

Patent Owner's Demonstratives for Oral Hearing

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

July 28, 2026

List of Exhibits Cited

EX1024	EX2016
EX1030	EX2018
EX1031 (includes EX2035)	EX2021
EX1032	EX2024
	EX2025

'153 Prov. Support for SC 22: Excitation and Response by Low Altitude Aircraft

- The '153 provisional teaches:
 - Ground device transmits light beam excitation
 - Low altitude aircraft (LAA) light sensor captures, i.e., receives, the excitation
 - Responds by changing the data transmitted

In order to excite the identification box light sensor 19, the ground device has a light beam emitter 23 connected to a light beam modulator 35. The light beam excitation flow 82 is executed by the ground device 21. This beam, when captured by the light sensor 19 will change the data transmitted by the identification box RF module 16. This difference in the data is detected by the ground device RF module

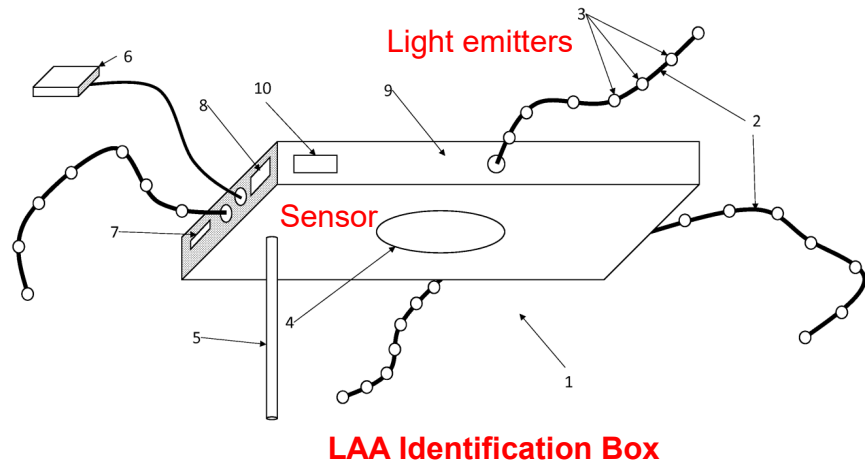
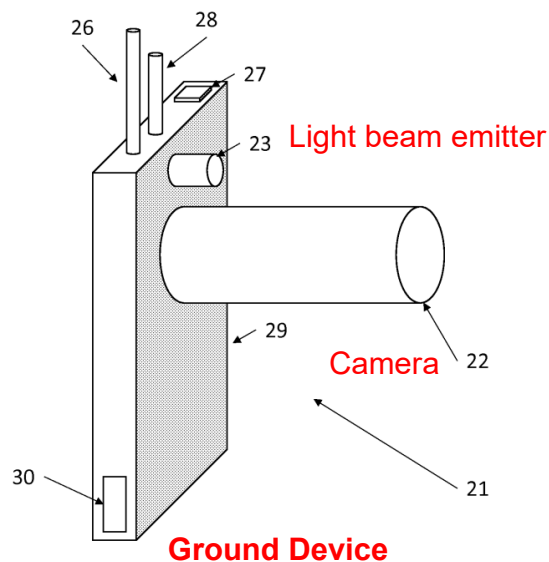
- **The same information exchange can occur via RF as well**

The identification box light emitters 3 and light sensor 4 create a two-way communication system. Similarly, the ground device camera 22 and light beam emitter 23 also create the same kind of communication. The RF receiver and transmitter 16 and 37 in both devices also creates a duplex communication. Therefore, the identification box 1 and ground device 21 together can exchange information through light or RF. This feature allow other applications. An example application is to send

Paper 26 at 5-7; Paper 35 at 1-3; EX2018 ¶¶ 44-45, 49-52, 58-59, 63-74; EX2016 ¶¶ 34, 36, at 9-12

'153 Provisional's Support: Two-Way (Duplex) Light-Based Communication

'153 Provisional (EX2016) at 9, 11, ¶36



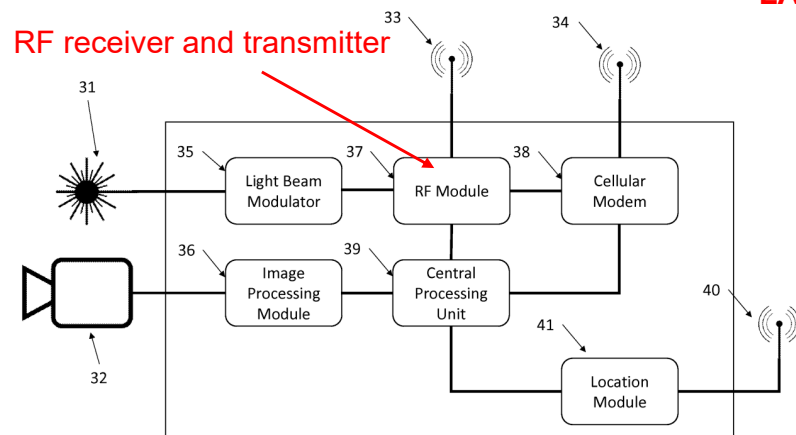
The identification box light emitters 3 and light sensor 4 create a two-way communication system. Similarly, the ground device camera 22 and light beam emitter 23 also create the same kind of communication. The RF receiver and transmitter 16 and 37 in both devices also creates a duplex

Paper 26 at 5-7; Paper 35 at 1-3; EX2018 ¶¶ 44-45, 49-52, 58-59, 63-74; EX2016 ¶ 36, at 9-12

'153 Provisional's Support: RF-Based Duplex (Two-Way) Communication

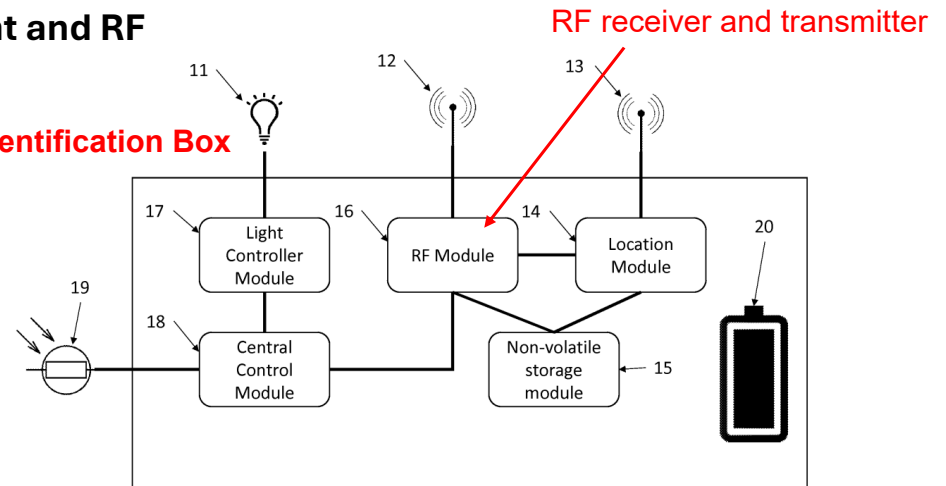
- Information can be exchanged both through light and RF

'153 Provisional (EX2016) at 10, 12, ¶¶36



Ground Device

LAA Identification Box



The identification box light emitters 3 and light sensor 4 create a **two-way communication** system. Similarly, the ground device camera 22 and light beam emitter 23 also create the **same kind of communication**. The RF receiver and transmitter 16 and 37 in both devices also creates a **duplex communication**. Therefore, the identification box 1 and ground device 21 together can exchange **information through light or RF**. This feature allow other applications. An example application is to send

Paper 26 at 5-7; Paper 35 at 1-3; EX2018 ¶¶ 44-45, 49-52, 58-59, 63-74; EX2016 ¶¶ 36, at 9-12

'153 Prov. Support: LAA RF Receiver Receives RF Excitation from Ground Station

'153 Provisional (EX2016) ¶¶ 34, 36

In order to excite the identification box light sensor 19, the ground device has a light beam emitter 23 connected to a light beam modulator 35. The light beam excitation flow 82 is executed by the ground device 21. This beam, when captured by the light sensor 19 will change the data transmitted by the identification box RF module 16. This difference in the data is detected by the ground device RF module

The identification box light emitters 3 and light sensor 4 create a two-way communication system. Similarly, the ground device camera 22 and light beam emitter 23 also create the same kind of communication. The RF receiver and transmitter 16 and 37 in both devices also creates a duplex communication. Therefore, the identification box 1 and ground device 21 together can exchange information through light or RF. This feature allow other applications. An example application is to send

- LAA's light sensor receives light excitation from ground device's light beam emitter
- The same information exchange can occur via RF
- It essentially follows – without needing any obviousness-based combination – that
 - LAA's RF module 16 receives RF excitation from ground device's RF module 37
 - Note: even with light excitation, the LAA's response is RF based

Paper 26 at 5-7; Paper 35 at 1-3; EX2018 ¶¶ 44-45, 49-52, 58-59, 63-74; EX2016 ¶¶ 34, 36, at 9-12

Excitation from Ground Is a Secure Identifier per Board's Construction

Patent Owner's proposed construction and preliminarily construe "secure identifier" as "a credential that can be used to securely verify the identity of a device, such as an airborne object or ground-based transmitter."⁸

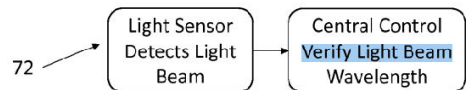
EX2024

Paper 13 (ID) at 10

credentials *noun*

2 documents such as letters that prove that you are who you claim to be, and can therefore be trusted

'153 Provisional (EX2016) ¶¶ 9, 30, 34, at 15



transmitter, and/or to modify the behavior of the blinking pattern. In some scenarios, there will be many aircrafts flying close to each other such that a receiver on the ground would detect all of them without knowing which UAV is transmitting each identification code. Therefore, it is just a matter of directing a **specific wavelength** light beam emitter to one of the aircrafts and the **aircraft will thus modify its behavior and its transmitted data, allowing the data-to-vehicle association**. This feature creates a duplex defined wavelength and intensity. In case of external light detection by the light sensor 4, the light beam **detection flow 72 is executed. Consequently, the behavior of the identification box can change**. For device 21. This **beam, when captured** by the light sensor 19 **will change the data transmitted** by the identification box RF module 16. This **difference in the data is detected** by the ground device RF module 37, and the light excited aircraft ID presented in the field 55 will be **shown in a distinguishable form** (e.g.,

- Excitation is a credential because it allows the LAA to prove that it is authentic, i.e., it is what it says it is

Paper 26 at 5-7; Paper 35 at 4-5; Paper 13 at 10; EX2018 ¶¶ 77-86; EX2016 ¶¶ 9, 30, 34, at 15; EX2024

'153 Prov. Clearly Describes “Low Altitude Aircraft”

- Specification ('153 Prov.) discloses:

Vehicles (DMV), is the license plate. Analogously, the UAS industry needs an identification system, specifically for small UASs. These aircrafts, weighing up to 25 pounds and **flying up to 500 feet of the low altitude airspace**, are too small to utilize the large, commercially used, related art tail numbers that other vehicles could use. An **identification solution is needed**. This solution must allow the vehicle to be identified by people on the ground and by other aircrafts. It must also allow external devices to identify

- Petitioners state: “specification never says what the ‘low altitude airspace’ is”

- But Dr. Papanikolopoulos explained:

EX1031 at 21:3-6

25 pounds flying up to 500 feet of the low altitude airspace.” And this comes from the -- from the specification and also is supported by **FAA rules that govern the space**.

Paper 26 at 3; Paper 35 at 5; EX2018 ¶ 92; EX2016 ¶ 2; EX1031 at 21:3-6

Meaning of “Low Altitude Aircraft” Is Clear

- Petitioners state

invention scope with reasonable certainty). PO’s expert further demonstrated indefiniteness, testifying the low-altitude airspace could go up to “14,000 feet” or to “18,000 feet” (EX1031, 22:2-24:16) and could change based on location (New York,

Paper 37 at 7

- Dr. Papanikolopoulos stated

EX1031 at 22:21-23:2

Q Does the low-altitude airspace have a maximum altitude?

A FAA usually sets this to these numbers that I told you.

EX1031 at 24:10-16

A Again, if we use the FAA numbers, which are available to a POSITA, and, again, I don't recall the exact number -- I believe -- if -- for example, if the exact number is 14,000 feet, it is not. If it is 18,000 feet, it is. This information is available to a POSITA from the FAA guidelines.

Paper 26 at 3; Paper 35 at 5; Paper 37 at 7; EX2018 ¶ 92; EX2016 ¶ 2; EX1031 at 22:21-23:2, 24:10-16

Meaning of “Low Altitude Aircraft” Is Clear

- FAA does set airspace rules that a POSITA would know and would need to follow

EX1031 at 55 (EX2035)

Airspace 101 – Rules of the Sky

FAA rules apply to the entire National Airspace System -- there is no such thing as "unregulated" airspace. Drone operators should be familiar with the difference between controlled and uncontrolled airspace, and where you can legally fly. Controlled airspace is found



Paper 26 at 3; Paper 35 at 5; EX2018 ¶ 92; EX2016 ¶ 2; EX1031 at 55 (EX2035)

Meaning of “Low Altitude Aircraft” Is Clear

- Petitioners state

invention scope with reasonable certainty). PO’s expert further demonstrated indefiniteness, testifying the low-altitude airspace could go up to “14,000 feet” or to “18,000 feet” (EX1031, 22:2-24:16) and could change based on location (New York, Minneapolis, Sacramento) (*id.*, 27:2-31:6), and also stated that a *low altitude aircraft*

Paper 37 at 7

- Dr. Papanikolopoulos stated

Q Have you reviewed Patent Owner's Reply to Opposition to the Revised Motion to Amend in this proceeding?

A Yes, but it has been some time. I mainly

Q Do you see at the end of that section there's a reference to 14 C.F.R. section 91.119(c)?

A I see, but I'm not a lawyer to understand.

EX1031 at 26:12-17, 27:16-10

Paper 26 at 3; Paper 35 at 5; Paper 37 at 7; EX2018 ¶ 92; EX2016 ¶ 2; EX1031 at 26:12-17, 27:16-10

Meaning of “Low Altitude Aircraft” Is Clear

- Dr. Papanikolopoulos explained that the “highest obstacle” can vary from place to place

§ 91.119 Minimum safe altitudes: General.

Except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:

- (a) **Anywhere.** An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.
- (b) **Over congested areas.** Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.

EX1032

A I mean, you have normal operations. And here it says, for example, the highest obstacle. How do you define the highest obstacle? You see like, for example, when we are talking about Minneapolis and New York and Sacramento, the highest obstacle may be completely different.

EX1031 at 31:1-6

Paper 26 at 3; Paper 35 at 5; EX2018 ¶ 92; EX2016 ¶ 2; EX1031 at 31:1-6; EX1032

Meaning of “Low Altitude Aircraft” Is Clear

- Petitioners state

Minneapolis, Sacramento) (*id.*, 27:2-31:6), and also stated that a *low altitude aircraft*

“depends [] on the type of the plane” (*id.*, 24:22-25:22). *Id.*, 21:11-31:17. A POSITA

Paper 37 at 7

- Dr. Papanikolopoulos stated

EX1031 at 25:8-22

Q Is an airplane a low-altitude aircraft?

A During landing and during certain phases.

Depends on the altitude. And depends also on the type of the plane.

Q What do you mean by that?

A For example, if you take a small amateur plane, it often is. But if we're talking about an Airbus 380, it's not.

Q Even if the Airbus 380 is flying at 1,000 feet?

A Yeah, I'm talking about not the approach landing or departure phases, but during the normal flying altitudes, it's not. And landing and departure, these are not normal operations. Landing and takeoff.

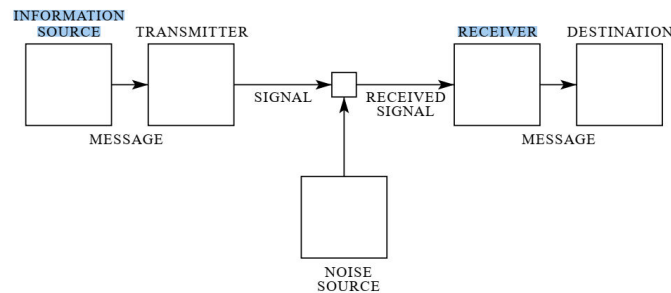
Paper 26 at 3; Paper 35 at 5; Paper 37 at 7; EX2018 ¶ 92; EX2016 ¶ 2; EX1031 at 25:8-22

Meaning of Received Information Is Clear

- SC 22 recites

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

- Signals carry information was well-known for decades



EX2025 at 2

Fig. 1—Schematic diagram of a general communication system.

- Presence of “information” would be clear to a POSITA

POSITA would readily understand that because radio *signals* contain information, the received radio signal contains the received information. EX2018, ¶94.

Paper 35 at 6

Paper 26 at 4, Claim Appendix at 1; Paper 35 at 5-6; EX2018 ¶¶ 93-97; EX2025 at 2

PO Did Not Broaden Scope of SC 22

- SC 22 recites

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

- Petitioners argue

Removing *received* **necessarily** broadens SC 22, as it **no longer limits the signal**

received by the *radio communication module* **to radio signals already received** by

Paper 37 at 9

the device, its radio frequency communication antenna, or another component.

- Signal is still received by the device

At this juncture, we determine proposed substitute claim 22 **does not impermissibly broaden the scope** of the claims of the '959 patent. The original language of claim 21—"receive a received radio signal"—**appears to be redundant**, because in order to receive a radio signal, it would have to be a *received* radio signal. Thus, while proposed substitute claim 22 removes the word "received"

Paper 23 (PG) at 5

Paper 26 at 4, Claim Appendix at 1; Paper 35 at 6; Paper 37 at 9; Paper 23 at 5; EX2018 ¶¶ 54-57, 93-97

Proposed Combinations / Viggiano Do Not Teach/Suggest Changed Behavior

[22.e]	“a specified excitation enabling disambiguation”
[22.f]	“the specified excitation causes the first low-altitude aircraft to change a behavior thereof”
[22.i]	“detection system is configured to disambiguate ... based on the changed behavior of the first low-altitude aircraft

- Petitioners allege that the authentication challenge 12 is the claimed excitation
- A POSITA would know that in challenge-response authentication
 - Response to a challenge is the default behavior
 - Not a changed behavior

EX2021 at 7

Challenge-Response Protocol	An authentication protocol where the Verifier sends the Claimant a challenge (usually a random value or a nonce) that the Claimant combines with a secret (such as by hashing the challenge and a shared secret together, or by applying a private key operation to the challenge) to generate a response that is sent to the Verifier. The Verifier can independently verify the response generated by the Claimant (such as by re-computing the hash of the challenge and the shared secret and comparing to the response, or performing a public key operation on the response) and establish that the Claimant possesses and controls the secret.
-----------------------------	---

Paper 26 at 5-7, 8-10, Claim Appendix at 1-2; Paper 33 at 14; Paper 35 at 7-8; EX2018 ¶¶ 98-103; EX2021 at 7

Proposed Combinations / Viggiano Do Not Teach/Suggest Changed Behavior

[22.e]	“a specified excitation enabling disambiguation”
[22.f]	“the specified excitation causes the first low-altitude aircraft to change a behavior thereof”
[22.i]	“detection system is configured to disambiguate ... based on the changed behavior of the first low-altitude aircraft

- Petitioners allege that the authentication challenge 12 is the claimed excitation
- Viggiano states:

of the present invention, if an ADS-B transmitter 20 fails two or more consecutive authentication response comparisons, the Authenticator 10 notifies a responsible higher command authority of the authentication failures, so that the

- If two or more consecutive failed responses is a change in behavior causing alleged disambiguation
 - **At least two alleged excitations** are necessary
 - One alleged excitation does not enable disambiguation
- Additionally, consecutive failed response is not a change in behavior
- There was **no change in behavior at all**

Paper 26 at 5-7, 8-10, Claim Appendix at 1-2; Paper 33 at 14-15; Paper 35 at 8-9; EX2018 ¶ 103; EX1024 ¶ 15

Proposed Combinations / Hayes Do Not Teach/Suggest Disambiguation

[22.i]

“detection system is configured to disambiguate ... based on the changed behavior of the first low-altitude aircraft

- ’153 provisional states:

RF receiver module 37. Since many signals can be received at the substantially same time by the receiver module 37, the detected IDs are presented in the field 55 in a list format. If at any time the users decide

identification box RF module 16. This difference in the data is detected by the ground device RF module 37, and the light excited aircraft ID presented in the field 55 will be shown in a distinguishable form (e.g., bolded).

- Hayes teaches

Points of interest and other objects may also be removed automatically from a UAV associated map. For example, an alert may be received from an unmanned aerial vehicle in a region and a subset of a plurality of objects on a map of the region may be displayed, wherein the subset of the plurality of objects is based on the alert. An alert may include the

- Petitioners argue:

0015; Pet., 29-31, 35-39; Section IV.1 (MTC); EX1027, ¶59. Consecutive failures of the authentication causes issuance of “an alert” that triggers a modification of the displayed user interface of Beard’s receiver, causing other detected and displayed UASs to be removed from the interface and the first UAS to thus be more clearly

- Removing / displaying a subset is isolating – not disambiguating

Paper 26 at 5-7, 8-10, Claim Appendix at 1-2; Paper 33 at 15; Paper 35 at 9-10; EX2018 ¶¶ 104-106; EX1030 5:10-15