

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ADB SAFEGATE SWEDEN AB,
ADB SAFEGATE BV, and
ADB SAFEGATE AMERICAS, LLC,
Petitioner,

v.

HONEYWELL INTERNATIONAL INC.,
Patent Owner.

PGR2023-00053
Patent 11,538,349 B2

Before JAMES P. CALVE, BENJAMIN D. M. WOOD, and
JASON W. MELVIN, *Administrative Patent Judges*.

CALVE, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 328(a)

I. BACKGROUND

A. *History of the Proceeding*

ADB Safegate Sweden AB, ADB Safegate BV, and ADB Safegate Americas, LLC (collectively, “Petitioner”) filed a petition seeking a post-grant review of claims 1–20 (the “challenged claims”) of U.S. Patent No. 11,538,349 B2 (“the ’349 patent”). Paper 1 (“Pet.”). Honeywell International Inc. (“Patent Owner”) filed a preliminary response. Paper 8 (“Prelim. Resp.”). Applying the standard in 35 U.S.C. § 324(a), we instituted an *inter partes* review of all challenged claims on all grounds asserted in the Petition. Paper 10 (“Dec. Inst.”). After we instituted trial, Patent Owner filed a Patent Owner Response. Paper 15 (“PO Resp.”). Petitioner filed a Reply to Patent Owner’s Response. Paper 17 (“Reply”). Patent Owner filed a Sur-reply to Petitioner’s Reply. Paper 18 (“Sur-reply”).

An oral hearing was held on December 18, 2024, and a copy of the transcript was entered in the record. Paper 23 (“Tr.”).

We have jurisdiction pursuant to 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 328(a) and 37 C.F.R. § 42.73 as to the patentability of the claims on which we instituted trial. Petitioner bears the burden of proving unpatentability of the challenged claims. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, Petitioner must prove unpatentability by a preponderance of the evidence. *See* 35 U.S.C. § 326(e); 37 C.F.R. § 42.1(d). For reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–20 of the ’349 patent are unpatentable.

B. Related Proceedings

The parties indicate that the '349 patent is not involved in any other case or matter. Pet. 2; Paper 6 (Mandatory Notices by Patent Owner), 1.

C. Real Parties in Interest

Petitioner asserts that ADB Safegate Sweden AB, ADB Safegate BV, and ADB Safegate Americas, LLC are the real parties in interest. Pet. 2. Patent Owner identifies Honeywell International Inc. as the sole real party in interest. Paper 6, 1.

D. The '349 Patent

The '349 patent describes systems for detecting, tracking, and docking aircraft in a taxiway, apron, or ramp area of an airport, as shown in Figure 1, which is reproduced below. Ex. 1001, 1:7–9.

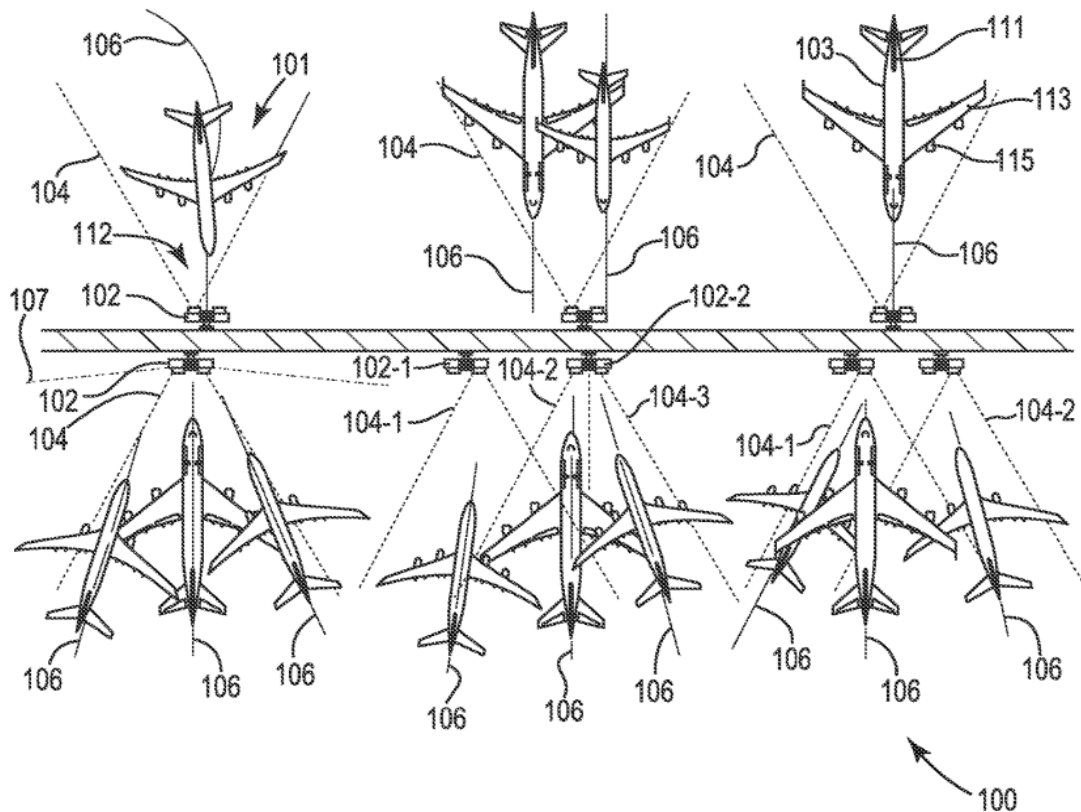


FIG. 1

Figure 1 depicts aircraft ramp areas with sensor arrays 102 that combine at least one camera image sensor and at least one laser or radar sensor (LIDAR/Radar sensor) at a ramp area within field of view 104 of at least one sensor of sensor array 102. *Id.* at 3:53–67. Ramp areas provide a parking space where passengers and crew may access an aircraft. *Id.* at 4:1–8.

The top left arrangement shows aircraft 101 moving into a ramp area within field of view 104 of sensor array 102 that comprises a camera image sensor and a LIDAR/Radar sensor 112 (represented together) with aircraft 101 altering its path 106 to align itself with the lead-in line. Ex. 1001, 4:26–37. Using multiple sensor arrays 102 allows for more precise movements and provides aircraft docking scenarios that are not straight. *Id.* at 4:38–43.

The bottom left arrangement depicted in Figure 1 uses two sensors in a single location. One sensor provides a wider field of view 107. The other sensor provides a narrower field of view 104. Ex. 1001, 4:44–50.

The bottom middle arrangement has two sensor arrays spaced apart. Sensor array 102-1 is a camera image sensor with field of view 104-1, and sensor array 102-2 has multiple camera image sensors with different fields of view 104-2, 104-3 for determining the six dimensional information (x, y, z, roll, pitch, yaw) used to create a 3D model. Ex. 1001, 4:60–5:3, 8:50–54.

The bottom right arrangement arranges two arrays spaced apart from each other. Each array has one camera image sensor and one LIDAR/Radar sensor with overlapping fields of view 104-1, 104-2. Ex. 1001, 5:4–8.

The different sensor arrangements collect different information for determining the six dimensional information used to create the 3D model for determining an aircraft's position, orientation, and movement using a system shown in Figure 3, which is reproduced below. Ex. 1001, 2:39–42, 4:51–59.

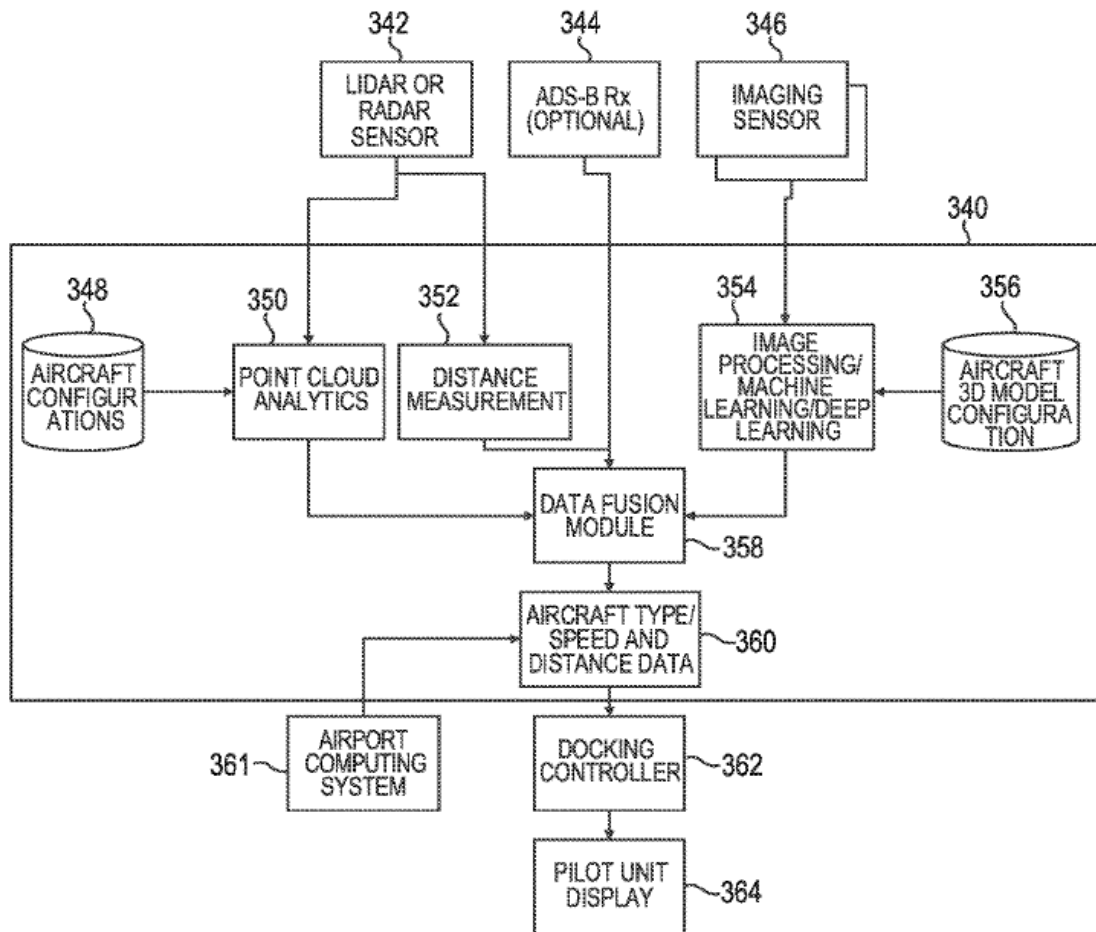


FIG. 3

Figure 3 is a flow diagram of LIDAR/Radar sensor 342 and imaging sensor 346 that send data to central docking system controller 340. *Id.* at 6:1–8. LIDAR/Radar sensor 342 captures data to send to central docking system 340 to create a LIDAR/Radar point cloud. *Id.* at 6:9–23. Camera image sensor 346 sends image sensor data to central docking station controller 340. *Id.* at 6:35–45. Image processing system 354, 356 creates a 3D image model and LIDAR/Radar point cloud analytics 348, 350 creates a point cloud as the aircraft nears the ramp area. *Id.* at 6:46–52, Fig. 4 (elements 468, 470).

E. Challenged Claims

Petitioner challenges all twenty claims of the '349 patent. Of these, claims 1, 10, and 18 are independent. Claims 2–9 depend from claim 1. Claims 11–17 depend from claim 10. Claims 19 and 20 depend from claim 18. Ex. 1001, 12:38–14:64.

Claim 1 is representative of the claimed subject matter and is reproduced below.

1. A method for tracking an aircraft, comprising:
 - receiving camera image data of the aircraft while the aircraft is approaching a ramp area for parking the aircraft on an airside of an airport;
 - receiving Light Detection And Ranging (LIDAR) or Radio Detection And Ranging (RADAR) sensor data of the aircraft while the aircraft is approaching or in the ramp area;
 - merging the camera image data and the LIDAR/RADAR sensor data into a merged data set; and
 - wherein the merged data set includes at least one of: data for determining position and orientation of the aircraft relative to the position and orientation of the ramp area, data for determining speed of the aircraft, data for determining direction of the aircraft, data for determining proximity of the aircraft to a particular object within the ramp area, and data for forming a three dimensional virtual model of at least a portion of the aircraft from the merged data; and
 - displaying messages to provide directional and speed guidance to a pilot with the merged data set.

Ex. 1001, 12:38–58.

F. Asserted Grounds of Unpatentability

We instituted trial on the following grounds of unpatentability:

Ground	Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1	1–20	101	Ineligibility
2	1, 6–10, 13–20	102/103 ¹	Berkmo ²
3	1–20	103	Berkmo, Richman ³

II. DISCUSSION

A. Eligibility for Post-Grant Review

A petitioner seeking post-grant review must certify that the challenged patent is available for post-grant review. 37 C.F.R. § 42.204(a). “A petition for a post-grant review may only be filed not later than the date that is 9 months after the date of the grant of the patent or of the issuance of a reissue patent (as the case may be).” 35 U.S.C. § 321(c). Petitioner must establish eligibility for post-grant review. *See Mylan Pharms. Inc. v. Yeda Res. & Dev. Co.*, PGR2016-00010, Paper 9 at 10 (PTAB Aug. 15, 2016).

Petitioner “certif[ies] that the ’349 Patent is eligible for post-grant review because it contains at least one claim with an effective filing date after March 16, 2013,” and has “not filed a civil action challenging the

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 285–88 (2011), revised 35 U.S.C. § 103 effective on March 16, 2013. Because the ’349 patent has an effective filing date after March 16, 2013, we refer to the current versions of 35 U.S.C. §§ 102 and 103.

² US 2022/0066025 A1, published Mar. 3, 2022 (Ex. 1004, “Berkmo”).

³ US 5,675,661, issued Oct. 7, 1997 (Ex. 1005, “Richman”).

validity of any claim of the '349 Patent.” Pet. 3; *see* 37 C.F.R. § 42.201(a). Petitioner also asserts that it is “not barred or estopped from requesting post-grant review challenging the patent claims on the grounds identified in this Petition.” Pet. 3. Patent Owner does not contest Petitioner’s assertions.

On this record, we determine that the '349 patent is eligible for post-grant review. The patent’s earliest effective filing date is August 3, 2020, which is after March 16, 2013. The Petition’s September 27, 2023, filing date (Paper 3, 1) is not later than the date that is nine months after the '349 patent’s grant date of December 27, 2022. Ex. 1001, code (45). Finally, we accept Petitioner’s certification that it has not filed a civil action challenging the validity of a claim of the '349 patent before filing the Petition. Pet. 3.

B. Level of Ordinary Skill in the Art

Petitioner asserts that a skilled artisan would have “held at least a degree in electrical engineering, computer engineering, computer science or a similar discipline, with at least two years of relevant industry or research experience, including experience designing, planning, or implementing sensor networks using LIDAR, radar and/or cameras and corresponding data analysis” and “[a]dditional work or research experience can substitute for less or different education, and vice versa.” Pet. 10 (citing Ex. 1003 ¶¶ 18–23). Patent Owner does not dispute Petitioner’s definition of a person of ordinary skill in the art. PO Resp. 14.

Having considered the record, we adopt Petitioner’s uncontested level of ordinary skill as articulated above. Petitioner’s description appears to be consistent with the prior art cited and the skill reflected in the Specification of the '349 patent. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1354–55 (Fed. Cir. 2001) (the applied prior art may reflect an appropriate level of skill).

C. Claim Interpretation

We interpret claims using the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.200(b). Under that standard, words of a claim are generally given their ordinary and customary meaning as understood by a person of ordinary skill in the art at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc). We only need to construe the claims to the extent necessary to resolve the parties' disputes. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019).

Petitioner asserts that “[n]o terms require construction to determine that claims 1–20 are invalid under §§ 101, 102, 103.” Pet. 9. Patent Owner argues that the terms “directional . . . guidance” and “speed guidance” in the limitation “displaying messages to provide directional and speed guidance to a pilot” need to be construed. PO Resp. 15–19.

I. “directional . . . guidance”

Patent Owner asserts that “directional guidance” means “navigational instructions, including horizontal deviation with respect to the center line of a path.” PO Resp. 16. Patent Owner argues that “directional guidance” “refers to the navigational instructions to be provided to the pilot guiding the airplane in view of the merged data derived from the received camera image data and LIDAR/RADAR data.” *Id.* Patent Owner also asserts that the ’349 patent indicates that the invention can “provide the remaining distance and the horizontal deviation with respect to the center line of the path (*e.g.*, lead-in line) that the aircraft is supposed to follow” to “provide the pilot with directions regarding how to get the aircraft to the correct location.” *Id.* (quoting Ex. 1001, 10:8–13; citing Ex. 2002 ¶¶ 62–65).

Petitioner contends that “‘directional . . . guidance’ is simply telling the pilot which way to go.” Reply 2. Petitioner asserts that the claims do not require directional guidance to include “horizontal deviation with respect to the center line of a path” as Patent Owner asserts, and the ’349 patent describes this feature as a permissive example of directional guidance rather than a requirement. *Id.* at 2–3 (asserting that the ’349 patent states that the “guidance module of the central docking system **can, for example, provide** the remaining distance and the horizontal deviation with respect to the center line of the path (e.g., lead-in line) that the aircraft is supposed to follow.”) (quoting Ex. 1001, 10:8–11). Petitioner argues that it is improper to limit this term to such an exemplary embodiment. *Id.* at 3–4.

We reject Patent Owner’s interpretation because it limits the claims to an exemplary embodiment that “can, for example, provide the remaining distance and the horizontal deviation with respect to the center line of a path” (Ex. 1001, 10:8–11), and it reads limitations of that embodiment into the claims. Absent a lexicographic definition or a disavowal, such claim interpretations are not permissible. *See Phillips*, 415 F.3d at 1312, 1316 (claims are given their ordinary, customary meaning in the context of the entire patent and the specification absent a lexicographic definition or a disclaimer or disavowal of claim scope by the inventor); *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004) (“Even when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using ‘words or expressions of manifest exclusion or restriction.’”) (citation omitted). Patent Owner has not asserted a definition or a disclaimer to support its interpretation. PO Resp. 16–17.

The parties agree that “directional guidance” includes “navigational instructions” and “maneuvering guidance information.” PO Resp. 16 (“the claims make clear that this guidance refers to the navigational instructions to be provided to the pilot guiding the airplane”), 17 (a skilled artisan “reading the challenged claims in light of the specification would understand that ‘directional guidance’ refers to navigational instructions including the horizontal deviation with respect to the center line of a path”); Reply 21 (Berkmo teaches providing “pilot maneuvering guidance information . . . for aiding a pilot of the approaching aircraft towards [a] parking position”); Pet. 54 (Berkmo provides maneuvering guidance information).

We interpret “directional guidance” as navigational instructions and maneuvering guidance information. This interpretation is consistent with the claims, which do not recite features of “directional guidance,” much less a horizontal deviation with respect to a center line as Patent Owner asserts.

Our interpretation also is consistent with the ’349 patent specification, which indicates “the pilot will need guidance to know which lead-in line to follow based on their type of aircraft” (Ex. 1001, 4:23–25) and “directions regarding how to get the aircraft to the correct location” (*id.* at 10:12–13), to include “indicat[ing] to the pilot when to brake in order to stop on the stop point” (*id.* at 10:12–15). *See* Ex. 1044 ¶ 52 (directional guidance tells the pilot “which direction to go” “such as left, right, continue, or go toward”). The testimony of Patent Owner’s declarant, Mr. Wilson, is not supported by the claim language and does not address the entire ’349 patent specification. Ex. 2002 ¶¶ 63–65. Neither party identifies relevant evidence from the ’349 patent file history. *See* Reply; PO Resp. 16–17. Our interpretation is sufficient to resolve the parties’ controversy.

2. “*speed guidance*”

Patent Owner argues that “speed guidance to a pilot” should mean “instructions concerning maximum speeds for approaching a gate.” PO Resp. 18. Patent Owner asserts that the specification describes the speed guidance as the docking system “can also provide and monitor maximum speeds for approaching a gate” and “speed thresholds can be set and monitored and instructions can be passed to the pilot to slow down.” *Id.*

We agree with Petitioner that “speed guidance” should be given its plain and ordinary meaning of instructing a pilot how to regulate speed. Reply 4. Patent Owner reads limitations from an example embodiment in which the docking system *can also* provide and monitor maximum speeds into the claim without a basis for doing so. Ex. 1001, 10:16–19; Reply 4.

Our interpretation is consistent with the claims, which do not recite any features of “speed guidance” much less providing maximum speeds for approaching a gate. It is consistent with the ’349 patent, which indicates the docking system may set maximum speeds to approach a gate, but the speed guidance to the pilot may also comprise “instructions [that] can be passed to the pilot to slow down.” Ex. 1001, 10:17–19. It may “indicate to the pilot when to brake in order to stop on the stop point.” *Id.* at 10:13–15; Ex. 1044 ¶ 53 (“When a moving aircraft is instructed to ‘stop,’ that instruction necessarily provides speed guidance because it is instructing the pilot to change the speed of the aircraft” and “the ’349 Patent explicitly describes ‘speed guidance’ as including to ‘slow down’”). Neither party identifies relevant evidence from the ’349 patent file history. Reply; PO Resp. 18–19. No definition or disavowal is cited by Patent Owner. PO Resp. 18–19. This interpretation is sufficient to resolve the parties’ controversy.

3. “*with the merged data set*”

Claim 1 recites “displaying messages to provide directional and speed guidance to a pilot with the merged data set.” Patent Owner argues a plain reading of the claims requires the messages to provide the merged data set along with the claimed guidance. PO Resp. 58; *id.* at 59 (“Such data must be displayed in the messages *with* the directional and speed guidance.”).

Petitioner asserts that this limitation means “the displayed direction and speed guidance are determined by the ‘merged data set.’” Reply 6.

The meaning of this limitation in the context of claim 1 is unclear. Camera image data and LIDAR/RADAR sensor data are merged to form a merged data set that is used *for* determining the direction and speed of the aircraft. Then, messages are displayed “to provide directional and speed guidance to a pilot with the merged data set.” Ex. 1001, 12:38–58.

The disclosure in the ’349 patent cited by Patent Owner states that “the determined speed, position, orientation, and/or direction can be sent to a ramp docking system controller device in the ramp docking system and then passed to the pilot unit computing device.” Ex. 1001, 10:19–23 (quoted in PO Resp. 59). There is no indication the *merged data set* itself is sent to the pilot unit computing device. The ’349 patent instead states (*id.* at 6:57–65):

data fusion can be real-time processes . . . which derive[] the speed and position of the aircraft. This will provide the input to the central docking system controller to provide the clear information to use in pilot unit display messages that can be used to provide directional and/or speed guidance to the pilot.

This description supports Petitioner’s contention that the merged data set is used to determine directional and speed guidance that is provided to a pilot, but the merged data set itself is not provided to the pilot with the messages.

Our interpretation is consistent with what the '349 patent's description of a merged data set in Figure 4, which we reproduce below.

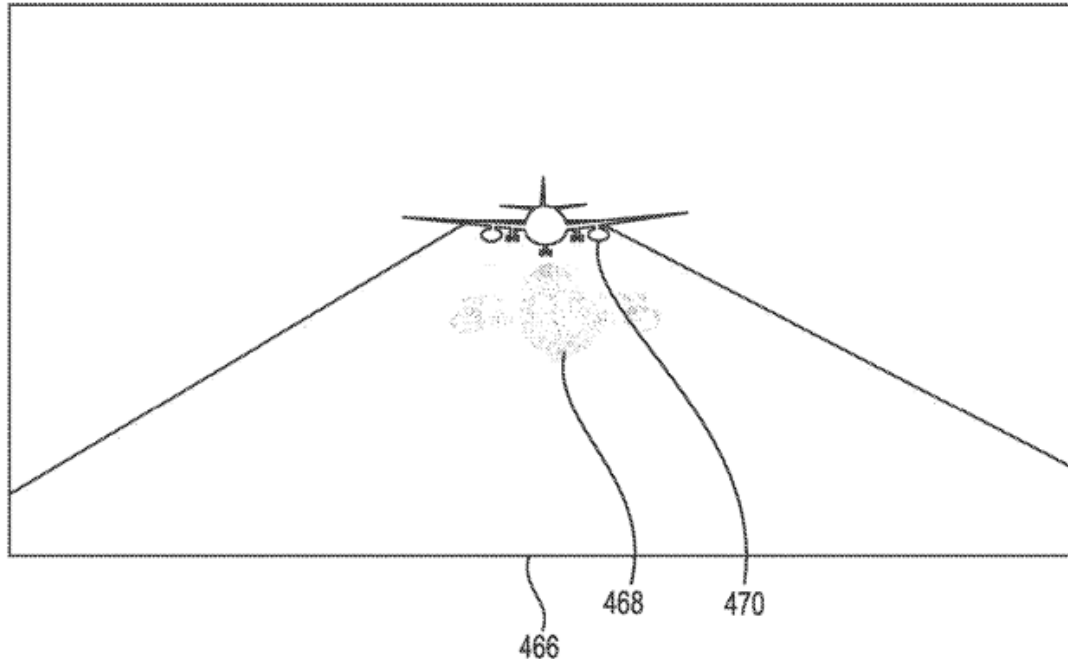


FIG. 4

Figure 4 is a 2D display of a 3D model of an aircraft and point cloud data. It shows the differences between point cloud data 468 and 3D model data 470 as “illustrated in a virtual 3D space.” Ex. 1001, 2:43–46, 10:39–46. “As can be understood from this comparison, the two data sets are very distinctly different and each has its beneficial uses.” *Id.* at 10:44–46. Patent Owner does not assert that such a merged data set is displayed with the directional and speed guidance or explain how such a merged data set would be useful in providing directional or speed guidance to a pilot, particularly when it is in virtual space unconnected to a ramp area. *See* PO Resp. 58–60; Sur-Reply 15. In traversing Ground 1, Mr. Wilson indicates that the human mind cannot process or interpret such data. *See* Ex. 2002 ¶¶ 75–79.

The merged data set is used *to determine* the speed and direction of an aircraft, and the determined speed and direction can be sent to the pilot unit computing device with direction and speed guidance. Ex. 1001, 10:19–23, 7:8–14, 7:31–37, 7:56–62, 11:8–23, 11:51–12:5. Thus, speed and direction guidance are *based on* the merged data set, but the merged data set itself is not sent to the pilot with this guidance. *Id.*; see PO Resp. 59 (asserting that displaying the determined speed and direction displays the merged data)

We adopt Petitioner’s construction as more consistent with the claim language, the ’349 patent specification, and the file history,⁴ but our decision would be the same under either party’s construction, as discussed below.

D. Principles of Law

1. Subject Matter Eligibility under 35 U.S.C. § 101

The Supreme Court interprets 35 U.S.C. § 101 to include exceptions for “[l]aws of nature, natural phenomena, and abstract ideas.” *Alice Corp. v. CLS Bank Int’l*, 573 U.S. 208, 216 (2014). To determine whether a claim falls within a judicial exception to § 101, we apply the two-step framework set forth in *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 566 U.S. 66 (2012), and reaffirmed in *Alice*. *Alice*, 573 U.S. at 217–18 (citing *Mayo*, 566 U.S. at 75–77). The USPTO’s Patent Subject Matter Eligibility Guidance⁵ designates the first step of *Alice* as Step 2A.

⁴ This limitation was added by Examiner’s Amendment in a Notice of Allowability without explanation. See Ex. 1002, 12–21.

⁵ 2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50 (Jan. 7, 2019) (“Guidance”) available at <https://www.govinfo.gov/content/pkg/FR-2019-01-07/pdf/2018-28282.pdf>; MANUAL OF PATENT EXAMINING PROCEDURE § 2106.03 (9th Ed. Rev. 07.2022, Feb. 2023) (“MPEP”).

At Step 2A, we determine whether claims are directed to a patent-ineligible abstract idea, law of nature, or natural phenomenon. MPEP § 2106.04; *Alice*, 573 U.S. at 217. If so, we advance to the second step of *Alice* (Step 2B of the Guidance) where we consider the additional elements of a claim, individually and as an ordered combination, to determine whether the additional elements transform the claim into a patent-eligible application of the ineligible concept. MPEP § 2106.05; *Alice*, 573 U.S. at 217.

The Guidance establishes a two-prong inquiry to determine whether a claim is directed to a judicial exception. Guidance at 54. At Prong One, we determine whether a claim *recites* a judicial exception. *Id.* Abstract ideas include mathematical concepts, certain methods of organizing human activity, and mental processes. *Id.* at 52. If a claim recites a judicial exception, we consider whether it recites additional elements that *integrate* the judicial exception *into a practical application*. *Id.* at 54 (Prong Two). A claim is *directed to* a judicial exception if it recites a judicial exception *and* does not integrate the exception into a practical application. *Id.* Integration into a practical application requires an additional element or a combination of additional elements to apply, rely on, or use a judicial exception in a way that imposes a meaningful limit on the judicial exception, such that the claim is more than a drafting effort to monopolize the exception. *Id.* at 54–55.

If we determine the claim is directed to a judicial exception, we then determine whether the claim adds a specific limitation beyond the judicial exception that is not a well-understood, routine, and conventional activity in the field, or whether the claim simply appends well-understood, routine, and conventional activities previously known to the industry, specified at a high level of generality, to the judicial exception. *Id.* at 56 (Step 2B).

2. *Anticipation under 35 U.S.C. § 102*

A “prior art reference—in order to anticipate under 35 U.S.C. § 102—must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements ‘arranged as in the claim.’” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008) (citation omitted). “A single prior art reference may anticipate without disclosing a feature of the claimed invention if such feature is necessarily present, or inherent, in that reference.” *Allergan, Inc. v. Apotex Inc.*, 754 F.3d 952, 958 (Fed. Cir. 2014).

3. *Unpatentability under 35 U.S.C. § 103*

A claim is unpatentable under “if differences between the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.” 35 U.S.C. § 103; *see KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). “The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *KSR*, 550 U.S. at 416.

The question of obviousness is resolved based on underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Neither party has presented any objective evidence of non-obviousness or obviousness.

E. Ground 1: Ineligibility under 35 U.S.C. § 101

Petitioner asserts that claims 1–20 are directed to a judicial exception to 35 U.S.C. § 101 without significantly more. Pet. 16–38.

1. Step 1 of the Guidance

We agree with Petitioner that claims 1–17 recite methods within a statutory category of a “process,” and claims 18–20 recite a system within a statutory category of a “machine.” Pet. 19. Patent Owner does not contest these points. *See* PO Resp.

2. Step 2A, Prong One of the Guidance

Petitioner asserts that representative claim 1 recites receiving image and sensor data of an aircraft, merging it, and displaying messages with the merged data as mental processes. Pet. 19–23 (citing Ex. 1003 ¶¶ 78–83). Petitioner asserts that *Electric Power Group, LLC v. Alstom S.A.*, 830 F.3d 1350, 1353 (Fed. Cir. 2016) held a similar claim to receiving plural data streams, detecting and analyzing events in real-time from the data streams, displaying event analysis and concurrent visualization of measurements, and deriving a composite indicator of reliability was focused, as in claim 1, on collecting information, analyzing it, and displaying results of the collection and analysis, even though the claim in *Electric Power* was significantly longer and more detailed than claim 1 here. *Id.* at 20–21; Tr. 21:4–22:9 (responding to PO Resp. 26–34). Petitioner asserts that steps of analyzing collected data by mental steps or mathematical algorithms recite mental processes, and deriving a composite reliability indicator in *Electric Power* parallels deriving directional and speed guidance from merged camera and LIDAR/RADAR data as the ’349 patent recites. Pet. 22–23; Reply 9–11.

The steps of “receiving camera image data of the aircraft while the aircraft is approaching a ramp area for parking the aircraft on an airside of an airport” and “receiving LIght Detection And Ranging (LIDAR) or Radio Detection And Ranging (RADAR) sensor data of the aircraft while the aircraft is approaching or in the ramp area” in claim 1 simply gather sensor data, which is an abstract idea and extra-solution activity. *See Elec. Power*, 830 F.3d at 1353; Guidance at 55 & n.31 (data gathering for analysis is extra-solution activity); Pet. 20. Claim 18 recites a “camera image sensor for capturing camera image data of the aircraft,” a “LIght Detection And Ranging (LIDAR) or Radio Detection And Ranging (RADAR) sensor for capturing LIDAR/RADAR sensor data of the aircraft,” and a computing device to receive this data with no technical implementation details of these data gathering steps or devices. Ex. 1001, 14:31–40, 8:37–46, 6:1–23.

Data gathering for analysis is abstract. *See Univ. of Fla. Research Found., Inc. v. Gen. Elec. Co.*, 916 F.3d 1363, 1367 (Fed. Cir. 2019) (data synthesis technology to convert formats of physiologic data and collect, analyze, manipulate, and display the data is an abstract idea); *Braemar Mfg., LLC v. ScottCare Corp.*, 816 F. App’x 465, 470 (Fed. Cir. 2020) (receiving a cardiac biological signal, classifying events, filtering data by characteristics to determine a measure of merit and sending data for review merely collects, classifies, and filters data, and the measure of merit can be performed in the human mind or with pen and paper); *CardioNet, LLC v. InfoBionic, Inc.*, 816 F. App’x 471, 475, 476–77 (Fed. Cir. 2020) (collecting and identifying atrial fibrillation events in physiological data without any particular technology is an abstract idea, and the atrial fibrillation burden is, at most, a mathematical computation that can be performed mentally or with pen and paper).

“Courts have examined claims that required the use of a computer and still found that the underlying, patent-ineligible invention could be performed via pen and paper or in a person’s mind.” *Versata Dev. Group v. SAP Am., Inc.*, 793 F.3d 1306, 1335 (Fed. Cir. 2015); *see also Intellectual Ventures I LLC v. Symantec Corp.*, 838 F.3d 1307, 1318 (Fed. Cir. 2016) (“[W]ith the exception of generic computer-implemented steps, *there is nothing in the claims themselves* that foreclose them from being performed by a human, mentally or with pen and paper.” (emphasis added)).

The merging step merges “camera image data” and “LIDAR/RADAR sensor data” into “a merged data set” without claiming how it is done. The ’349 patent specification *describes* merging as *calculating a transformation* between coordinates of the sensor system and camera system to *determine an estimated pose* of the 3D model using a vision pose estimation process to determine six dimensions of the aircraft. Ex. 1001, 8:50–9:10. The process can include registering point cloud data from a 3D model and 3D point cloud data from a sensor using an *iterated point cloud algorithm*. *Id.* at 9:18–20.

We agree with Petitioner that the merging recites mental processes because the algorithms described in the specification (Ex. 1001, 8:50–9:10) can be performed as mental processes. Pet. 20–22; Reply 9–11; Ex. 1044 ¶¶ 56–58; *Elec. Power Grp.*, 830 F.3d at 1351–52, 1353–54 (receiving time stamped synchronized phasor measurements at different points of an electric power grid and analyzing and updating the measurements in real time using limits, sensitivities, and rates of change of dynamic stability metrics derived from voltages, power flows, phase angles, damping, and oscillation modes recite mental processes); *id.* at 1354 (analyzing data by mental steps or mathematical algorithms is an abstract mental process).

Merging data by transforming and converting it from one format to another is an abstract idea. *See AI Visualize, Inc. v Nuance Commc'ns, Inc.*, 97 F.4th 1371, 1379 (Fed. Cir. 2024) (“But ‘converting information from one format to another . . . is an abstract idea.’” (citation omitted); creating virtual views in real time by “creating the requested frames of the requested views *from the volume visualization dataset*” created a virtual view from the existing volume visualization dataset as “abstract data manipulation”); *Hawk Tech. Sys., LLC v. Castle Retail, LLC*, 60 F.4th 1349, 1357 (Fed. Cir. 2023) (the method receives, displays, converts, stores, and transmits digital video data using result-based functional language); *FICEP Corp. v. Peddinghaus Corp.*, No. 2022-1590, 2023 WL 5346043, *3–4 (Fed. Cir. Aug. 21, 2023) (the focus of the advance is on automating the identification, extraction, and transfer of a 3D rendering of an object by a CAD design model including dimensions and intersection parameters without specifying how intersection parameter data was generated or used to create a design model and therefore encompasses a human deriving intersection parameters and adding this data to the design model for extraction); *Digitech Image Techs., LLC v. Elecs. for Imaging, Inc.*, 758 F.3d 1344, 1351 (Fed. Cir. 2014) (“[A] process that employs mathematical algorithms to manipulate existing information to generate additional information is not patent eligible.”) (quoting *Parker v Flook*, 437 U.S. 584, 595 (1978) (“If a claim is directed essentially to a method of calculating, using a mathematical formula, even if the solution is for a specific purpose, the claimed method is nonstatutory.”)); MPEP § 2106.04(a)(2) (mathematical relationships include converting binary coded decimal numerals to pure binary numerals as did the claims in *Gottschalk v. Benson*, 409 U.S. 63, 71–72 (1972)); *see also* Tr. 22:24–25:23.

Similar claims to data manipulation recited an abstract idea. *See Rady v. Boston Consulting Grp., Inc.*, No. 2022-2218, 2024 WL 1298742, **1, 3 (Fed. Cir. Mar. 27, 2024) (using spectral analysis data and 3D scan data from measurements to determine a unique signature for a physical item for tracking and authentication gathered, stored, and interpreted data to identify a physical item’s pattern of imperfections as an abstract idea); *Burnett v. Panasonic Corp.*, 741 F. App’x 777, 780–81 (Fed. Cir. 2018) (“We have held that a process that starts with data, applies an algorithm, and ends with a new form of data is directed to an abstract idea.” (citing *Digitech*, 758 F.3d at 1351); “In sum, the claims apply a mathematical methodology to convert geospatial coordinates into a single string of natural numbers” by “converting longitude and latitude coordinates into natural numbers—i.e., removing the decimal points and replacing any ‘+’ signs with a ‘1’ and any ‘-’ signs with a 0—and second, concatenating the resulting natural numbers—i.e. joining the strings of resulting numbers together.”); *Coffelt v. Nvidia Corp.*, 680 F. App’x 1010, 1011 (Fed. Cir. 2017) (calculating and comparing 3D steradian regions in space is “nothing more than a mathematical algorithm that could be implemented using a pen and paper” and a mental process); *see also Int’l Bus. Machines Corp. v. Zillow Grp., Inc.*, 50 F.4th 1371, 1378 (Fed. Cir. 2022) (selecting and manipulating data to provide a humanly comprehensible amount of information useful for users does not transform the data collection and analysis that displays, filters, and interacts with the geospatial data on a map to display a more limited data set to the user); *CardioNet, LLC v InfoBionic, Inc.*, 816 F. App’x 471, 476–77 (Fed. Cir. 2020) (an atrial fibrillation burden metric is a mathematical computation that can be performed by a human, mentally or with pen and paper).

We disagree with Patent Owner that the challenged claims “track the type of claims that have already been reviewed and have been expressly found to be non-abstract by the Federal Circuit” in *Thales Visionix Inc. v. United States*, 850 F.3d 1343 (Fed. Cir. 2017). PO Resp. 22. *Thales* “use[d] inertial sensors in a non-conventional manner to reduce errors in measuring the relative position and orientation of a moving object on a moving reference frame” and “specify a particular configuration of inertial sensors and a particular method of using the raw data from the sensors in order to more accurately calculate the position and orientation of an object on a moving platform.” *Thales*, 850 F.3d at 1348–49; see PO Resp. 23. Here, the challenged claims do not use inertial sensors on a moving platform to track an object. Nor do they use sensors in any non-conventional manner.

Here, the claims track an aircraft relative to a *fixed* frame of reference of a ramp area without mounting sensors on an aircraft or a moving platform and without reciting a particular sensor configuration as in *Thales*. See *iLife Techs., Inc. v Nintendo of Am., Inc.*, 839 F. App’x 534, 537 (Fed. Cir. 2021) (the claims did not focus on a specific physical configuration of sensors to evaluate body movement with static and dynamic acceleration information).

In claim 1 here, camera image and LIDAR/RADAR data are received and merged without reciting a sensor configuration. Ex. 1001, 12:39–47. In claim 18, a camera image sensor captures camera image data of the aircraft, a LIDAR/RADAR sensor captures LIDAR/RADAR sensor data of the aircraft, and a computing device merges this data without claiming a sensor configuration. *Id.* at 14:31–41; see *Sensormatic Elecs., LLC v Wyze Labs, Inc.*, No. 2020-2320, 2021 WL 2944838, *3 (Fed. Cir. July 14, 2021) (“Sensormatic fails to identify any particular nonabstract configuration.”).

The “merged data set” recited in claim 1 is used to determine aircraft position and orientation, speed, direction, proximity, and a 3D virtual model without claiming a particular sensor configuration. *See Automated Tracking Solutions, LLC v. Coca-Cola Co.*, 723 F. App’x 989, 994 (Fed. Cir. 2018) (“The claim does not recite any ‘particular configuration’ or specialized arrangement of the RFID system components” or a configuration of the antenna to determine the location, identity, and movement of transponders); *In re Gopalan*, 809 F. App’x 942, 944–945 (Fed. Cir. 2020) (a spectrally-based measurement strategy using mathematical algorithms did not claim or describe any concrete placement or design of sensors or components).

Even if the Specification describes improvements, those details are not claimed. *See Ericsson Inc. v. TCL Commc’n Tech. Holdings Ltd.*, 955 F.3d 1317, 1325 (Fed. Cir. 2020) (“[T]he specification may be ‘helpful in illuminating what a claim is directed to . . . [but] the specification must always yield to the claim language’ when identifying the ‘true focus of a claim.’”); *ChargePoint, Inc. v. SemaConnect, Inc.*, 920 F.3d 759, 769 (Fed. Cir. 2019) (“Even a specification full of technical details about a physical invention may nonetheless conclude with claims that claim nothing more than the broad law or abstract idea underlying the claims.”); *Two-Way Media Ltd. v. Comcast Cable Commc’ns, LLC*, 874 F.3d 1329, 1339 (Fed. Cir. 2017) (disagreeing that the claim solved technical problems where it used only generic functional language to achieve these solutions); *Accenture Glob. Servs., GmbH v. Guidewire Software, Inc.*, 728 F.3d 1336, 1345 (Fed. Cir. 2013) (“[T]he complexity of the implementing software or the level of detail in the specification does not transform a claim reciting only an abstract concept into a patent-eligible system or method.”).

We also agree with Petitioner that displaying messages to provide directional and speed guidance to a pilot with the merged data set merely displays results of the collection and analysis as an abstract idea. Pet. 22; *see SAP Am., Inc. v. InvestPic, LLC*, 898 F.3d 1161, 1167 (Fed. Cir. 2018) (“The focus of the claims . . . is on selecting certain information, analyzing it using mathematical techniques, and reporting or displaying the results of the analysis. That is all abstract.”); *Elec. Power Grp.*, 830 F.3d at 1354 (“[W]e have recognized that merely presenting the results of abstract processes of collecting and analyzing information, without more (such as identifying a particular tool for presentation), is abstract as an ancillary part of such collection and analysis.”). The claims do not recite technical details of how the system or method displays messages with speed and directional guidance with the merged data set to pilots. *See AI Visualize*, 97 F.4th at 1379 (“[W]e refuse to import details from the specification if those details are themselves not claimed. . . . There is no recitation in the claim about *how* to create frames or virtual views, much less in a manner that would meaningfully support a technical solution to a technical problem in the prior art.”).

Patent Owner’s reliance on the *descriptions* of using a pose detection algorithm and 3D models to obtain a point cloud and fuse image data points with data in a LIDAR/RADAR point cloud to obtain a merged data set for determining orientation, location, and speed of the plane (PO Resp. 30, 41) is unavailing because such features are not claimed beyond using a generic point cloud process to correlate camera image and LIDAR/RADAR sensor data in claim 19 without any technical details. The ’349 patent describes the use of generic mathematical algorithms and calculations to merge sensor and image data as part of the abstract idea. *See* Ex. 1001, 8:50–9:28.

We disagree with Patent Owner’s arguments that the holding in *SRI International v. Cisco Systems* is applicable to the challenged claims here or that it renders the challenged claims patent eligible. PO Resp. 38–41 (citing *SRI Int’l, Inc. v. Cisco Sys., Inc.*, 930 F.3d 1295, 1303 (Fed. Cir. 2019)).

The claims in *SRI* recited steps of “deploying a plurality of network monitors in the enterprise network” and “detecting, by the network monitors, suspicious network activity based on an analysis of network traffic data selected from . . . network packet data transfer commands, network packet data transfer errors, network packet data volume, network connection requests, network connection denials, error codes included in a network packet, network connection acknowledgements, and network packets indicative of well-known network-service protocols.” *SRI Int’l*, 930 F.3d at 1301 (claim 1). The court held that “[t]he claims are directed to using a specific technique—using a plurality of network monitors that each analyze specific types of data on the network and integrating reports from the monitors—to solve a technological problem arising in computer networks: identifying hackers or potential intruders into the network.” *Id.* at 1303.

The court held, “[t]his is not the type of human activity that § 101 is meant to exclude. Indeed, we tend to agree with *SRI* that the human mind is not equipped to detect suspicious activity by using network monitors and analyzing network packets as recited in the claims.” *SRI Int’l*, 930 F.3d at 1304. The claims required suspicious network activity to be detected by *network monitors* based on analysis of network traffic data and *hierarchical monitors* to generate and integrate reports of suspicious activity. *Id.* at 1303. Here, generic camera image and LIDAR/ RADAR data is merged with no technical details of the process or indication of any technical improvement.

Unlike the claims in *SRI*, the claims here do not use network monitors to analyze network traffic data packets for specific types of data or hierarchical monitors to generate and integrate reports of suspicious activity. Claim 1 merely recites steps of receiving generic camera image and LIDAR/RADAR sensor data. Ex. 1001, 12:39–45; Ex. 1003 ¶ 78 (“This abstract idea is one that can be performed in the human mind. . . . [C]laim 1 does not recite any tools for performing the abstract idea.”). Claim 18 recites a generic camera image sensor for capturing camera image data and a generic LIDAR/RADAR sensor for capturing LIDAR/RADAR sensor data of an aircraft, and this data is merged by a generic computing device. Ex. 1001, 14:32–45. “That purely mental processes can be unpatentable, even when performed by a computer, was precisely the holding of the Supreme Court in *Gottschalk v. Benson*[, 409 U.S. 63 (1972)].” *CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1375–76 (Fed. Cir. 2011); *see also Trinity Info Media, LLC v. Covalent, Inc.*, 72 F.4th 1355, 1363–64 (Fed. Cir. 2023) (rejecting arguments that humans cannot mentally engage in “nanosecond comparisons” and aggregate “result values with huge numbers of polls and members” because the asserted claims do not require “nanosecond comparisons” or aggregating “huge numbers of polls and members”).

The method in *Electric Power* received data streams of time stamped synchronized phasor measurements in real time from an electric power grid and other data sources and analyzed the data streams to determine events in real-time, calculate dynamic stability metrics, and display analysis results and diagnoses with concurrent visualization of measurements. *Elec. Power Grp.*, 830 F.3d at 1351–1352; Pet. 21. The focus of the claim was on mental processes in the abstract-idea category. *Id.* at 1353–54.

Even if the human mind cannot merge LIDAR/RADAR and image data into point clouds (PO Resp. 41), point clouds are not claimed,⁶ and the “three dimensional virtual model” and “merged data set” are in no particular format. *See Miller Mendel, Inc. v City of Anna, Texas*, 107 F.4th 1345, 1353 (Fed. Cir. 2024) (“We are not persuaded that claim 1 cannot be directed to an abstract idea even if certain steps [sending hyperlinks by email and generating a reference list] cannot be completed in the mind or by pen and paper [because] ‘[t]he inability for the human mind to perform each claim step does not alone confer patentability.’”) (citation omitted); *Bancorp Servs., L.L.C. v. Sun Life Assurance Co. of Can. (U.S.)*, 687 F.3d 1266, 1277–78 (Fed. Cir. 2012) (the definition of “computer” as “an automatic electronic device for performing mathematical or logical operations” (3 Oxford English Dictionary 640 (2d ed. 1989)) and “digital computer” as operating on digital data to solve a problem “by doing arithmetic as a person would do it by head and hand” (*Gottschalk v. Benson*, 409 U.S. 63, 65 (1972)) show “the interchangeability of certain mental processes and basic digital computation”); Tr. 18:25–21:4.

Petitioner also asserts that analyzing data by mathematical algorithms involves mental processes. Pet. 22; Reply 9; *see Coffelt*, 680 F. App’x at 1011 (calculating a steradian region of space can be implemented using a pen and paper), *see also Burnett*, 741 F. App’x at 780 (converting geospatial coordinates into a single string of natural numbers is an abstract idea).

⁶ Claim 19 recites a point cloud process to correlate points in both data sets without any technical details. It maps both data sets to a virtual space with a common coordinate system using an iterated point cloud algorithm, i.e., via mathematical calculations. *See* Ex. 1001, 8:50–54, 8:67–9:10, 9:23–28.

The claims in *Research Corporation* demonstrate why the claims here recite an abstract idea. In *Research Corporation*, the method used a pixel-by-pixel comparison of a plurality of color planes of a color image against a blue noise mask comprising a random non-deterministic, non-white noise single valued function that provided visually pleasing dot profiles, and the blue noise masks were used for the pixel-to-pixel comparison, uncorrelated with other blue noise masks. *Research Corp. Techs., Inc. v. Microsoft Corp.*, 627 F.3d 859, 865 (Fed. Cir. 2010). Here, the claims merge camera and sensor data with no technical details, and Patent Owner has not asserted that the challenged claims perform similar comparisons. PO Resp. 40–41.

The claims in *SiRF* recited a level of technical detail that is lacking in the challenged claims. In *SiRF*, the claims calculated a position of a GPS receiver and an absolute time of reception of satellite signals by receiving pseudoranges to estimate the range of the GPS receiver to a plurality of GPS satellites, estimate an absolute time of reception of plural satellite signals, estimate a position of the GPS receiver and provide satellite ephemeris data to compute the absolute position and time of the GPS receiver using the pseudoranges, and updating the estimated absolute time and position of the GPS receiver. *SiRF Tech., Inc. v. Int’l Trade Comm’n*, 601 F.3d 1319, 1331 (Fed. Cir. 2010). The court held that the methods could not be performed without a GPS receiver, which played a significant role in generating the pseudoranges and determining its position rather than an obvious means to achieve a solution more quickly, and there was no evidence the calculations could be performed in the human mind. *Id.* at 1332–33. Patent Owner has not shown the challenged claims perform similar operations to take them out of the realm of mental steps or mathematical concepts. *See* PO Resp. 40–41.

Here, the claims recite mental processes, as discussed *supra*. Dr. Campbell testifies that a skilled artisan “with knowledge of cameras, LIDAR, and radar would understand [that] the output of these sensors are simply numbers . . . generated in a predetermined format that defines what each value means.” Ex. 1044 ¶ 56 (“[N]ot only would these numbers be understandable to a human, but they must be so. Otherwise, a human would not be able to configure a connected device, such as a display, to take the outputs of these sensors and configure the connected device to perform a function based on their outputs.”; “LIDAR and radar . . . still produce[] data values in a format that can be received and understood by a human.”); *id.* ¶ 57 (“The merging of data from these sensors is also well within the ability of a human . . . by using mathematical algorithms.”); *id.* ¶ 58 (“Determining speed and orientation from the merged data can be easily calculated by hand, on a piece of paper.”).

His testimony is consistent with *Electric Power*’s holding that merely receiving data streams of time stamped synchronized phasor measurements and deriving dynamic stability metrics recite mental processes. 830 F.3d at 1353–54; *see also Content Extraction and Transmission LLC v. Wells Fargo Bank, Nat’l Ass’n*, 776 F.3d 1343, 1347 (Fed. Cir. 2014) (“CET argues that its claims are not drawn to an abstract idea because human minds are unable to process and recognize streams of bits output by a scanner. . . . However, the claims in *Alice* also required a computer that processed streams of bits, but nonetheless were found to be abstract.”); *Hawk Tech.*, 60 F.4th at 1357 (claims to receiving and digitizing video images and converting video source images to a selected video format that is displayed using result-based functional language recited an abstract idea).

Patent Owner's arguments that a human cannot receive LIDAR/RADAR sensor and camera image data (PO Resp. 38–41) do not address Petitioner's contention that humans can do so. Pet. 22; Ex. 1044 ¶¶ 56–58; PO Resp. 38–44; Reply 14–15; Sur-reply 9–10. These arguments also are contrary to *Electric Power* and other decisions holding that claims to data collection and analysis (e.g., merging) can be done as mental processes with mathematical algorithms as an abstract idea. *Elec. Power*, 830 F.3d at 1354; *AI Visualize*, 97 F.4th at 1379 (converting information from one format to another is an abstract idea); *FICEP*, 2023 WL 5346043 at *3–4 (a human can transfer a 3D rendering of an object to create a design model); *Burnett*, 741 F. App'x at 780–81 (using mathematical methods to convert geospatial longitude and latitude coordinates into a string of natural numbers and *a new type of data* is an abstract idea); *Coffelt*, 680 F. App'x at 1011 (calculating and comparing 3D steradian regions of space is a purely arithmetic exercise and mathematical algorithm that can be implemented using a pen and paper).

Unlike *SRI* and *SiRF*, the challenged claims do not require technical means for receiving or merging camera image and LIDAR/RADAR sensor data. As claimed, the receiving and merging can be performed by any and all means and do not require network monitors or GPS receivers. Other claims that recite steps of comparing 3D virtual models to aircraft reference models to find a match to determine aircraft type (claims 2 and 3), scanning the aircraft with a “sweep” (claim 4), comparing camera image and LIDAR/RADAR data to identify an aircraft is present (claims 5 and 7), and using a point cloud process to correlate points in the two data sets (claim 19) are recited at high levels of generality devoid of any technical implementation details indicative of any technical improvement.

Dr. Campbell also testifies that “[t]he merging of data from sensors is well within the ability of a human . . . by using mathematical algorithms [and] I have been teaching merging of camera, LIDAR, and radar data in the context of navigation and tracking to undergraduate and graduate students since 2008.” Ex. 1044 ¶ 57 (“[T]hese are all mathematical algorithms that can be written on a piece of paper” to fuse 2D camera image data and 3D LIDAR/RADAR data using a Kalman Filter estimation framework) (citing Section IV.C. (¶¶ 47–51) of his testimony that 2D camera and 3D LIDAR/RADAR data can be combined by a skilled artisan using well-understood, routine, and conventional algorithmic approaches such as a depth estimation algorithm for cameras, a Kalman Filter framework, point cloud library tools, and a 3D template model described in Berkmo and Richman). We credit his testimony, which is supported by disclosures in Berkmo, Richman, and other references and is unrefuted by Patent Owner. Ex. 1044 ¶¶ 47–51, 56–59.

Mr. Wilson testifies that the human mind cannot perform the elements recited in the independent claims because “[h]umans do not have the ability to receive and process camera data (e.g., digital binary image data) from an image sensor, or 3D point cloud data from a RADAR or LIDAR sensor.” Ex. 2002 ¶ 75. His testimony does not address Dr. Campbell’s testimony or the authorities therein that humans can merge this data. Ex. 1044 ¶¶ 47–51, 56–59. Nor does it address Petitioner’s contentions that the merging uses algorithms performable as mental processes. Pet. 22; Ex. 1044 ¶¶ 56–58. His testimony also is not commensurate with the claim scope, which does not recite any technical details such as interfaces, locations of cells, pixels, gray values, color values, noise, or attributes that the human mind allegedly cannot receive or process according to Mr. Wilson. Ex. 2002 ¶¶ 75–80.

We disagree the claims generate new data as Patent Owner asserts. PO Resp 43. Dr. Campbell and Mr. Wilson testify that camera, LIDAR, and radar data were merged before the '349 patent filing date to track objects. *See* Ex. 1044 ¶¶ 41–51, 56–59; Ex. 1045, 20:6–23:18. “The ‘novelty’ of any element or steps in a process, or even of the process itself, is of no relevance in determining whether the subject matter of a claim falls within the § 101 categories of possibly patentable subject matter.” *Diamond v. Diehr*, 450 U.S. 175, 188–89, (1981); *see also Elec. Commc’n Techs., LLC v. ShoppersChoice.com, LLC*, 958 F.3d 1178, 1183 (Fed. Cir. 2020) (“[E]ven taking as true that claim 11 is ‘unique,’ that alone is insufficient to confer patent eligibility [when] the purported uniqueness of claim 11 . . . is itself abstract.”); *Solutran, Inc. v. Elavon, Inc.*, 931 F.3d 1161, 1169 (Fed. Cir. 2019) (“[M]erely reciting an abstract idea by itself in a claim—even if the idea is novel and non-obvious—is not enough to save it from ineligibility.”); *Two-Way Media*, 874 F.3d at 1340 (“Eligibility and novelty are separate inquiries.”).

Combining two types of data to create a new type of data not found in the original data sets is an abstract idea. *See Digitech*, 758 F.3d at 1351 (a process that uses mathematical algorithms to combine first and second data to create a new type of data (device profile) is not patent eligible); *Burnett*, 741 F. App’x at 780–81 (converting geospatial coordinates into a string of natural numbers and *a new type of data* is an abstract idea); *RecogniCorp, LLC v. Nintendo Co.*, 855 F.3d 1322, 1327 (Fed. Cir. 2017) (a process of taking two data sets and combining them into a single data set simply organizes existing data into a new form as an abstract idea) (citing *Digitech*, 758 F.3d at 1351). Here, the data are combined by mental processes.

We determine claims 1, 10, and 18 recite an abstract mental process. Claim 18 implements the abstract idea on generic sensors and a computing device. *CyberSource*, 654 F.3d at 1374 (“Regardless of what statutory category . . . a claim’s language is crafted to literally invoke, we look to the underlying invention for patent-eligibility purposes.”); *see Alice*, 573 U.S. at 226 (“Put another way, the system claims are no different from the method claims in substance. The method claims recite the abstract idea implemented on a generic computer; the system claims recite a handful of generic computer components configured to implement the same [abstract] idea.”). We agree with Petitioner that the dependent claims recite the same abstract idea, and we adopt Petitioner’s arguments and evidence. Pet. 36–38; *Apple, Inc. v. Ameranth, Inc.*, 842 F.3d 1229, 1240 (Fed. Cir. 2016) (“An abstract idea can generally be described at different levels of abstraction.”).

Claim 7 compares camera image and LIDAR/RADAR data to identify that an aircraft is present in both the camera image data and the LIDAR/RADAR sensor data before merging the data without reciting any technical details. Ex. 1001, 13:14–19. Such a comparison recites mental processes. *Mobile Acuity Ltd. v. Blippar Ltd.*, 110 F.4th 1280, 1292–93 (Fed. Cir. 2024) (receiving and associating information with images, comparing images (without any details), and presenting information based on the comparison is an abstract idea); *see also In re BRCA1- and BRCA2-Based Hereditary Cancer Test Patent Litig.*, 774 F.3d 755, 763 (Fed. Cir. 2014) (comparing BRCA sequences and determining the existence of alterations claimed an abstract mental process of comparing and analyzing); *Content Extraction*, 776 F.3d at 1347 (humans always have performed steps of collecting data and recognizing certain data in the collected data set).

3. *Step 2A, Prong 2 of the Guidance*

We agree with Petitioner that the claims lack additional elements that integrate the abstract idea into a practical application. Pet. 23–30 (citing Ex. 1003 ¶¶ 42–67, 78–83; Ex. 1001, 1:57–64, 2:61–3:18, 3:25–28, 6:9–45, 10:50–51, 10:56–62, 11:14–24, 11:32–50, claim 18; MPEP § 2106.05(a)). Claims 1 and 10 do not recite any additional elements. Claim 18 recites a camera image sensor, LIDAR/RADAR sensor, and computing device as generic components that are used as tools to perform the abstract idea without improving computer functions or other technology. The claims do not implement the abstract idea on a machine that is integral to the claims, transform a particular article to a different state or thing, or apply the abstract idea in a meaningful way beyond linking its use to a particular technological environment using off-the-shelf components to perform their generic functions. *See* Guidance at 55; MPEP § 2106.04(d)(I); Pet. 24–30.

The '349 patent describes these elements as generic components that are used as tools to perform the abstract idea. LIDAR/Radar sensor 342 and camera imaging sensor 346 are “components that send data to the central docking system controller 340” that sends data to pilot unit display 364. Ex. 1001, 6:1–8. A LIDAR/Radar system operates LIDAR/Radar sensor 342 to capture LIDAR/Radar sensor data, and send data to central docking system 340 for processing. *Id.* at 6:9–15. Other light/radio based detection and ranging methods may be used to provide the LIDAR/Radar system. *Id.* at 6:24–34. The camera imaging system operates camera image sensor 346 to capture image data and send it to central docking system controller 340 for processing and has a least one camera sensor. *Id.* at 6:35–41, 8:37–49.

System 541 can connect to camera image device 559, LIDAR/Radar sensing device 561, and input/output interface 557 to receive sensor data and aircraft information. Ex. 1001, 11:9–18. Computing device 543 is described as “a typical computing device” including processor 545 and memory 547. *Id.* at 10:47–60, Fig. 5.

“Merely claiming ‘those functions in general terms, without limiting them to technical means for performing the functions that are arguably an advance,’ does not make a claim eligible at step one.” *Ericsson*, 955 F.3d at 1328; *Mobile Acuity*, 110 F.4th at 1292–93 (the claims “consist solely of result-orientated, functional language and omit any specific requirements as to how these steps of information manipulation are performed.”); *Beteiro, LLC v. DraftKings Inc.*, 104 F.4th 1350, 1356 (Fed. Cir. 2024) (“[T]he claims are drafted using largely (if not entirely) result-focused functional language, containing no specificity about how the purported invention achieves those results. Claims of this nature are almost always found to be ineligible for patenting under Section 101.”); *Hawk Tech.*, 60 F.4th at 1358 (“The claims here . . . fail to recite a specific solution to make the alleged improvement—conserving bandwidth while preserving quality—‘concrete’ and at most recite abstract data manipulation.”; “Stated otherwise, the ’091 patent claims lack ‘sufficient recitation of *how* the purported invention improve[s] the functionality’ of video surveillance systems and are ‘recited at such a level of result-oriented generality that those claims amount[] to a mere implementation of an abstract idea.”); *Two-Way Media*, 874 F.3d at 1337 (“The claim requires the functional results of ‘converting,’ ‘routing,’ ‘controlling,’ ‘monitoring,’ and ‘accumulating records,’ but does not sufficiently describe how to achieve these results in a non-abstract way.”).

“Software can make non-abstract improvements to computer technology just as hardware improvements can, and . . . the improvements can be accomplished through either route.” *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1335 (Fed. Cir. 2016). To make non-abstract improvements “the claims must be directed to an improvement to the functionality of the computer or network platform itself.” *Customedia Techs., LLC v. Dish Network Corp.*, 951 F.3d 1359, 1365 (Fed. Cir. 2020) (citation omitted).

Contrary to Patent Owner’s arguments that the ’349 patent provides a specific solution to an existing technological problem in a particular way that improves an existing technological process, the claims recite only an abstract idea without any technical details of how Patent Owner solved any technical problem in a technical way to improve computers, sensors, and/or other technology. *See* PO Resp. 34–38. The claims do not recite a particular arrangement or operation of sensors or a particular way to merge data from multiple sensors to solve a technical problem in a particular technical way. The claims capture data of an aircraft approaching or in a ramp area and then merge that data into a generic merged data set that is used to make various determinations without any technical details of how the merging of different types of sensor data or the making of determinations improves computers or other technologies. *See* Ex. 1001, 8:50–9:40, 11:51–12:5, Fig. 7; *see also Two-Way Media*, 874 F.3d at 1338 (“This construction fails to indicate how the claims are directed to a scalable network architecture that itself leads to an improvement in the *functioning* of the system.”).

Accordingly, we determine that claims 1–20 do not recite additional elements that integrate the abstract idea into a practical application, and we determine that the claims are directed to the abstract idea identified above.

4. *Step 2B of the Guidance*

Petitioner asserts that the additional elements append well-understood, routine, and conventional aircraft tracking activity to the abstract idea using generic computers, camera sensor, LIDAR sensor, and RADAR sensor that are commercially available versions without improving these components. They receive camera image data, LIDAR, and RADAR data, merge it into a data set, and display messages to a pilot. Pet. 30–34 (citing Ex. 1003 ¶¶ 42–67, 78–89, 92; Ex. 1001, 10:47–60; MPEP § 2106.05(I)(A); federal court decisions). Petitioner asserts that the ordered combination is conventional because it uses these conventional functions to perform aircraft tracking and guidance to a gate as an ordinary sequence of using sensor data to track and guide an aircraft. *Id.* at 35 (citing Ex. 1003 ¶ 94; federal court decisions). We agree, and we adopt Petitioner’s contentions and evidence.

Individually, the additional elements of a camera image sensor and a LIDAR/RADAR sensor are recited as generic sensors that capture data, and the computing device also is recited as a generic element that receives this data and merges it into a generic merged data set. The ’349 patent indicates the claimed LIDAR/RADAR systems and camera system are conventional and are used to track aircraft movement. Ex. 1001, 1:54–2:9. As indicated above in our Step 2A, Prong 2 analysis, the computing device is a generic computer with conventional components that perform functions of receiving and processing data. *Id.* at 10:47–11:50, Figs, 5, 6. The camera may have a single or dual sensor, image processor, and memory, mono- or multi-mode sensors, or high-definition sensors (*id.* at 8:37–49), but these features are not claimed. These generic descriptions evidence that the camera components, sensors, and computers are known and used conventionally.

A generic computer implementation is not enough. *See Alice*, 573 U.S. at 223 (“[M]ere recitation of a generic computer cannot transform a patent-ineligible abstract idea into a patent-eligible invention. Stating an abstract idea ‘while adding the words “apply it”’ is not enough for patent eligibility.”) (citation omitted); *BSG Tech LLC v. BuySeasons, Inc.*, 899 F.3d 1281, 1286 (Fed. Cir. 2018) (“[C]laims are not saved from abstraction merely because they recite components more specific than a generic computer.”); *Two-Way Media*, 874 F.3d at 1338 (performing abstract ideas on generic computers is insufficient); *Intellectual Ventures I LLC v. Erie Indem. Co.*, 850 F.3d 1315, 1331 (Fed. Cir. 2017) (using a generic mobile interface and pointers to retrieve and display information did not transform an abstract idea); *In re TLI Commc’ns LLC Patent Litig.*, 823 F.3d 607, 611 (Fed. Cir. 2016) (reciting concrete, tangible components does not always escape the reach of the abstract-idea inquiry); *Mortg. Grader, Inc. v. First Choice Loan Servs. Inc.*, 811 F.3d 1314, 1324–25 (Fed. Cir. 2016) (claims to an “interface,” “network,” and “database” were directed to an abstract idea).

The ordered combination of elements recites no more than when the elements are considered individually and thus does not provide an inventive concept. We disagree with Patent Owner’s argument that “[w]hen considered individually or in combination with the other claimed elements, the reliance on this merged data from a *camera* and *LIDAR/RADAR sensor* is itself an inventive concept because it was not conventional and improves the technology of aircraft tracking and guidance.” PO Resp. 49–50. Merging data from two different sensors is part of the abstract idea and therefore cannot provide an inventive concept that makes that abstract idea patent eligible. *See, e.g., BSG*, 899 F.3d at 1291–92; Guidance at 56.

“If a claim’s only ‘inventive concept’ is the application of an abstract idea using conventional and well-understood techniques, the claim has not been transformed into a patent-eligible application of an abstract idea.” *BSG*, 899 F.3d at 1290–91. “It has been clear since *Alice* that a claimed invention’s use of the ineligible concept to which it is directed cannot supply the inventive concept that renders the invention ‘significantly more’ than that ineligible concept.” *Id.* at 1290.

Even if merging camera and LIDAR/RADAR sensor data is treated as an additional element, the description of the point cloud process and iterated point cloud algorithm indicates Patent Owner did not invent or improve the merging process. Ex. 1001, 8:64–9:40; MPEP § 2106.05(d)I.2. (a generic description indicates that elements are conventional enough that no further description is needed to satisfy § 112(a)); *see AI Visualize*, 97 F.4th at 1379 (converting data from one format to another is an abstract idea); *Adaptive Streaming Inc. v. Netflix, Inc.*, 836 F. App’x 900, 903 (Fed. Cir. 2020) (encoding and decoding image data and converting data formats are abstract ideas). Dr. Campbell and Mr. Wilson testify that merging data is known for detecting and tracking objects and navigation. Ex. 1044 ¶¶ 41–51, 56–59; Ex. 1003 ¶¶ 54–65, 81–87; Ex. 1045, 20:6–23:18. A “data fusion process” is not claimed, much less one of any particular features. *See* PO Resp. 50.

Nor do the claims recite a non-conventional arrangement of sensors. *See* Ex. 1003 ¶¶ 42–67, 83; *iLife*, 839 F. App’x at 538 (because sensors for measuring static and dynamic acceleration were known, and claim 1 did not recite unconventional means for processing that data, sensing and processing the static and dynamic acceleration information using generic components did not transform the nature of claim 1 into patent eligible subject matter).

The combination of merging camera and LIDAR/RADAR data to form a merged data set that is used for tracking and guiding aircraft is the abstract idea. *See* PO Resp. 49–51; *AI Visualize*, 97 F.4th at 1380 (“the alleged inventive concepts in the claims were not more than the abstract ideas themselves” and the “step of creating a virtual view is itself an abstract idea” known in the art to present richer 3D views from existing 2D views); *In re Killian*, 45 F.4th 1373, 1379–80 (Fed. Cir. 2022) (collecting data from different sources, comprehending its meaning, and displaying results are mental processes); *Yu v. Apple Inc.*, 1 F.4th 1040, 1043–44 (Fed. Cir. 2021) (“claim 1’s solution to those problems is the abstract idea itself—to take one image and ‘enhance’ it with another” using conventional camera components); *In re Bd. of Tr. of Leland Stanford Junior Univ.*, 991 F.3d 1245, 1251–52 (Fed. Cir. 2021) (receiving, extracting, and storing data are well-known, routine, and conventional steps for executing an algorithm on a computer); *Elec. Power*, 830 F.3d at 1355 (using off-the-shelf, conventional computer, network, and display technology to gather, send, and present data is not inventive); *Sensormatic* 2021 WL 2944838 at *3 (no inventive concept where there was no nonabstract configuration of wireless input capture devices (ICDs), the concept of dual encoding image data is abstract, and prioritizing ICD input data by detecting trigger events is an abstract idea of remote surveillance); *Burnett*, 741 F. App’x at 781–82 (the additional features of a “geospatial media recorder” and allowing a user to geospatially reference entities or objects based on the geospatial positional location and point identification restate the abstract idea); *Coffelt*, 680 F. App’x at 1011 (the novelty of an algorithm to derive “realistic complex 3D shadows” did not recite an inventive concept by implementing it on a generic computer).

5. *Conclusion*

For the foregoing reasons, based on the current record, we determine that Petitioner has demonstrated by a preponderance of evidence that claims 1–20 are directed to an abstract idea without significantly more and therefore are directed to ineligible subject matter under 35 U.S.C. § 101.

F. Ground 2: Asserted Anticipation by or Obviousness over Berkmo

Petitioner asserts that claims 1, 6–10, and 13–20 are anticipated by Berkmo under 35 U.S.C. § 102 and/or unpatentable over Berkmo under 35 U.S.C. § 103. Pet. 38–67.

1. *Berkmo*

Berkmo describes an airport stand arrangement configured to aid a pilot of an aircraft in maneuvering the aircraft towards a parking position at the airport stand. Ex. 1004 ¶ 1. Berkmo’s airport stand arrangement may include interconnected units disposed at different positions at or around the gate area to combine more than one sensing technique to detect and track aircraft. *Id.* ¶¶ 11, 12. Units may include a radar-based system for remote sensing detection using microwave electromagnetic radiation, a laser-based system for remote sensing detection using optical electromagnetic radiation, and an imaging system comprising a camera that is sensitive to optical or infrared radiation to capture the emission of natural radiation from the target. ¶¶ 13–15. Berkmo also discloses that the airport stand arrangement can detect and track approaching aircraft based on a spatially resolved weighted average of the combined output data of a radar system, camera, and/or laser system. *Id.* ¶¶ 23–25, 32. Figure 3 of Berkmo is reproduced below to show one such stand arrangement that combines all three systems. *Id.* ¶ 132.

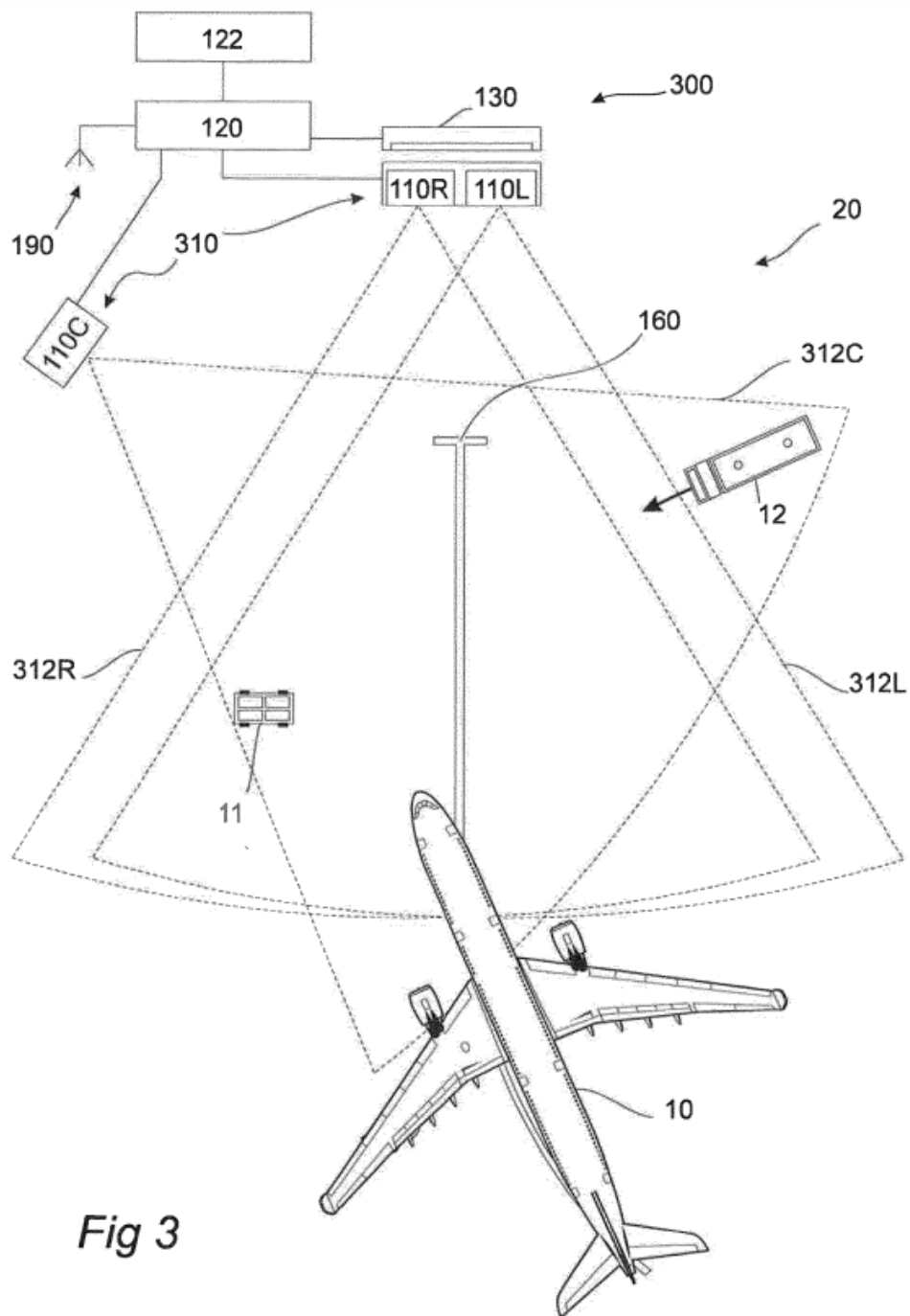


Fig 3

Figure 3 depicts aircraft 10 guided toward parking position 160 using data provided to control unit 120 by image-based system 110C, radar-based system 110R, and laser-based system 110L within their respective coverage areas 312C, 312R, 312L. *Id.* ¶¶ 132, 134.

The offset of camera-based image system 110C enables airport stand arrangement 300 to detect approaching aircraft 10 at each position in time using different collection angles with coverage area 312C of camera-based system 110C arranged to complement areas of coverage 312R and 312L of radar-based system 110R and laser-based system 110L. Ex. 1004 ¶ 132. The airport stand arrangement includes display 130 mounted on the wall of the terminal building at a vertical position that is in clear view of the pilot of the approaching aircraft 10 to provide maneuvering guidance information to the pilot. *Id.* ¶ 120.

Airport stand arrangement 300 is configured to detect and track other objects in stand area 20 such as luggage dolly 11 and food delivery truck 12 to allow for continuous monitoring of stand area 20 for potential objects that may cause accidents at the stand. Ex. 1004 ¶ 133. As shown in Figure 3, luggage dolly 11 is stationary while food delivery truck 12 is approaching the stand area from the right. *Id.* Berkmo tracks the direction and speed of objects and aircraft to ensure they do not collide and that food trucks dock properly with aircraft noses and chocks lock wheels. *Id.* ¶¶ 81, 82, 134–138.

Airport stand arrangement 300 is configured to predict if approaching aircraft 10 is on a collision course with any object 11, 12 and, in response to predicting a collision course, to provide the pilot with maneuvering guidance instructing the pilot to stop aircraft 10. Ex. 1004 ¶ 135. Based on the speed and direction of each object 11, 12 and approaching aircraft 10, the system can predict if objects 11, 12 will leave stand area 20 before approaching aircraft is predicted to arrive and provide guidance to the pilot concerning any objects 11, 12 that are not predicted to leave stand area 20. *Id.* ¶ 136.

2. *Claim 1*

a. *“A method for tracking an aircraft, comprising:”*

Petitioner asserts that Berkmo’s airport stand arrangement 100 is configured using data output from combined system 110 to detect and track aircraft 10 in stand area 20 when the aircraft is approaching a stand in stand area 20. Pet. 42 (citing Ex. 1004 ¶¶ 125–126, 129, 143, Abstr., Figs. 1–3; Ex. 1003 ¶ 112). Patent Owner does not dispute that Berkmo discloses the preamble. *See* PO Resp. We have reviewed Petitioner’s evidence and arguments, and we find that Petitioner has shown that Berkmo discloses the preamble. *See, e.g.*, Ex. 1004 ¶¶ 120, 132, Figs. 1, 3. Thus, we do not need to decide whether the preamble is limiting.

b. *“receiving camera image data of the aircraft while the aircraft is approaching a ramp area for parking the aircraft on an airside of an airport;”*

Petitioner contends that Berkmo’s imaging system 110C includes a camera that is sensitive to optical or infrared radiation and that outputs data pertaining to imaging system coverage 112C at stand area 20, i.e., ramp area for parking aircraft 10 at parking position 160. Pet. 42–43 (citing Ex. 1004 ¶ 131, Figs. 2, 3). Petitioner contends that imaging system 110C produces image data of aircraft 10 approaching stand area 20 (ramp area) for parking aircraft 10 at parking position 160 inside imaging system coverage 312C. *Id.* at 43 (citing Ex. 1004 ¶¶ 131, 132, 140, Fig. 3; Ex. 1003 ¶¶ 113, 114). Patent Owner does not dispute that Berkmo discloses this limitation. *See* PO Resp. We have reviewed Petitioner’s evidence and arguments, and we find that Petitioner has shown that Berkmo discloses this limitation. *See, e.g.*, Ex. 1004 ¶¶ 131, 132, Figs. 1, 3.

- c. *“receiving Light Detection And Ranging (LIDAR) or Radio Detection And Ranging (RADAR) sensor data of the aircraft while the aircraft is approaching or in the ramp area;”*

Petitioner asserts that Berkmo’s laser system 110L and radar system 110R emit continuous or pulsed laser radiation and radar signals toward a target, capture and detect laser radiation and radar pulses backscattered from a target, and output data pertaining to laser-based system coverage 112L and radar-based coverage 112R as aircraft 10 approaches stand area 20. Pet. 44–45 (citing Ex. 1004 ¶¶ 117, 118, 131, 132, 140, Figs. 1–3; Ex. 1003 ¶¶ 115, 116). Patent Owner does not dispute that Berkmo discloses this limitation. See PO Resp. We have reviewed Petitioner’s evidence and arguments, and we find that Petitioner has shown that Berkmo discloses this limitation. See, e.g., Ex. 1004 ¶¶ 117, 118, 126, 132, Figs. 1–3.

- d. *“merging the camera image data and the LIDAR/RADAR-sensor data into a merged data set; and,”*

Petitioner asserts that Berkmo detects and tracks aircraft 10 based on the combined output data from radar-based system 110R and one or more additional systems such as imaging system 110C and laser system 110L. Pet. 46 (citing Ex. 1004 ¶¶ 126, 127, 129, 130, 134, 137–139; Ex. 1003 ¶ 117). Petitioner contends that Berkmo combines or merges output data by determining a spatially resolved weighted average of the combined output data based on the statistical weights of imaging system 110C, laser system 110L, and radar system 110R, and the weighted average can be a matrix of average data values each corresponding to a specific spatial location on the stand area. *Id.* (citing Ex. 1004 ¶¶ 22–25, 129, 130, Ex. 1003 ¶¶ 117, 118).

Patent Owner argues that claim 1 requires merging camera data with LIDAR or RADAR data, and paragraph 129 of Berkmo combines data from radar system 110R and laser system 110L, but not imaging system 110C. PO Resp. 60–61 (citing Ex. 2003, 107:11–19; Ex. 2002 ¶¶ 98–101). Patent Owner argues that the spatially resolved weighted average in paragraph 130 of Berkmo applies to data in paragraph 129, and the weighted averages in paragraphs 22–25 do not refer to the imaging system. *Id.* at 61–62 (citing Ex. 2002 ¶¶ 102–104). Patent Owner asserts that there is no disclosure “concerning how the weighted averages would be implemented for image data combined with the radar data.” *Id.* at 62 (citing Ex. 2002 ¶¶ 100–101, 103). Patent Owner argues that a skilled artisan would have understood that image data is 2D representations, but radar data involves 3D representations, and there is no disclosure of merging these two disparate and incompatible types of data through a weighted average process in paragraphs 129 and 130, which only describe the weighted averaging of laser and radar output data. *Id.* at 62–63 (citing Ex. 2003, 33:22–34:5; Ex. 2002 ¶¶ 99–101, 103).

We agree with Petitioner that Berkmo discloses to merge camera image and LIDAR/Radar sensor data in paragraphs 129 and 130. Pet. 46. To rebut Patent Owner’s argument that these processes only combine radar and laser data (PO Resp. 60–63), Petitioner points out, and we agree, that Berkmo discloses, globally and in the broader context, that the airport stand arrangement “may be configured to detect and track the approaching aircraft based on a spatially resolved weighted average of the combined output data . . . based on statistical weights for the radar system and the one or more additional systems” (Ex. 1004 ¶ 23) that can be imaging systems only (*id.* ¶ 17) or both imaging and laser-based systems (*id.* ¶ 18). Reply 23.

Further to this issue, Berkmo expressly discloses that:

The one or more additional systems may comprise a laser-based system and an imaging system used in combination. For example, the airport stand arrangement may be configured to *detect and track the approaching aircraft based on combined output data from a laser-based system and an imaging system. This implies that the area of coverage of the laser-based system and the area of coverage of the imaging system at least partly overlaps.*

Ex. 1004 ¶ 32 (emphasis added); *see id.* ¶ 132, Fig. 3 (overlapping areas).

Paragraphs 129 and 130 describe how to combine/merge the output data of two different systems whose areas of coverage overlap, and Patent Owner does not dispute that this is so except to argue that the disclosures of paragraphs 129 and 130 are limited to combining the output data of radar and laser systems. PO Resp. 60–63; Ex. 1002 ¶¶ 98–103. We disagree.

First, if we accept that paragraph 129 is an example limited to laser-based system 110L and radar-based system 110R because it says “in the example: the laser-based system 110L” (PO Resp. 61), paragraph 130 is not so limited. Paragraph 130 describes “one example embodiment” unrelated to paragraph 129, in which an approaching aircraft is detected and tracked “based on a spatially resolved weighted average of the combined output data . . . based on statistical weights for the radar system and the one or more additional systems.” Unlike paragraph 129, which lists laser-based system 110L as an “example” of “the one or more additional systems,” paragraph 130 broadly describes “the one or more additional systems” without limit. This disclosure comports with Berkmo’s description that the “one or more additional systems” used with a radar can be a laser or an imaging system or a laser and an imaging system. Ex. 1004 ¶¶ 8, 17, 18, 31, 32, Figs. 1–3.

Second, in the context of the claimed merging at issue here, Berkmo makes clear that detecting and tracking of approaching aircraft is based on a *spatially resolved weighted average of the combined output data* based on the “statistical weights for the radar system and the one or more additional systems” without being limited to a laser-based system. Ex. 1004 ¶¶ 23, 25, 27, 32, 44. Notably, Berkmo discloses image-based system 110C as being offset from radar-based system 110R in Figure 2 to the same extent laser-based system 110L is offset from radar-based system in Figure 1, indicating the same need to spatially resolve the combined data output of the radar with the camera system as with the laser system as described in paragraph 130.

Dr. Campbell provides persuasive rebuttal testimony (rebutting Patent Owner’s argument that the description of spatial resolution in paragraph 130 (and paragraph 129) does not apply to combined output data of a radar and camera system (PO Resp. 62–63)) by explaining that: (1) cameras provide more than just 2D pixel/color data that can be used to create 3D point clouds (Ex. 1044 ¶¶ 43–46); and (2) even 2D camera data can be combined/merged with 3D LIDAR/RADAR data including by using a Kalman filter described in Berkmo, paragraph 137 (Ex. 1044 ¶¶ 47–51). Patent Owner does not dispute the accuracy of Dr. Campbell’s testimony. *See* Sur-reply 16–17. We credit Dr. Campbell’s un rebutted testimony because it is consistent with Berkmo’s description of spatially resolving the combined output data of a radar system with a camera and/or laser system. Dr. Campbell also testifies that Berkmo describes how to merge/combine camera image data with radar and/or laser output data by: (1) simple combination when they are aligned as in Figure 2 of Berkmo; (2) pixel-to-pixel weighted average based on spatial location; (3) a Kalman filter; and (4) using point clouds. Ex. 1044 ¶¶ 47–50.

Dr. Campbell's testimony explains that Berkmo's disclosure of these processes would be understood by a skilled artisan to describe how to merge camera image data with radar/laser sensor data. Ex. 1044 ¶¶ 47–50 (citing Ex. 1004 ¶¶ 22–25, 137, embodiment 200 (¶ 131)); Ex. 1003 ¶¶ 118 (citing Ex. 1004 ¶¶ 22–25, 129, 130). His unrefuted testimony addresses Patent Owner's concerns that Berkmo does not explain how to merge camera image and radar/lidar data. PO Resp. 61–63; Ex. 2002 ¶¶ 100–104.

Mr. Wilson testifies that he worked on systems that combined camera images with LIDAR/RADAR data using Kalman filtering that Dr. Campbell asserts is described in Berkmo as a process for combining/merging camera images and LIDAR/RADAR data, and this filtering is within the ability of a skilled artisan. Ex. 1045, 22:9–23:18 (cited in Ex. 1044 ¶ 49).

Dr. Campbell's testimony is consistent with the '349 patent's similar description of the merging process as transforming coordinates of the sensor system and vision coordinate system using a point cloud process to correlate points in the sensor data to points in the camera image data. Ex. 1001, 8:64–10; *id.* at 9:18–28 (the process of point cloud analytics registers points on the point cloud formed from image sensor data to the positionally similar data points received from the sensor by mapping both data sets to a virtual space having a common coordinate system); Ex. 1044 ¶ 50; Ex. 1003 ¶ 118; *see also* Ex. 1004 ¶¶ 129 (determine corresponding spatial regions of the output data by pixel-to-pixel matching), 130 (spatially resolve the weighted average of the combined output data based on a specific spatial location on the stand area using the radar system and the one or more additional systems).

Having reviewed the parties' evidence and arguments, we find that Petitioner has shown that Berkmo discloses this limitation.

- e. *“wherein the merged data set includes at least one of: data for determining position and orientation of the aircraft relative to the position and orientation of the ramp area;”*

Petitioner asserts that Berkmo outputs a combined/merged data set for determining the position and orientation of aircraft 10 relative to the position and orientation of stand area 20 (the ramp area) to controller 120, which analyzes the data to determine the position, velocity, and direction of aircraft 10 relative to stand area 20. Pet. 47 (citing Ex. 1004 ¶¶ 25, 82, 89, 126; Ex. 1003 ¶ 119). Petitioner asserts that Berkmo’s airport stand arrangement uses imaging system 110C, laser system 110L, and radar system 110R to provide combined output data to track the position, speed, and direction of aircraft 10 relative to stand area 20 and parking position 160, and this data is for determining aircraft orientation. *Id.* at 47–48 (citing Ex. 1004 ¶¶ 25, 80, 82, 89, 126, 136; Ex. 1003 ¶ 120). Alternatively, Petitioner asserts that it would have been obvious to use the combined output data to determine an aircraft’s orientation because radar tracking typically includes position and velocity information in three dimensions, and it would have been obvious to apply a Kalman filter to the output data to determine aircraft orientation as Berkmo explicitly teaches the use of a Kalman filter on the combined output data. *Id.* at 48–50 (citing Ex. 1004 ¶¶ 134–136; Ex. 1019, 2–4, 7–11; Ex. 1030, 23; Ex. 1031, 1, 4–5, 7, 9, 11, 16–17; Ex. 1003 ¶¶ 121–123). Patent Owner does not dispute that Berkmo discloses or suggests this limitation. *See* PO Resp. We have reviewed Petitioner’s evidence and arguments, and we find that Petitioner has shown that Berkmo discloses this limitation and that Berkmo also suggests this limitation as Petitioner alternatively asserts.

*f. “data for determining speed of the aircraft,
data for determining direction of the aircraft”*

Petitioner contends that Berkmo’s combined output data (merged data set) includes data for determining speed of aircraft 10, and controller 120 analyzes the combined output data to determine tracking data of aircraft 10 including the position and velocity of aircraft 10. Pet. 50 (citing Ex. 1004 ¶¶ 80, 126, 136, claim 50; Ex. 1003 ¶ 124). Petitioner asserts that Berkmo also uses the combined output data to determine the speed and direction and the position and velocity of approaching aircraft 10. *Id.* at 50–51 (citing Ex. 1004 ¶¶ 80, 126, 136, claim 50; Ex. 1003 ¶ 125). Patent Owner does not dispute that Berkmo discloses these limitations. *See* PO Resp. We have reviewed Petitioner’s evidence and arguments, and we find that Petitioner has shown that Berkmo discloses these limitations.

*g. “data for determining proximity of the aircraft to a
particular object within the ramp area, and”*

Petitioner contends that Berkmo’s combined output data include data for determining proximity of aircraft 10 to a particular object such as objects 11, 12 in stand area 20 during maneuvering of aircraft 10 towards parking position 160 and to predict if approaching aircraft 10 is on a collision course with any of objects 11, 12 using positions and trajectories of aircraft 10 and objects 11, 12 and to provide maneuvering guidance to the pilot if a collision course is predicted. Pet. 51–52 (citing Ex. 1004 ¶¶ 134–136; Ex. 1003 ¶¶ 126–128). Patent Owner does not dispute that Berkmo discloses this limitation. *See* PO Resp. We have reviewed Petitioner’s evidence and arguments, and we find that Petitioner has shown that Berkmo discloses this limitation.

- h. “data for forming a three dimensional virtual model of at least a portion of the aircraft from the merged data; and”*

Petitioner asserts that this limitation requires combined output data to include “data for forming” a 3D virtual model without actually forming the 3D virtual model, and Berkmo’s combined output data from imaging system 110C, laser system 110L, and radar system 110R includes data sufficient to form a 3D virtual model. Pet. 52–53 (citing Ex. 1003 ¶ 129; Ex. 1016, 2, 6, 10, 12). Petitioner asserts that this combined output data can be a spatially resolved weighted average with pixel-to-pixel matching to form a 3D virtual model of an aircraft portion. *Id.* at 53 (citing Ex. 1004 ¶¶ 37, 129, 130, 132–134, 143, Figs. 1–3, 6; Ex. 1016, 2, 6–7; Ex. 1003 ¶¶ 129–132). Patent Owner does not dispute that Berkmo discloses this limitation. *See* PO Resp. We have reviewed Petitioner’s evidence and arguments, and we find that Petitioner has shown that Berkmo discloses this limitation.

- i. “displaying messages to provide directional and speed guidance to a pilot with the merged data set.”*

Petitioner contends that Berkmo’s airport stand arrangement includes display 130 on a terminal building wall for providing maneuvering guidance, including direction and speed guidance, to aid the pilot in maneuvering the aircraft towards parking position 160. Pet. 54 (citing Ex. 1004 ¶¶ 120, 127). Petitioner asserts that maneuvering guidance is determined by control unit 120 analyzing output data and providing it to display 130 or transmitting it wirelessly for viewing on an aircraft cockpit display to instruct the pilot to stop the aircraft or continue approaching the stand. *Id.* (citing Ex. 1004 ¶¶ 127, 128, 135, 136, 143, Figs. 2–4; Ex. 1003 ¶¶ 133, 134).

(1) *directional guidance*

Patent Owner argues that “directional guidance” means “navigational instructions, including the horizontal deviation with respect to the center line of a path” and Berkmo’s guidance to “continue approaching the stand” or “stop the aircraft” has no directional component. PO Resp. 54–55. Patent Owner asserts that these instruction only tell a pilot whether they are “allowed to continue approaching” with no directional guidance. *Id.* at 56.

Because we interpret “directional . . . guidance” in Section II.C.1. as “navigational instructions” and “maneuvering guidance information,” we find that Berkmo’s maneuvering guidance information provides “directional guidance” to a pilot. Ex. 1004 ¶ 120. The maneuvering guidance aids the pilot “in maneuvering the aircraft 10 towards the parking position 160.” *Id.* ¶ 127. It helps a pilot maneuver the aircraft to the parking position without having to look through the cockpit windows. *Id.* ¶ 128. It also instructs a pilot “to continue approaching the stand,” i.e., to maneuver the aircraft in a direction toward the stand. *Id.* ¶ 143, Abstr., claim 31; Ex. 1003 ¶ 134. We disagree with Patent Owner’s argument that the maneuvering guidance has no directional component (PO Resp. 55) because it tells a pilot to continue in a particular direction as Petitioner asserts. *See* Reply 20–21; Ex. 1044 ¶ 54.

Berkmo’s pilot maneuvering guidance that instructs a pilot how to maneuver an aircraft to a parking position corresponds to the ’349 patent’s description of directional guidance that tells a pilot “how to get the aircraft to the correct location” and “when to brake in order to stop on the stop point” at the parking position. Ex. 1001, 10:12–15; *id.* at 7:56–65 (“to assist the pilot in positioning and orienting the aircraft correctly [in] the ramp area” or “indicating that they are going to [the] wrong ramp area”).

(2) *speed guidance*

Patent Owner argues that Berkmo’s guidance information instructing the pilot to stop the aircraft “amounts to nothing more than a ‘Stop’ or ‘Go’ instruction. PO Resp. 57. Patent Owner argues that “an instruction to ‘stop the aircraft’ does not include any information concerning actual maximum speeds that the aircraft should take while approaching a gate.” *Id.* at 58.

We agree with Petitioner that Berkmo’s instruction to a pilot to “stop the aircraft” provides speed guidance based on our interpretation of this term *supra* in Section II.C.2. Instructing a pilot to stop an aircraft provides speed guidance to reduce an aircraft’s speed to 0 mph. Ex. 1004 ¶¶ 136, 143; Pet. 54; Reply 21; Ex. 1044 ¶ 53. It instructs a pilot to change the aircraft’s speed to 0 mph in the same way the ’349 patent describes speed guidance as instructing a pilot to “slow down,” or “stop on the stop point.” Ex. 1001, 10:14–20; Reply 21; Ex. 1044 ¶ 53; Pet. 54.

(3) *“with the merged data set”*

Petitioner contends that Berkmo provides the merged data set by displaying maneuvering guidance information to aid a pilot in maneuvering an aircraft towards a parking position and this information is determined by control unit 120 analyzing the combined data of system 110. Pet. 54 (citing Ex. 1004 ¶¶ 120, 127, 128, 135, 136, 143, Figs. 2–4; Ex. 1003 ¶¶ 133, 134).

Patent Owner argues that the merged data set must be displayed with the directional and speed guidance, and displaying the determined speed and direction displays the merged data set. PO Resp. 59. Patent Owner asserts that “Berkmo’s guidance to the pilot is limited to providing permission to continue, including ‘instructing the pilot to stop the aircraft’ and ‘instructing the pilot to continue approaching the stand.’” *Id.* at 59–60.

Berkmo's provision of directional and speed maneuvering guidance based on the combined data of image and LIDAR/RADAR systems satisfies this limitation under our interpretation *supra* in Section II.C.3.

Berkmo merges output data of imaging system 110C and LIDAR/RADAR systems 110L/110R, as discussed *supra* in Section II.F.2.d. (Ex. 1004 ¶¶ 21, 32, 130–132), and provides pilot maneuvering guidance with this data (i.e., based on this data) to help a pilot maneuver an aircraft to a parking spot (*id.* ¶¶ 127, 128, 80, 97, 100, 136, 143) as Petitioner asserts. Pet. 54. Providing direction and speed maneuvering guidance based on the merged data set also provides the merged data set with the guidance. *See* PO Resp. 59 (asserting that providing the direction and speed determined from a merged data set also provides the merged data set with that guidance).

To rebut Patent Owner's argument that an aircraft's determined speed and direction must be displayed to display the merged data set (PO Resp. 59), Petitioner asserts that Berkmo determines the speed and direction of an aircraft and nearby objects in the stand area using combined sensor data and provides maneuvering guidance to a pilot to avoid collisions with the objects (Ex. 1004 ¶¶ 80, 126, 134–136), and a skilled artisan would understand this guidance would include an aircraft's and other objects' *speed and direction* to ensure an aircraft's safe arrival to the stand and ability to adjust its path (Reply 22; Ex. 1044 ¶ 55; Pet. 54 (citing Ex. 1004 ¶¶ 135–136); Ex. 1003 ¶ 134 (citing Ex. 1004 ¶¶ 135–136)). Petitioner asserts it would have been obvious to display an aircraft's and objects' speed and direction for the same reasons. Reply 22; Ex. 1044 ¶ 55. Patent Owner argues that this latter theory is new, but Patent Owner does not dispute that the maneuvering guidance includes an aircraft's speed and direction. *See* Sur-reply 15.

We have reviewed the parties' evidence and arguments, and we find that Petitioner has shown that Berkmo discloses or suggests this limitation.

j. Conclusion

We have reviewed the parties' evidence and contentions, and we find that Petitioner has shown by a preponderance of evidence that claim 1 is anticipated by, or unpatentable over, Berkmo.

3. Claims 6, 8–10, 13–18, and 20

Petitioner asserts that claims 6, 8–10, 13–18, and 20 are anticipated by or would have been obvious over Berkmo. Pet. 55–67. Petitioner provides detailed analysis to support its contentions. *Id.* Patent Owner does not dispute these contentions. *See* PO Resp. Having considered the record, we are persuaded by Petitioner's undisputed contentions that Petitioner has shown by a preponderance of evidence that claims 6, 8–10, 13–18, and 20 are anticipated by, or would have been obvious over, Berkmo.

4. Claim 7: “comparing the camera image data and the LIDAR/RADAR sensor data to identify that the aircraft is present in both the camera image data and the LIDAR/RADAR sensor data before merging the camera image data and the LIDAR/RADAR sensor data.”

Petitioner contends that Berkmo verifies objects based on the output of imaging system 110C and laser-based system 110L or radar-based system 110R. Pet. 56 (citing Ex. 1004 ¶¶ 35, 138; Ex. 1003 ¶ 138). Petitioner also asserts that Berkmo compares data of imaging system 110C, laser system 110L, and radar system 110R to verify an object before combining the data. *Id.* (citing Ex. 1004 ¶ 130; Ex. 1003 ¶ 139). Petitioner asserts that it would have been obvious to compare and verify before merging to identify aircraft 10 correctly. *Id.* at 57 (citing Ex. 1004 ¶¶ 35, 36; Ex. 1003 ¶ 140).

Petitioner asserts that the data comparison would have been obvious as one of a finite number of options (i.e., compare before or after merging), and it would have been obvious to verify before merging data to compare the unaltered versions of the output data. Pet. 57–58 (citing Ex. 1003 ¶ 141).

Patent Owner argues that Berkmo compares output data for smaller objects 11 (luggage dolly 11), 12 (food delivery truck) in a stand area from imaging system 110C and verifies the existence of these objects using data from laser-based system 110L and/or radar-based system 110R. PO Resp. 65–66 (citing Berkmo ¶ 138, Fig. 3; Ex. 2002 ¶¶ 107–109). Patent Owner asserts that Berkmo indicates that it is not necessary to verify and detect an aircraft due to its larger size and material construction that allow individual sensor systems to detect an aircraft's existence with higher certainty than smaller objects that have shadow images. *Id.* at 66–67 (citing Ex. 1004 ¶ 36). Patent Owner also argues that it would not have been obvious to use the verification process to identify larger aircraft because it is required only to detect smaller objects. *Id.* at 68 (citing Ex. 1004 ¶¶ 22, 36, 130, 134).

We agree with Petitioner that Berkmo renders claim 7 obvious for the following reasons. First, Petitioner reasonably contends that Berkmo's use of a verification process to detect and track objects 11, 12 within an stand area would have been obvious to apply to aircraft 10 within the stand area because aircraft 10 travels through the same area and, as such, would have been obvious to track similarly, as Dr. Campbell testifies. Pet. 56; Ex. 1003 ¶ 138. A skilled artisan would have understood that verifying small aircraft features (nose, wheels) that are tracked relative to objects would improve aircraft and object tracking to verify aircraft features and improve safety and efficiency. *See* Ex. 1003 ¶ 140; Ex. 1004 ¶¶ 81, 82, 129, 137, 138.

In this regard, Berkmo's airport stand arrangement tracks the location of a food delivery truck relative to the location of an aircraft's nose or front wheel, and it tracks the location of an aircraft's wheels for applying chocks. Ex. 1004 ¶¶ 78, 81, 82. The system "outputs data pertaining to objects at the stand area 20 to the controller 120" which "receives said output data and performs a data analysis of it so as to determine tracking data of the aircraft 10." *Id.* ¶ 126. Berkmo tracks objects relative to such aircraft features to avoid collisions and improve food delivery and docking. *Id.* ¶¶ 81, 82, 134, 135, 137, 138; Ex. 1003 ¶ 138; *see* Pet. 57. These teachings refute Patent Owner's arguments that it is unnecessary to verify the location of an aircraft (and its features) with objects interacting with it. PO Resp. 67.

Additionally, Berkmo detects and tracks aircraft "based on output data from two or more systems in different relative weights dependent on spatial position" and can "automatically shift to another more accurate system when the aircraft has entered the area of coverage of that system." Ex. 1004 ¶ 22. Berkmo compares data from multiple systems using pixel-to-pixel matching to determine which output data contains the most promising data to detect and track an aircraft's nose. *Id.* ¶ 129. This process verifies an aircraft's identity and location of features using multiple systems such as camera/laser and radar systems before merging the output data. *Id.* ¶¶ 82, 129, 130, 139. If an aircraft is not detected by the additional camera or laser systems, the radar-based system may be used to detect the aircraft and provide a second opinion. *Id.* ¶ 139. These determination steps may be used by two or more systems "at all times to further increase the accuracy of determination." *Id.*; *see* Ex. 1003 ¶ 138. These teachings refute Patent Owner's argument that Berkmo does not verify an aircraft's location in the stand area. PO Resp. 67.

These teachings to compare data from multiple systems, including camera and LIDAR/RADAR, to verify the identity of aircraft in the stand area based on the most accurate system, and to use multiple systems at all times to increase the accuracy of the determination disclose, or at least very strongly suggest, to compare camera image and LIDAR/RADAR data to identify an aircraft's presence *before* merging data sets, as claimed, to avoid image artifacts and collisions. Ex. 1004 ¶¶ 129, 130, 138, 139; Ex. 1003 ¶ 140. We agree with Petitioner that verifying an aircraft's identity before merging data is one of two finite options that uses the original data to verify an aircraft and determine/adjust weights before altering the data by merging to perform other analyses. *See* Ex. 1004 ¶¶ 24, 130; Ex. 1003 ¶ 141 (finite options); Pet. 57–58. We also agree it would have been obvious to verify an aircraft by its features (nose, wheels) with other objects to avoid collisions and improve operations. Ex. 1004 ¶¶ 81, 82, 126, 134, 135, 137–139.

Based on the parties' contentions and record evidence, we find that Petitioner has established by a preponderance of evidence that claim 7 is anticipated by, or would have been obvious over, Berkmo.

5. *Claim 19*

Petitioner asserts that Berkmo analyzes LIDAR/RADAR sensor data using a point cloud process to correlate points in the LIDAR/RADAR sensor data to points in the camera image data, as recited in claim 19, by running a pre-processing sub-algorithm to determine corresponding spatial regions of output data by pixel-to-pixel matching and determining a weighted average as a matrix of average data values with each pertaining to a specific spatial location on the stand area using the radar system and one or more additional systems. Pet. 66–67 (citing Ex. 1004 ¶¶ 129, 130; Ex. 1003 ¶ 156).

Patent Owner argues that paragraphs 129 and 130 describe pixel-to-pixel matching of data from a radar-based system to a laser-based system. They are not referring to pixel-to-pixel matching of data from the LIDAR/RADAR sensor data to the points in the camera image data as claimed. PO Resp. 69–70 (citing Ex. 2002 ¶¶ 119, 120).

As discussed *supra* in Section II.F.2.d., we find that Berkmo discloses merging data from imaging system 110C and radar-based system 110R and/or laser system 110L using a spatially resolved weighted average of the combined output data such as statistical weights of imaging system 110C, laser system 110L, and radar system 110R as Petitioner asserts. *See* Pet. 46, 66–67; Reply 23. Berkmo uses pixel-to-pixel matching of corresponding spatial regions of the output data and determines weighted averages of data values for specific spatial locations on the stand area. Ex. 1004 ¶¶ 129, 130.

Patent Owner’s arguments that “Berkmo is not capable of performing its pre-processing sub-algorithm . . . or weighted averaging process . . . on a combination of 3D point cloud data and 2D image data” are contradicted by Dr. Campbell’s testimony and supporting evidence that we discussed *supra* in Section II.F.2.d. that Berkmo’s disclosure would be understood by skilled artisans to disclose how to merge camera image data with sensor data of radar-based systems and/or laser-based systems using point cloud algorithms and processes or Kalman filters. *See* Ex. 1044 ¶¶ 46–51.

Based on the parties’ contentions and record evidence, we find that Petitioner has established by a preponderance of evidence that claim 19 is anticipated by, and/or would have been obvious over, Berkmo.

G. Ground 3: Asserted Obviousness over Berkmo and Richman

Petitioner asserts that claims 1–20 are unpatentable under 35 U.S.C. § 103 over Berkmo and Richman. Pet. 10, 67–80.

1. Richman

Richman describes a system for guiding an aircraft from a taxiway into a dock by automatically viewing an arriving aircraft and the dock area to detect the aircraft and any obstacles that may be in the travel path of the aircraft. Ex. 1005, 1:4–8. The system matches stored three-dimensional models of the aircraft with an image of the aircraft obtained using ranging circuitry of a laser radar (ladar) to determine the location and orientation of the approaching aircraft and to update that data to determine the aircraft's travel path as shown in Figure 1 reproduced below. *Id.* at 1:8–13, 2:4–11.

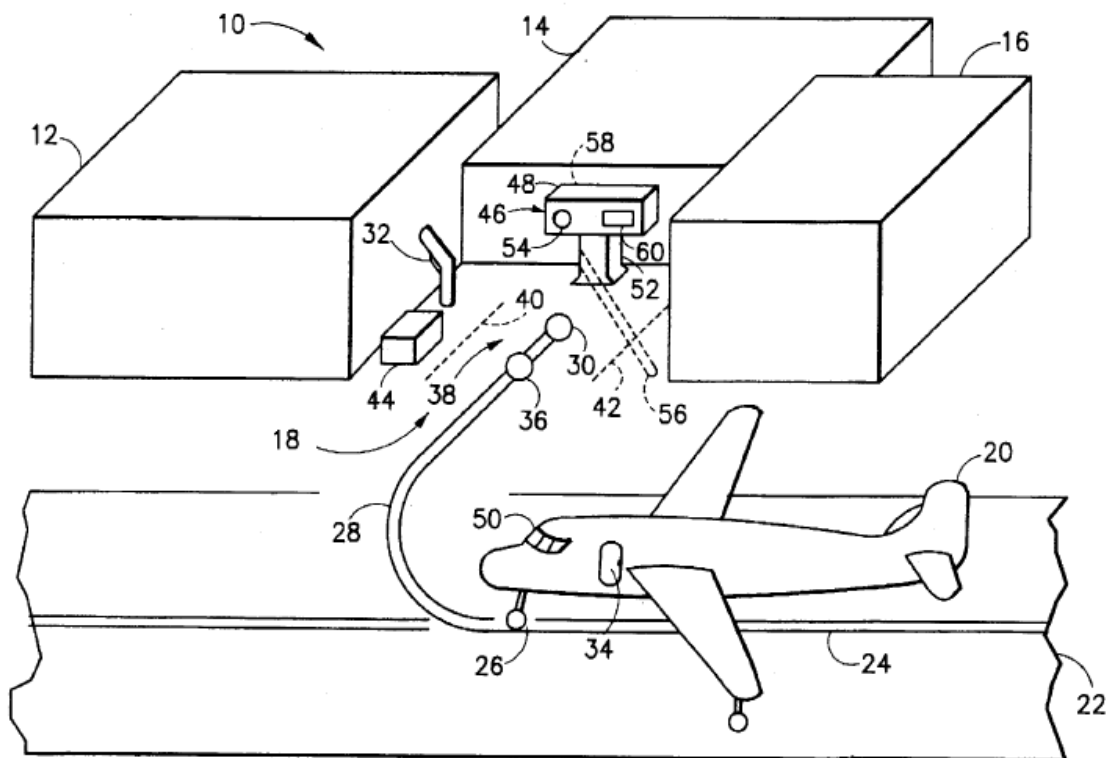


Figure 1 shows aircraft 20 approaching dock 18 along taxiway 22 guidelines 24, 28 for nose wheel 26 leading into dock 18 to stop point 30 so passenger bridge 32 registers at aircraft door 34 for passengers. *Id.* at 2:57–3:8.

Docking system 46 provides steering and speed commands to the pilot and warns the pilot of obstacles. Ex. 1005, 3:21–24. Ladar 54 scans dock 18 in elevation and azimuth with beam 56 (e.g., infrared radiation beam) to obtain an image of an aircraft or obstacle present within dock 18. *Id.* at 2:4, 3:24–36. Display 60 presents instructions to help a pilot dock aircraft 20. *Id.* at 3:36–47. Ladar target points provide a 3D image of the aircraft that is compared to a library of aircraft templates by correlator 68 to determine the aircraft’s position and orientation. *Id.* at 3:48–4:50, Fig. 3.

2. *Motivation to Combine and Expectation of Success*

Petitioner asserts that Berkmo and Richman disclose aircraft guidance docking systems that use laser sensors to detect approaching aircraft, and a skilled artisan would have combined Richman’s 3D modeling, orientation detection, and template matching with Berkmo, as a predictable combination of familiar elements by known methods for predictable results. Pet. 70–71 (citing Ex. 1004 ¶¶ 116–132, Figs. 1–3; Ex. 1005, 2:4–24, 3:48–4:34; Ex. 1003 ¶ 163). Petitioner asserts that Richman’s 3D models would return the location and *orientation* of objects, lower the number of missed detections resulting from partial sensor returns, identify the aircraft type, and improve tracking by arranging the detections in a time series and using “feature extraction” from sensor data to match specific parts (nose and wing wheel) to aircraft in a library and would improve the accuracy of aircraft tracking in the stand area. Pet. 71–73 (citing Ex. 1005, 1:4–13, 2:3–11, 4:1–7; Ex. 1003 ¶¶ 163–168).

Patent Owner argues that the Petition relies on Dr. Campbell's declaration that provides only conclusory positions with no evidence to support the positions beyond merely repeating arguments from the Petition. PO Resp. 77. We disagree.

The Petition and Dr. Campbell rely on Richman's disclosure that the comparison of an image extracted from a ladar to a scaled model can show the location and orientation of the approaching aircraft. Ex. 1005, 2:3–7; *see* Pet. 71 (citing Ex. 1005, 2:3–6); Ex. 1003 ¶ 164 (citing Ex. 1005, 2:3–6). Patent Owner does not dispute Petitioner's contention that Richman discloses this subject matter. *See* PO Resp.

Petitioner and Dr. Campbell also rely on Richman's disclosure that "feature extraction" from ladar data can be used to determine the type of an approaching aircraft by comparing features such as a nose wheel, wing wheel, wing height and size, fuselage, and rudder to a library of 3D models. Ex. 1005, 4:1–7; Pet. 71–72 (citing Ex. 1005, 4:1–7), Ex. 1003 ¶ 166 (citing Ex. 1005, 4:1–7). Dr. Campbell testifies that using multiple specific parts to identify an aircraft would improve Berkmo by using detailed information that is specific to an aircraft to match the sensor data to aircraft in a library of 3D models. Ex. 1003 ¶ 166. Patent Owner does not dispute the accuracy of Dr. Campbell's testimony in this regard. *See* PO Resp.

Dr. Campbell testifies that Berkmo has sufficient sensor data with the dynamic model to track objects in the ramp area, and using Richman's 3D matching techniques would make Berkmo's arrangement more accurate. Ex. 2003:56:19–20 ("I said it would be more accurate. I didn't say Berkmo was not accurate."). Patent Owner does not dispute the accuracy of Dr. Campbell's testimony. *See* PO Resp. 77–78.

Patent Owner argues that Petitioner and Dr. Campbell do not explain how a skilled artisan would or could have modified Berkmo to incorporate Richman's 3D model functionalities. PO Resp. 74. Patent Owner asserts that Berkmo and Richman are not simple mechanical or electrical designs where the effects of a substitution or combination are understandable with no detailed explanation but instead are complex systems that use a variety of different sensor technologies and computers to analyze sensor data in real-time to track large and expensive aircraft. *Id.* at 75. Patent Owner argues that the Petition does not explain how Richman's functionality would have been incorporated "in Berkmo's laser sensor." *Id.* at 75–76.

We find that Petitioner has shown a skilled artisan would have been motivated to combine Richman's 3D modeling and feature extraction with Berkmo's aircraft tracking system to improve the accuracy of determinations of an aircraft's location, orientation, detection, type, and classification and would have had a reasonable expectation of success in doing so. Pet. 70–73; *see KSR*, 550 U.S. at 417 (using a technique that was used to improve one device to improve similar devices in the same way is obvious unless its application is beyond the level of ordinary skill in the art). Richman teaches how to implement its 3D modeling in laser-based systems, such as Berkmo's system, which tracks the location of aircraft features, such as the wheels of an aircraft relative to chocks and the location of the nose or front wheel of the aircraft. Ex. 1004 ¶¶ 81, 82, 129. Richman teaches to extract aircraft features from ladar data, such as nose or wing wheels, compares the target images to 3D aircraft templates about various axes of rotation, matches a template to the image, and identifies the nose wheel in a specific template and its location relative to guideline 28. Ex. 1005, 3:50–4:50, Figs. 1, 2.

Richman discloses how to compare images of an approaching aircraft obtained by a ladar with a rotated and scaled aircraft model to determine the aircraft's location, orientation, and travel path. Ex. 1005, 2:3–11, 3:48–67. These teachings also provide a rational underpinning to support Petitioner's reason for combining teachings of Richman and Berkmo, as Dr. Campbell testifies. *See KSR*, 550 U.S. at 417; Ex. 1003 ¶ 164 (citing Ex. 1005, 2:3–6). Dr. Campbell testifies that using 3D models improves the detection of the aircraft type or classification and using Richman's feature extraction would improve the detection of aircraft type, as Richman discloses, by using more detailed aircraft specific information to match the sensor data to a library of aircraft 3D models. Ex. 1003 ¶ 166 (citing Ex. 1005, 4:1–7). We therefore disagree that Petitioner's rationale is unsupported. *Cf.* PO Resp. 77–78.

Patent Owner's other arguments against the combined teachings go to physical incorporation, which is not the standard for obviousness. *See* PO Resp. 74–76; *See In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) (“It is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements.”); *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (en banc) (“Etter's assertions that Azure cannot be incorporated in Ambrosio are basically irrelevant, the criterion being not whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole.”); *In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983) (“[I]t is not necessary that the inventions of the references be physically combinable to render obvious the invention under review.”). Petitioner established that Berkmo combines laser and image data as discussed *supra* in Section II.F.2.d. Pet. 46; *see* Ex. 1004 ¶¶ 32, 130–132.

Moreover, Berkmo and Richman arrange received sensor and image data from specific, spatial arrangements and locations of the stand area such that skilled artisans would have been motivated and able to apply Richman's comparison of a 3D spatial distribution of ladar target data to a 3D model in Berkmo's stand arrangement, which merges camera image and laser output data into a combined data set of three dimensions that can be compared to a 3D model of an aircraft and/or its particular features. *See* Ex. 1004 ¶¶ 81, 82, 129–132; Ex. 1005, 3:47–4:22. Richman further discloses:

The use of three-dimensional templates, including the rotation and scaling of the templates for viewing the templates at different angles of view and at different distances, is well known in the field of computer aided design (CAD) wherein numerous application programs are available for computers to provide the foregoing functions of the converter 66 upon the templates.

Ex. 1005, 4:23–29.

We find that Petitioner has established that a skilled artisan would have been motivated to combine the asserted teachings of Richman with Berkmo's arrangement for similar results that would improve Berkmo's aircraft tracking system as a combination of familiar elements according to known methods for predictable results based on Richman's teaching that this technology was well-developed and predictable as of the August 3, 2020, filing date of the '349 patent. Ex. 1005, 3:47–4:29. A skilled artisan would have had a reasonable expectation of success in combining these teachings to merge camera image and LIDAR/RADAR data to determine an aircraft's position and orientation based on the references' teachings and Dr. Campbell's testimony of the simplicity of implementing these asserted improvements. *Id.*; Ex. 1003 ¶¶ 164–168; Ex. 1004 ¶¶ 81, 82, 129–132.

3. *Independent Claim 1*

Petitioner asserts that Berkmo teaches or suggests every limitation of claim 1 as explained in Section X.B.2 of the Petition, and Richman discloses “wherein the merged data set includes at least one of: data for determining position and orientation of the aircraft relative to the position and orientation of the ramp area” and “data for forming a three-dimensional virtual model of at least a portion of the aircraft from the merged data.” Pet. 73–74.

Patent Owner argues that this ground is deficient because Petitioner relies on Berkmo to disclose every limitation of the independent claims, and Berkmo does not disclose the elements identified by Patent Owner as being deficient for claim 1 in Ground 2. PO Resp. 72–73. This argument is not availing in view of our determination *supra* in Section II.F.2. that Berkmo anticipates and/or renders obvious claim 1.

- a. *“wherein the merged data set includes at least one of: data for determining position and orientation of the aircraft relative to the position and orientation of the ramp area,”*

Petitioner contends that Richman’s docking system detects arriving aircraft and matches stored models of the aircraft with aircraft sensor data to determine the orientation of the aircraft and a tracking point of the aircraft, such as the nose wheel, by comparing a detected image with a rotated or scaled model. Pet. 73 (citing Ex. 1005, 1:4–14, 1:54–2:24, 7:55–8:13, 8:32–52, 8:65–10:11, Abstr.; Pet. § X.C.2. (motivation to combine); Ex. 1003 ¶ 170). Patent Owner does not dispute that Berkmo discloses this limitation. *See* PO Resp. We have reviewed Petitioner’s undisputed evidence and arguments, and we find that Petitioner has shown that Berkmo discloses or suggests this limitation.

- b. “data for forming a three dimensional virtual model of at least a portion of the aircraft from the merged data;”*

Petitioner contends that “[t]o the extent this limitation is not met by Berkmo, Richman teaches it.” Pet. 74 (citing Ex. 1003 ¶ 171). Petitioner asserts that Richman’s docking system ladar 54 “outputs target data in the form of elevation (EL), azimuth (AZ) and range (R) data for each point of a target, such as an aircraft” to provide a 3D image of the target, and memory 64 stores templates as 3D representations of aircraft used by correlator 68 to determine the quality of a match of a template and an image. Pet. 74 (citing Ex. 1005, 1:65–2:24, 3:49–55, 3:57–67, 4:23–34, 6:59–7:5, 8:13–17, 8:31–52, 8:65–10:11, Abstr., Fig. 2; Ex. 1003 ¶ 171). Patent Owner does not dispute that Richman discloses this limitation. *See* PO Resp. We have reviewed Petitioner’s undisputed evidence and arguments, and we find that Petitioner has shown that Richman discloses this limitation with Berkmo.

c. Conclusion

We have reviewed the parties’ evidence and contentions, and we find that Petitioner has shown by a preponderance of evidence that claim 1 is unpatentable over the combination of Berkmo and Richman, and a skilled artisan would have been motivated to combine their teachings and would have had a reasonable expectation of success in doing so.

4. Claims 2–20

Petitioner provides detailed contentions with citations to the teachings of Berkmo and Richman and testimony of Dr. Campbell that Berkmo and Richman render obvious claims 2–20. Pet. 74–80. Patent Owner does not contest these assertions of unpatentability of claims 2–20. *See* PO Resp.

We have reviewed the parties' evidence and contentions and find that Petitioner has shown by a preponderance of evidence that claims 2–20 are unpatentable over the combination of Berkmo and Richman, and a skilled artisan would have been motivated to combine their teachings and would have had a reasonable expectation of success in doing so.

III. CONCLUSION⁷

Based on the evidence presented with the Petition, the evidence introduced during the trial, and the parties' arguments, Petitioner has shown by a preponderance of the evidence that claims 1–20 are unpatentable.

In summary:

Claims	35 U.S.C. §	References/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–20	101	Eligibility	1–20	
1, 6–10, 13–20	102	Berkmo	1, 6–10, 13–20	
1, 6–10, 13–20	103	Berkmo	1, 6–10, 13–20	
1–20	103	Berkmo, Richman	1–20	

⁷ Should Patent Owner wish to amend the challenged claims in a reissue or a reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*, 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

Claims	35 U.S.C. §	References/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
Overall Outcome			1–20	

IV. ORDER

Accordingly, it is:

ORDERED that claims 1–20 of U.S. Patent No. 11,538,349 B2 are determined to be unpatentable; and

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

PGR2023-00053
Patent 11,538,349 B2

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