a “remote device” that may be a “remote controller” that communicates with a UAV using “wireless communications” such as “WiFi” and that shows on a display “a location of [] [a] first UAV” and “may...show a location of [] [a] second UAV.” EX1012, [0182], [0955]. Moreover, *Gong*’s remote controller can be implemented as a “geo-fencing device” that “detect[s] the presence of the UAV” and that the geo-fencing device can be “portable.” *Id.*, [0593], [0600], [0628]; *see also id.*, [0137] (describing the remote controller “may be a...mobile device” such as a “smartphone, cellular phone, [or] tablet.”). The geo-fence device further interacts with multiple UAVs, providing a “reference point for different sets of flight regulations for different UAVs in different circumstances that may approach the geo-fencing device.” *Id.*, [0864]-[0869]. Thus, in the combination of *Taveira* and *Gong*, *Taveira*’s wireless communication device 170, which can be a smartphone or tablet, is enhanced by remotely detecting the presence of one or

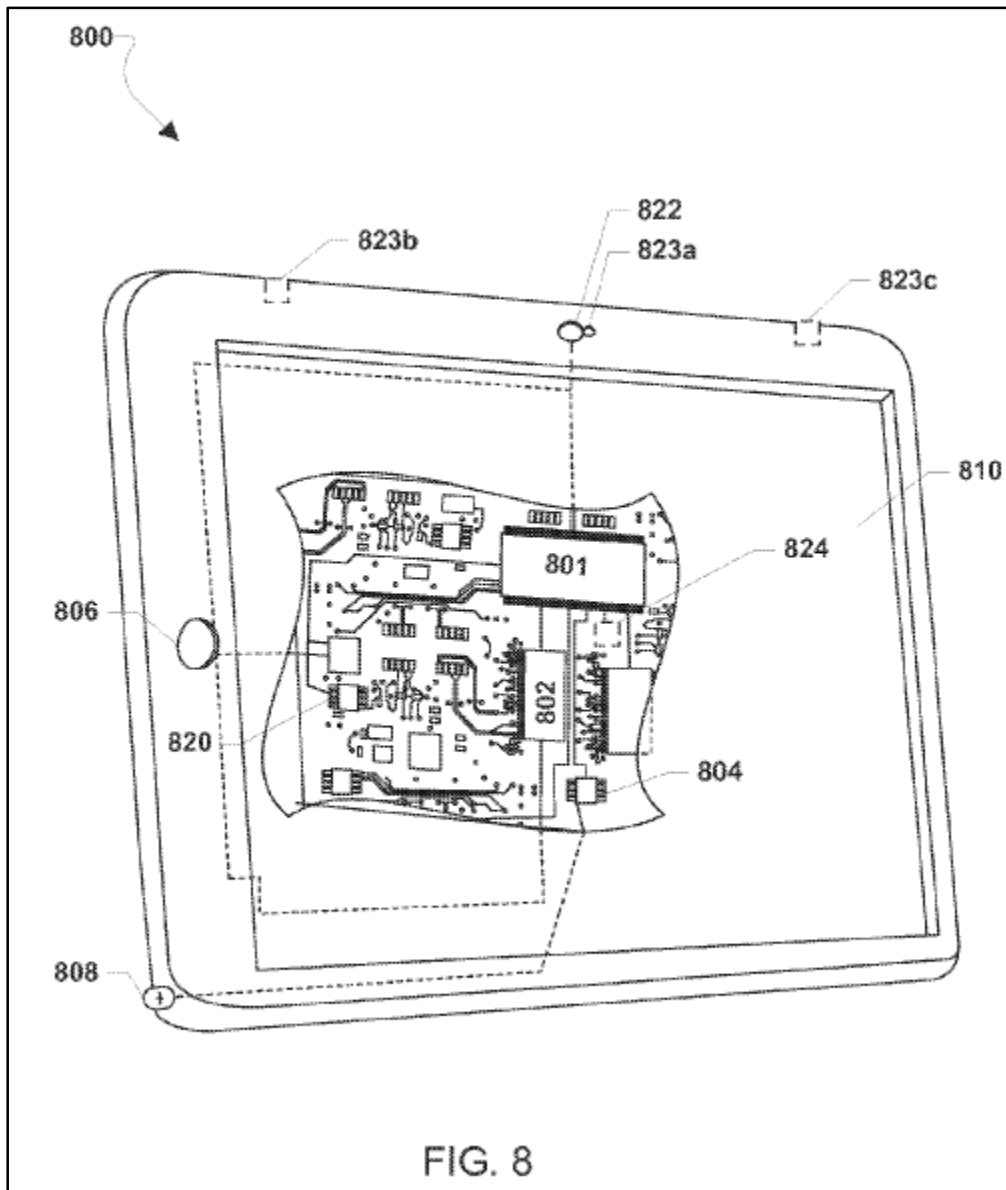
more drones 100 as taught by *Gong*, thereby teaching a “*remote portable detection system*.”

h) 21[g]

Taveira teaches Limitation 21[g]. *Taveira*’s control unit 110 (“*the device*”) is coupled to drone 100 (“*the low-altitude aircraft*”). *See supra*, VIII.B.2.(a).

i) 21[h]

Taveira’s wireless communication device 170 can be a smartphone or tablet. EX1010, [0057]. A POSITA would have understood that wireless communication device 170 therefore includes a user interface because smartphones and tablets are known to include a user interface. EX1003, ¶169. Figure 8, copied below, depicts tablet 800 that includes a “touch screen display 810.” EX1010, [0187]; *id.*, [0181]-[0182] (describing a mobile computing device 700 having a display).



EX1010, Fig. 8.

To the extent *Taveira* does not explicitly teach that the user interface of the wireless communication device is “*configured to provide to a user, information associated with a plurality of different low-altitude aircrafts detected by the remote portable detection system,*” the combination of *Taveira* and *Gong* does. As discussed for Limitation 21[e], a POSITA would have enhanced *Taveira*’s wireless

communication device 170 according to *Gong*'s teachings, such that wireless communication device 170 would remotely detect the presence of one or more drones 100 and display such detected drones via a user interface. *See supra*, VIII.B.2.(f); EX1003, ¶171. Accordingly, the *Taveira-Gong* combination renders obvious Limitation 21[h].

C. Ground 3: The Combination of *Taveira*, *Qi*, and *Gong* Renders Obvious Claim 21

1. Motivation to Combine

a) *Taveira* with *Qi*

Taveira discloses a radio module 130 that receives a radio frequency (RF) signal from an RF emitter and that the received signal includes a “unique identifier” such as a “service sector identification (SSID), a media access control (MAC) address, radio station call sign, [or] cell ID.” EX1010, [0056]. *Qi* discloses that utilizing SSIDs for wireless communication may periodically “update the SSID based on [an] update of the service name key,” and that such “updating the SSID, e.g., along time, may increase the security of the SSID and/or may reduce the probability of an attacker to discover the service name of the service based on the SSID, e.g., compared to an implementation in which the SSID is kept constant.” EX1013, [0168]-[0170].

A POSITA would have been motivated to combine *Taveira* and *Qi* such that the “unique identifiers” included in *Taveira*'s wireless communications (e.g., the

SSID and MAC address) are periodically updated as taught by *Qi*. A POSITA would have been motivated to combine these references for several reasons.

First, *Taveira* provides a motivation to combine with *Qi*'s security techniques, explaining that because drones are "conspicuous," they may be "vulnerable to tampering," intercepting, interfering, or hijacking during flight. EX1010, [0002]. Thus, a POSITA would have sought out various solutions to prevent such issues, and an obvious and known solution would be to periodically update the RF emitter's SSID or MAC address as taught by *Qi* to reduce the likelihood of an attacker to discover the SSID or MAC address and use it for illicit purposes. EX1003, ¶174.

Further, combining *Qi*'s teachings regarding periodically updating unique identifiers such as SSIDs with *Taveira*'s use of such unique identifiers in wireless communications is merely combining prior art elements (*i.e.*, periodically updating identifiers such as SSIDs, as taught by *Qi*) to known methods (*i.e.*, *Taveira*'s wireless communications system that uses unique identifiers such as SSIDs and MAC addresses) to yield predictable results (*i.e.*, producing a wireless communication system that periodically updates identifiers used in communications). *Id.*, ¶175. Accordingly, a POSITA would have been motivated to combine *Qi*'s teachings of updating unique identifiers with *Taveira*'s wireless

communication system, and would have reasonably expected success in doing so.
Id.

b) *Taveira with Gong*

See supra, VIII.B.1.(b).

2. Claim 21

a) 21[p]

See supra, VIII.B.2.(a).

b) 21[a]

See supra, VIII.B.2.(b).

c) 21[b]

See supra, VIII.B.2.(c).

d) 21[c]

See supra, VIII.B.2.(d).

e) 21[d]

See supra, VIII.B.2.(e).

f) 21[e]

Taveira's radio module 130 receives an RF signal from an RF emitter, where the signal includes a "unique identifier" such as a "service sector identification (SSID)," and radio module 130 provides this signal to processor 120, which "use[s] that information to obtain the ground coordinates and signal strength of the detected RF emitter" from a database of RF emitter characteristics and in turn

“estimate the location of the drone 100 relative to the coordinates.” EX1010, [0056]. Therefore, radio module 130 (“*the radio communication module*”) is “*configured to utilize an identifier*” of an RF emitter, such as an SSID, by providing it to processor 120 so that the processor can estimate the drone’s location.

To the extent *Taveira* does not explicitly disclose that the identifier of the RF emitter is a “*secure identifier*,” the combination of *Taveira* and *Qi* does. *Qi* teaches a system for “securing a service Identifier (ID)” used in wireless communications between devices such as a “vehicular device” and a “server computer,” where a “Secured Service ID (SSID) is utilized to identify a Service.” EX1013, Abstract, [0035], [0096]. An SSID processor 129 of a device 102 may “periodically receive an update of the service name key corresponding to the service, e.g., from the service provide[r]” and that the “SSID processor 129 may update the SSID based on the update of the service name key.” *Id.*, [0168]-[0169]. *Qi* explains that “updating the SSID, e.g., along time, may increase the security of the SSID and/or may reduce the probability of an attacker to discover the service name of the service based on the SSID, e.g., compared to an implementation in which the SSID is kept constant.” *Id.*, [0170]. Thus, applying these teachings of *Qi* to *Taveira*’s wireless communication system (which uses SSIDs in wireless communications), the combination of *Taveira* and *Qi* would have provided that

Taveira’s received “unique identifier,” which is, for example, an SSID, and which is utilized by radio module 130 as discussed, is a “*secure identifier*” because the SSID would have been periodically changed via updating (as opposed to being kept constant) as taught by *Qi*. EX1003, ¶183.

In addition, *Taveira* teaches Limitation 21[e] through its disclosure of receiving and processing heart beat signals that include identifying information and are encoded, as discussed above in Ground 2. *See supra*, VIII.B.2.(f). For at least those same reasons, the *Taveira-Qi* combination renders obvious Limitation 21[e].

g) 21[f]

See supra, VIII.B.2.(g).

h) 21[g]

See supra, VIII.B.2.(h).

i) 21[h]

See supra, VIII.B.2.(i).

D. Ground 4: The Combination of Gong and Wang-II Renders Obvious Claim 21

1. Motivation to Combine

a) *Gong with Wang-II*

Gong discloses a UAV that includes a “flight control unit,” such as “flight control unit 410,” which comprises “identification module 410, one or more processors 420, and one or more communication modules 430.” EX1012, [0233],

[0235]. Further, the UAV is capable of “two-way communications” with external devices via wireless resources. *Id.*, [0648]. Apart from *Gong*’s description of the communication module/unit⁶ as the device responsible for such wireless communication, *Gong* does not provide detail regarding all the particular components involved in implementing wireless communications. EX1003, ¶188. Accordingly, a POSITA implementing *Gong* would have been motivated to seek out additional disclosures that detail the particular components involved in implementing wireless communication, such as *Wang-II*. *Id.* *Wang-II* discloses a “communication terminal 1200 can be implemented by a mobile platform (e.g., UAV) or other remotely-controlled movable object capable of transmitting downlink data and receiving uplink data” in a wireless communication environment, and that such wireless communications involve the transmission of

⁶ *Gong* uses the term “communication module” and “communication unit” interchangeably throughout its disclosure, as both terms are used to describe the component responsible for a UAV’s communication functions. *See, e.g.*, EX1012, [0024] (“Aspects of the invention may also be directed to an unmanned aerial vehicle (UAV) comprising, a communication unit configured to receive or transmit wireless communications;...”), [0195] (“A UAV may comprise:...a communication module configured to receive one or more flight commands from a remote user;...”).

“electromagnetic signals such as electric voltage, radiowave, microwave, infrared signals, or the like.” EX1014, [0060], [00141]. The “communication terminal 1200 includes an uplink receiver 1204, a downlink transmitter 1202, and an antenna 1206.” *Id.*, [00141]. Accordingly, a POSITA would have recognized that *Wang-II* fills in the gaps left by *Gong* and would have been motivated to combine *Wang-II*’s teachings with *Gong* when implementing *Gong*’s system. EX1003, ¶188.

Further, both *Gong* and *Wang-II* were assigned to SZ DJI Technology Co., Ltd., and it would have been obvious to a POSITA to combine interrelated teachings of patents of the same company. *See* EX1012, item (71); *see also* EX1014, item (71); EX1003, ¶189.

Further, combining *Gong* with *Wang-II* is merely combining prior art elements (*i.e.*, *Wang-II*’s uplink receiver 1204, downlink transmitter 1202, and antenna 1206) to known methods (*i.e.*, *Gong*’s wireless communication technique using the communications module/unit) to yield predictable results (*i.e.*, two-way wireless communications by the communications module/unit). EX1003, ¶190.

Accordingly, a POSITA would have been motivated to combine *Gong* and *Wang-II*, and would have had a reasonable expectation of success in doing so. EX1003, ¶191.

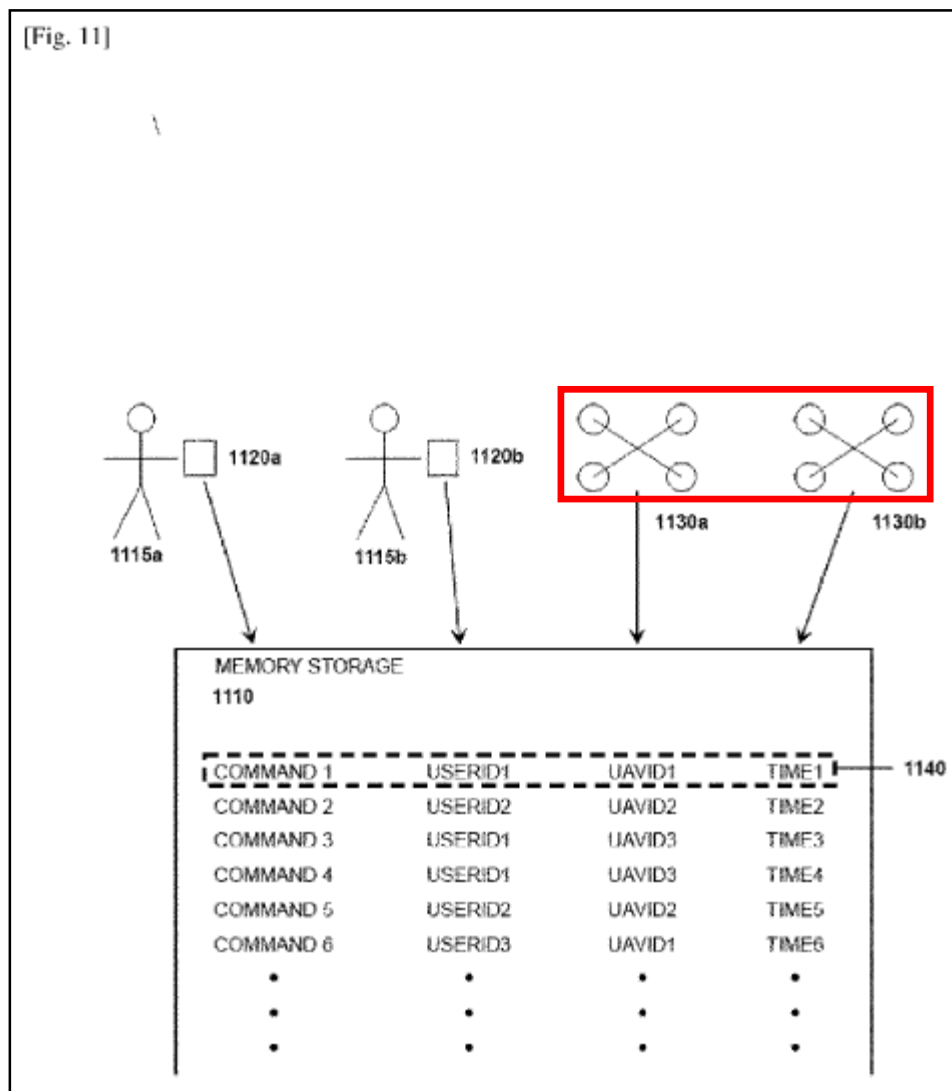
2. Claim 21

a) 21[p]

To the extent the preamble is limiting, *Gong* teaches the preamble. *Gong* discloses a UAV that includes a “flight control unit 410,” which comprises “identification module 410, one or more processors 420, and one or more communication modules 430.” EX1012, [0233], [0235]. “The identification module 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.” *Id.*, [0236]. The “UAV identifier may be unique to the UAV” and “may uniquely differentiate and/or distinguish the UAV from other UAVs.” *Id.*, [0133]. Further, “[a] UAV may broadcast the UAV identifier during operation.” *Id.*, [0277]. *Gong* explains that the “flight control unit may control communications of the UAV.” EX1012, [0234]. In particular, *Gong*’s communications module/unit is “configured to receive or transmit wireless communications.” EX1012, [0024].

Further, a POSITA would have understood that *Gong*’s UAV is a “*low-altitude aircraft*.” The UAV “may be a rotorcraft” that comprises multiple rotors that are “capable of rotating to generate lift for the UAV.” EX1012, [0126]. Also, *Gong*’s UAV may be prevented “from flying above an altitude ceiling that may be fixed or variable.” *Id.*, [0173]. And throughout the figures of *Gong*, such as

Figure 11, annotated below, UAVs are depicted as 4-rotor drones, which a POSITA would have understood to be “*low-altitude aircraft*.” EX1003, ¶193.



EX1012, Fig. 11 (annotated to identify UAVs 1130).

This understanding of *Gong*’s UAVs as “*low-altitude aircraft*” is consistent with the ’959 Patent, which acknowledges that a “drone” is an example of a “low altitude aircraft.” See EX1001, 12:61-62, Fig. 12 (depicting drone 1214 as a 4-rotor aircraft).

Accordingly, *Gong*'s flight control module 410 (“*[a] device*”) is configured to communicate, through communication module/unit 430, a UAV identifier that uniquely identifies the associated UAV (“*identification information associated with a low-altitude aircraft*”).

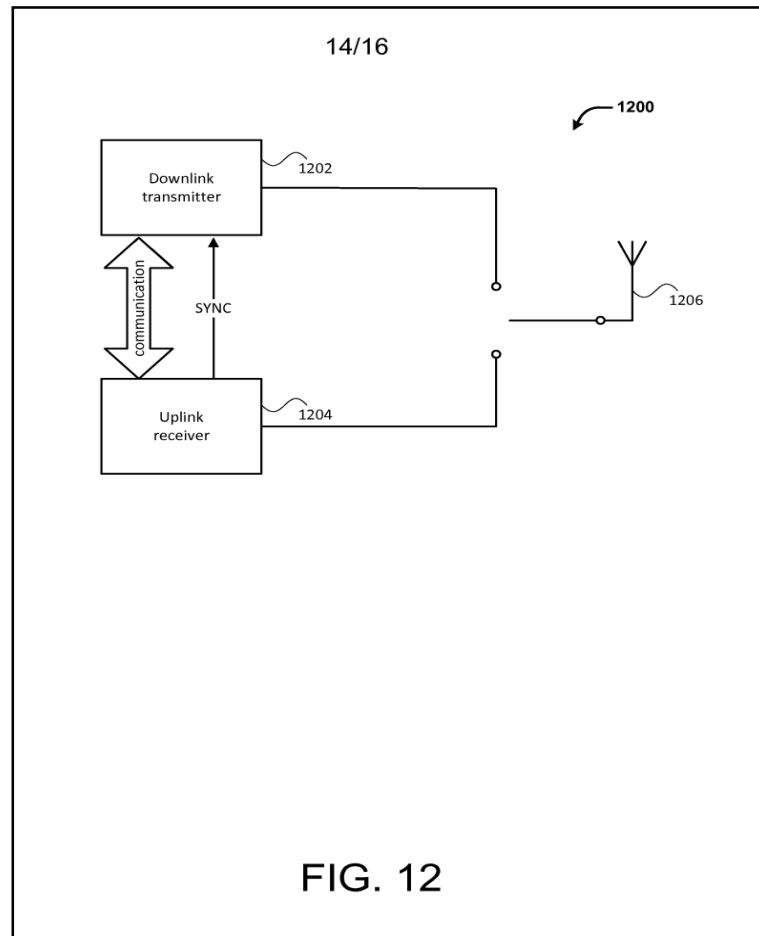
b) 21[a]

As discussed above with reference to Limitation 21[p], *Gong* explains that its flight control unit, through the communication module/unit, is capable of wireless communication. *See supra*, VIII.D.2.(a). An example of such communication is when the UAV broadcasts an associated UAV identifier “via a wireless signal (e.g., radio signal, optical signal, or an acoustical signal).” EX1012, [0271]. Accordingly, a POSITA would have understood that *Gong*'s communications module/unit includes an antenna capable of transmitting radio signals (“*a radio frequency communication antenna*”) in order to perform such broadcasting. EX1003, ¶197. Accordingly, *Gong* teaches Limitation 21[a].

In the alternative, the *Gong-Wang-II* combination renders Limitation 21[a] obvious. Like *Gong*, *Wang-II* discloses a “communication terminal 1200 can be implemented by a mobile platform (e.g., UAV) or other remotely-controlled movable object capable of transmitting downlink data and receiving uplink data” in a wireless communication environment, and that such wireless communications involve the transmission of “electromagnetic signals such as electric voltage,

radiowave, microwave, infrared signals, or the like.” EX1014, [0060], [00141].

The “communication terminal 1200 includes an uplink receiver 1204, a downlink transmitter 1202, and an antenna 1206.” *Id.*, [00141].



Id., Fig. 12.

Accordingly, the *Gong-Wang-II* combination, which renders obvious incorporating *Wang-II*'s antenna in *Gong*'s communications unit/module to facilitate wireless communication, teaches Limitation 21[a].

c) 21[b]

As discussed above with reference to Limitations 21[p] and 21[a], *Gong* discloses broadcasting, by a UAV, a “UAV identifier” that “may uniquely differentiate and/or distinguish the UAV from other UAVs” via “a wireless signal (e.g., radio signal,...).” *See supra*, VIII.D.2.(a)-(b); EX1012, [0133], [0236], [0271]. Further, *Gong*’s communications module/unit is the component responsible for wireless transmissions from the UAV. *See supra*, VIII.D.2.(a); EX1012, [0024]. Accordingly, *Gong*’s communications module/unit (“a radio communication module”) is configured to transmit UAV identifiers via radio signals (“identification information associated with the low-altitude aircraft through a transmitted radio signal”). Further, a POSITA would have understood that communication module/unit’s use of radio signals for such transmission indicates that the communication module/unit is coupled to a “radio frequency communication antenna,” which a POSITA would have understood to be a well-known component for such wireless communications. EX1003, ¶201; *see also supra*, VIII.D.2.(b) (discussing POSITA’s understanding of inclusion of a “radio frequency communication antenna” in *Gong*’s UAV).

In the alternative, the *Gong-Wang-II* combination renders obvious Limitation 21[b]. As discussed above with reference to Limitation 21[a], *Wang-II*’s UAV includes a “communication terminal 1200,” which includes an uplink receiver 1204, a downlink transmitter 1202, and an antenna 1206.” A POSITA

would have understood that under the *Gong-Wang-II* combination, *Gong*'s communications module/unit (“*a radio communication module*”) would comprise *Wang-II*'s “uplink receiver 1204” and “downlink transmitter 1202” and would be coupled to *Wang-II*'s “antenna 1206” (“*coupled to the radio frequency communication antenna*”) as such components would be necessary to effectuate the wireless signal transmission and reception functionality of *Gong*'s communication module/unit. EX1003, ¶202. Accordingly, the *Gong-Wang-II* combination renders obvious Limitation 21[b].

d) 21[c]

As discussed above with reference to Limitation 21[p], *Gong* explains that “identification module 410,” which, along with communication unit/module, is part of a flight control unit aboard a UAV, may comprise “a UAV identifier” that “uniquely differentiate[s] and/or distinguish[es] the UAV from other UAVs.” See *supra*, VIII.D.2.(a); EX1012, [0133], [0233], [0235], [0236]. The UAV identifier “may be issued by an ID registration database,” which “may be off-board the UAV.” EX1012, [0240]. Further, the “identification module may be configured to receive the UAV identifier.” *Id.* Because *Gong* discloses that reception of data from off-board devices is handled by the communication module/unit via radio signals, a POSITA would have understood that the identification module “receives the UAV identifier” via radio signals first received by communications

module/unit. EX1003, ¶204. Further, *Gong*’s “UAV identifier may be stored in the identification module in an unalterable state” once configured. EX1012, [0237]. Accordingly, *Gong*’s communications module/unit (“*the radio communication module*”) is configured to receive a UAV identifier via a radio signal (“*configured to receive a received radio signal*”) and store the received UAV identifier in the identification module (“*store the information in a storage*”).⁷

e) 21[d]

As discussed above with reference to Limitation 21[a], *Gong* suggests to a POSITA that its communications unit/module includes an antenna capable of transmitting radio signals in view of *Gong*’s disclosure of communications module/unit performing wireless communications. *See supra*, VIII.D.2.(b). And because the communications module/unit is included in a UAV (as a component of the flight control unit), a POSITA would have understood that the antenna (“*the radio frequency communication antenna*”) would also be coupled to the UAV (“*the low-altitude aircraft*”). EX1012, [0233] (explaining that the flight control unit is included in the UAV), [0235] (explaining that the communications module/unit is included in the flight control unit); EX1003, ¶205. Accordingly, *Gong* teaches Limitation 21[d].

⁷ This interpretation is consistent with Patent Owner’s own interpretation of the claim. *See supra*, fn. 4.

In the alternative, the *Gong-Wang-II* combination renders obvious Limitation 21[d]. As discussed above with reference to Limitation 21[a], it would have been obvious to a POSITA to incorporate *Wang-II*'s antenna (*e.g.*, antenna 1206) in *Gong*'s communications module/unit to facilitate communication module/unit's wireless communication functionalities. *See supra*, VIII.D.2.(b). And because the communications module/unit is included in a UAV (as a component of the flight control unit), a POSITA would have understood that the antenna ("*the radio frequency communication antenna*") would also be coupled to the UAV ("*the low-altitude aircraft*"). EX1012, [0233] (explaining that the flight control unit is included in the UAV), [0235] (explaining that the communications module/unit is included in the flight control unit); EX1003, ¶206.

f) 21[e]

As discussed above with reference to Limitations 21[p] and 21[b], *Gong*'s communications unit/module is configured to broadcast ("*utilize*") a UAV identifier ("*a[n] . . . identifier*") via radio signals. *See supra*, VIII.D.2.(a), VIII.D.2.(c). The "UAV identifier may be broadcasted when a communication between the UAV and the air control system may be encrypted or authenticated." EX1012, [0271]; *see also id.*, [0487]. Accordingly, *Gong* teaches that the UAV identifier is "secured" through encryption when it is broadcasted. Thus, *Gong* teaches that the communications module/unit ("*the radio communication module*")

is configured to broadcast (“*is configured to utilize*”) an encrypted UAV identifier (“*a secure identifier*”).

g) 21[f]

Gong discloses that “a UAV device may establish communications with [a] geo-fencing device and an exchange of information may occur,” and that such communications “may include one-way communications or two-way communications.” EX1012, [0648] (listing examples of the information exchanged between the devices). Because *Gong*’s communications module/unit is responsible for the UAV’s wireless signal transmission and reception, a POSITA would have understood that the communications module/unit (“*the radio communication module*”) is “*configured for two-way communication.*” See, e.g., EX1012, [0024] (“Aspects of the inventions may also be directed to an unmanned aerial vehicle (UAV) comprising: a communication unit configured to transmit or receive wireless communications;...”); EX1003, ¶208.

Gong’s “geo-fencing device” discloses “*a remote portable detection system.*” *Gong* describes a “remote device” that may be a “remote controller” that communicates with a UAV using “wireless communications” such as “WiFi” and “radio” and that shows on a display “a location of [] [a] first UAV” and “may...show a location of [] [a] second UAV.” EX1012, [0182] (describing UAV’s “remote communication with one or more remote devices.”), [0955]. The

“location of a UAV shown on the remote device may be updated in real-time.” *Id.*, [0957]. Moreover, *Gong*’s remote controller can be implemented as a “geo-fencing device” that “detect[s] the presence of the UAV” and that the geo-fencing device can be “portable.” *Id.*, [0593], [0600], [0628]; *see also id.*, [0137] (describing the remote controller “may be a...mobile device” such as a “smartphone, cellular phone, [or] tablet.”). The geo-fence device further interacts with multiple UAVs, providing a “reference point for different sets of flight regulations for different UAVs in different circumstances that may approach the geo-fencing device.” *Id.*, [0864]-[0869].

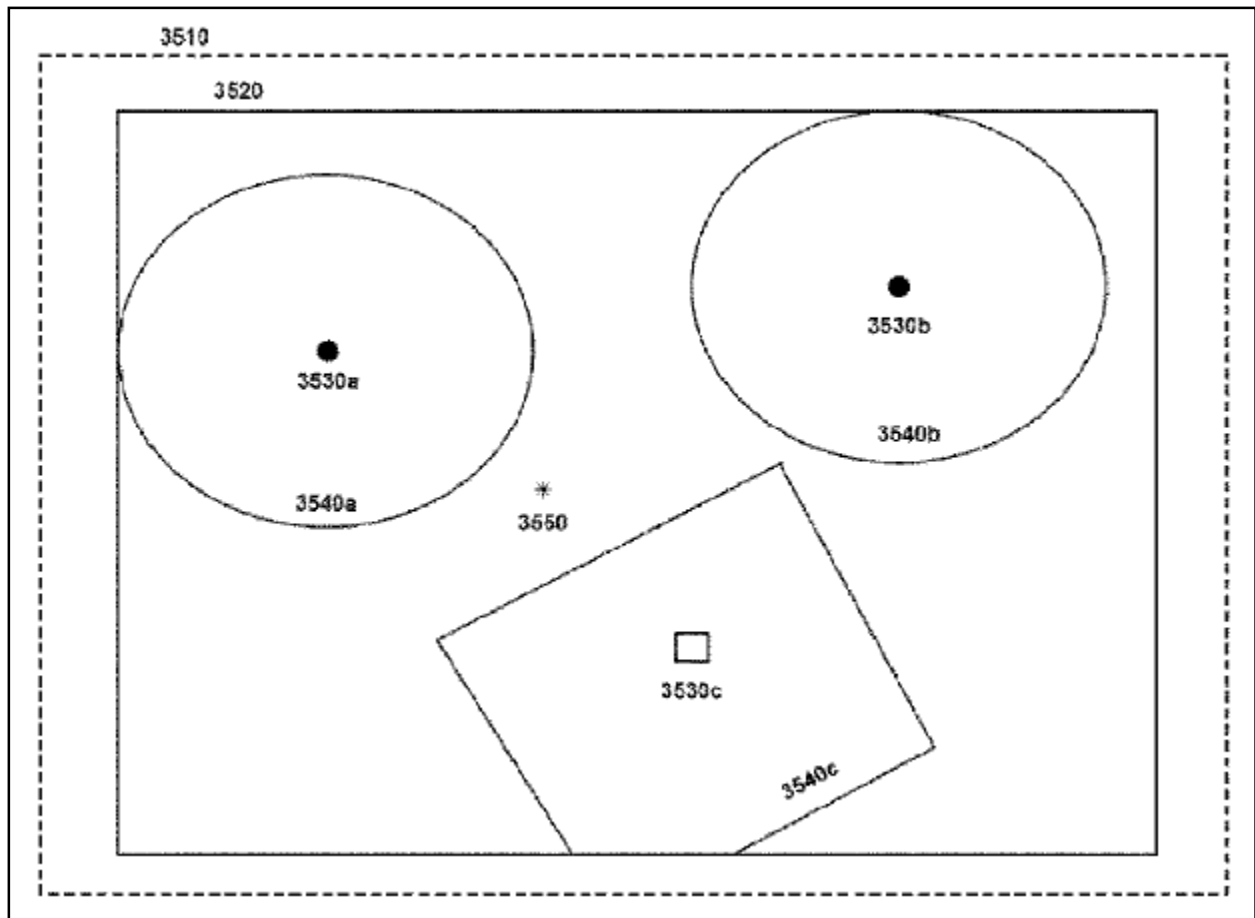
Accordingly, *Gong*’s disclosure regarding communication module/unit’s (“*the radio communication module*”) two-way communications with a geo-fencing device (“*two-way communication with a remote portable detection system*”) teaches Limitation 21[f].

h) 21[g]

As discussed above with reference to Limitation 21[p], *Gong*’s flight control unit (“*the device*”) is included in the UAV (“*the low-altitude aircraft*”). *See supra*, VIII.D.2.(a). Thus, *Gong*’s flight control unit is coupled to the UAV and teaches Limitation 21[g].

i) 21[h]

Gong’s “remote device” that shows on a display “a location of [] [a] first UAV” and “may...show a location of [] [a] second UAV.” EX1012, [0182], [0955]. The “location of a UAV shown on the remote device may be updated in real-time.” *Id.*, [0957]. And as discussed above with reference to Limitation 21[f], *Gong*’s remote controller can be implemented as a “geo-fencing device” that “detect[s] the presence of the UAV” and that the geo-fencing device can be “portable.” *See supra*, VIII.D.2.(g); EX1012, [0137], [0593], [0600], [0628]. The geo-fence device further interacts with multiple UAVs, providing a “reference point for different sets of flight regulations for different UAVs in different circumstances that may approach the geo-fencing device.” *Id.*, [0864]-[0869]. Figure 35 of *Gong*, copied below, shows an example of such user interface that displays the location of a UAV 3550 and geo-fencing devices 3530:



EX1012, Fig. 35.

Gong therefore discloses Limitation 21[f].

IX. OBJECTIVE INDICIA DO NOT SUPPORT PATENTABILITY

Petitioners are unaware of any evidence of secondary considerations of non-obviousness tied to the claimed invention of the '959 Patent identified by PO. Petitioners reserve the right to address any such alleged evidence should PO identify it.

X. CONCLUSION

Petitioners respectfully request that *inter partes* review of the '959 Patent be instituted and that the challenged claim be cancelled as unpatentable under 35 U.S.C. §318(b).

Respectfully submitted,

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CERTIFICATE OF SERVICE

The undersigned hereby certifies on this 4th day of February 2025, that true and correct copies of the foregoing PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 10,713,959, Exhibits 1001-1021, and Petitioners' power of attorney were served in their entirety to Patent Owner via FedEx Express® or Express Mail:

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**CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME
LIMITATION, TYPEFACE REQUIREMENTS, AND TYPE STYLE
REQUIREMENTS**

1. This Petition complies with the type-volume limitation of 14,000 words, comprising 13,998 words, excluding the parts exempted by 37 C.F.R. §42.24(a).
2. This Petition complies with the general format requirements of 37 C.F.R. §42.6(a) and has been prepared using Microsoft® Word in 14-point Times New Roman.

Respectfully submitted,

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