

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.

Case No.: PGR2023-00053
U.S. Patent No. 11,538,349

PETITION FOR POST-GRANT REVIEW

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TABLE OF EXHIBITS

No.	Description
1001	U.S. Patent No. 11,538,349
1002	File History of U.S. Patent No. 11,538,349
1003	Expert Declaration of Dr. Mark Campbell
1004	U.S. Application No. 2022/0066025 to Berkmo et al. (“Berkmo”)
1005	U.S. Patent No. 5,675,661 to Richman et al. (“Richman”)
1006	U.S. Application No. 2017/0178520 to Papageorgiou et al. (“Papageorgiou”)
1007	EP 3680689 to Berkmo et al. (“EP’689”)
1008	Annotated version of Berkmo highlighting paragraphs included in Berkmo but absent from EP’689
1009	Chinrungrueng J, Sunantachaikul U, Triamlumlerd S., “Smart Parking: An Application of Optical Wireless Sensor Network,” International Symposium on Applications and the Internet Workshops 15 Jan 2007
1010	Nussbaum, H., “Automated Parking System for Vehicles,” German Patent Number DE102014112269, 27 Aug 2014, US patent 2017/0226764
1011	Tran, V.L., Im N., “A Study on Ship Automatic Berthing with Assistance of Auxiliary Devices,” <i>International Journal of Naval Architecture and Ocean Engineering</i> 2012
1012	Mi, C., Shen, Y., Mi, W. and Huang, Y., “Ship Identification Algorithm based on 3D Point Cloud for Automated Ship Loaders.” <i>Journal of Coastal Research</i> , (73), 2015
1013	Thupakula, K., “Data Fusion Techniques for Object Identification in Airport Environment.” <i>SAE Technical Paper 2017-01-2109</i> , 19 Sept 2017, doi: 10.4271/2017-01-2109
1014	Miller, I., Campbell, M., Huttenlocher, D., Kline, F.R., Nathan, A., Lupashin, S., Catlin, J., Schimpf, B., Moran, P., Zych, N. and

	Garcia, E., “Team Cornell's Skynet: Robust Perception and Planning in an Urban Environment,” <i>Journal of Field Robotics</i> , 25(8), 2008
1015	Schumann, O., Hahn, M., Dickmann, J. and Wöhler, C., “Semantic Segmentation on Radar Point Clouds,” <i>International Conference on Information Fusion (FUSION)</i> , July 2018
1016	Aldoma, A., Marton, Z.-C., Tombari, F., Wohlking, W., Potthast, C., Zeisl, B., Rusu, R. B., Gedikli, S., and Vincze, M., “Tutorial: Point Cloud Library: Three-Dimensional Object Recognition and 6 DoF Pose Estimation,” <i>IEEE Robotics & Automation Magazine</i> 19, no. 3, 2012
1017	I. Miller and M. E. Campbell, “Sensitivity Analysis of a Tightly-Coupled GPS/INS System for Autonomous Navigation,” <i>IEEE Transactions on Aerospace and Electronic Systems</i> , 48(2), 2012
1018	Mund, J., Michel, F., Dieke-Meier, F., Fricke, H., Meyer, L., & Rother, C., “Introducing Lidar Point Cloud-based Object Classification for Safer Apron Operations,” <i>International Symposium on Enhanced Solutions for Aircraft and Vehicle Surveillance Applications</i> , April 2016
1019	I. Miller, M. E. Campbell, and D. Huttenlocher, “Efficient Unbiased Tracking of Multiple Dynamic Obstacles Under Large Viewpoint Changes,” <i>IEEE Transactions on Robotics</i> , 27(1), Feb 2011
1020	F. Havlak and M. E. Campbell, “Discrete and Continuous, Probabilistic Anticipation for Autonomous Robots in Urban Environments,” <i>IEEE Transactions on Robotics</i> , 30(2), Apr 2014
1021	I. Miller, M. E. Campbell, and D. Huttenlocher, “Map-aided Localization in Sparse Global Positioning System Environments using Vision and Particle Filtering,” <i>Journal of Field Robotics</i> , 28(5), Sept 2011
1022	Campbell, M. E., Ahmed, N. R., “Distributed Data Fusion: Neighbors, Rumors, and the Art of Collective Knowledge,” <i>IEEE Control Systems</i> , 36(4), Aug 2016
1023	Deng, J., Dong, W., Socher, R., Li, L.J., Li, K. and Fei-Fei, L., “Imagenet: A large-scale Hierarchical Image Database,” <i>IEEE</i>

	<i>Conference on Computer Vision and Pattern Recognition</i> , June 2009
1024	Rusu, R.B. and Cousins, S., “3D is Here: Point Cloud Library (PCL)” <i>IEEE International Conference on Robotics and Automation (ICRA)</i> , 2011
1025	Ip, C.Y. and Gupta, S.K., “Retrieving Matching CAD Models by using Partial 3D Point Clouds,” <i>Computer-Aided Design and Applications</i> , 4(5), 2007
1026	Wohlkinger, W., Aldoma, A., Rusu, R.B. and Vincze, M., “3Dnet: Large-scale Object Class Recognition from CAD Models,” <i>IEEE International Conference on Robotics and Automation</i> , May 2012
1027	Vock, R., Dieckmann, A., Ochmann, S. and Klein, R., “Fast Template Matching and Pose Estimation in 3D Point Clouds,” <i>Computers & Graphics</i> , 79, 2019
1028	Qi, C.R., Su, H., Mo, K. and Guibas, L.J., “Pointnet: Deep Learning on Point Sets for 3D Classification and Segmentation,” <i>IEEE Conference on Computer Vision and Pattern Recognition</i> , 2017
1029	Wang, Y., Chao, W.L., Garg, D., Hariharan, B., Campbell, M. and Weinberger, K.Q., 2019. “Pseudo-Lidar from Visual Depth Estimation: Bridging the Gap in 3D Object Detection for Autonomous Driving,” <i>IEEE/CVF Conference on Computer Vision and Pattern Recognition</i> , 2019
1030	Bar-Shalom, Y., Li, X. R., & Kirubarajan, T. (2001). Estimation with applications to tracking and navigation: theory algorithms and software. John Wiley & Sons.
1031	Petrovskaya, A. and Thrun, S., 2009. Model based vehicle detection and tracking for autonomous urban driving. <i>Autonomous Robots</i> , 26(2-3), pp.123-139.

I. INTRODUCTION

Pursuant to 35 U.S.C. § 313 and 37 C.F.R. § 42.107(a), Petitioners (“Petitioners” or “Safegate”) respectfully submit this Petition for Post Grant Review (Paper No. 1) (“the Petition”) of claims 1-20 (“the Challenged Claims”) of U.S. Patent No. 11,538,349 (“the ’349 Patent” EX1001) owned by Honeywell Corporation (“Patent Owner” or “Honeywell”).

Claims 1-20 of the ’349 Patent are invalid as unpatentable subject matter under 35 U.S.C. § 101. While directed to a sensor-based system for tracking aircraft in a ramp area, the ’349 Patent describes an entirely routine and conventional collection of steps that merely collects, merges, and displays data without any identifiable technical improvement to the prior art. The claims are directed to the abstract idea of collecting sensor data, merging the collected data into a merged data set, and displaying messages with the merged data. Moreover, both the ’349 Patent and its claims fail to disclose or recite any improvement to computer functionalities or resolution of any technological problem but simply present well-understood, routine, and conventional functions and devices. Without more, claims 1-20 must be found invalid under 35 U.S.C. § 101.

Claims 1-20 are also invalid as being anticipated and/or obvious over the prior art. That the claims 1-20 only recite well-understood, routine, and conventional functions and devices is clearly demonstrated by the anticipation

and obviousness Grounds 2 and 3. These Grounds, as well as the Background in Dr. Campbell's Declaration (EX1003), show that the prior art teaches every limitation of the '349 Patent claims. In particular, in the context of tracking an aircraft in a ramp area, the prior art teaches using multiple sensors including cameras, LIDAR, and radar to detect and track the aircraft and other objects in the ramp area. The prior art also teaches combining or merging that sensor data to determine the position, speed, direction, orientation, and proximity of the aircraft to other objects and using that combined data to provide aircraft guidance displayed to the pilot. With every limitation of the claims anticipated by and/or obvious over the prior art, claims 1-20 must also be found invalid under 35 U.S.C. §§ 102 and/or 103.

Since Grounds 1-3 demonstrate that claims 1-20 are invalid under 35 U.S.C. §§ 101, 102, and/or 103 by a preponderance of the evidence, institution of this PGR should be granted, and claims 1-20 should be found unpatentable.

II. MANDATORY NOTICES

A. Real Party-In-Interest

The real parties-in-interest are ADB Safegate Sweden AB, ADB Safegate BV, and ADB Safegate Americas, LLC.

B. Related Matters

Pursuant to 37 C.F.R. § 42.8(b)(2), to the best knowledge of the Petitioner, the '349 Patent is not involved in any other case or matter.

C. Lead and Back-Up Counsel

Petitioner provides the following designation and service information for lead and back-up counsel. 37 C.F.R. § 42.8(b)(3) and (b)(4).

Lead Counsel	Back-Up Counsel
Marc K. Weinstein (Reg. No. 43,250) marc.weinstein@xsensus.com	Bradley Lytle (Reg. No. 40,073) brad.lytle@xsensus.com
<u>Postal and Hand-Delivery Address:</u> Xsensus LLP 100 Daingerfield Road Suite 402 Alexandria, VA 22314 Telephone: (571) 376-6333 Fax: (571) 376-6334	<u>Postal and Hand-Delivery Address:</u> Xsensus LLP 100 Daingerfield Road Suite 402 Alexandria, VA 22314 Telephone: (571) 376-6333 Fax: (571) 376-6334

Please address all correspondence to lead and back-up counsel and to xsensuspat@xsensus.com. Petitioner consents to electronic service via email.

III. GROUNDS FOR STANDING

Petitioners certify 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, as described below in Section V. See AIA §§ 3(n)(1), 6(f)(2)(A). Petitioners are not barred or estopped from requesting post-grant review challenging the patent claims on the grounds identified in this Petition. Petitioners have not filed a civil action challenging the validity of any claim of the '349 Patent.

IV. THE '349 PATENT¹

A. Overview of the '349 Patent

The '349 Patent is directed to a method for tracking and docking an aircraft in a ramp area of an airport. EX1001, Abstract; 1:7-9. Earlier non-manual approaches have used laser/LIDAR systems or camera systems to track and dock aircraft. *Id.*, 1:54-2:9. The laser/LIDAR systems have issues with that approach path, detection range, and weather conditions, whereas camera systems have issues with distance accuracy and require precise calibration. *Id.* These limitations on laser/LIDAR and camera systems were well-known prior to the '349 Patent. *See* EX1003, ¶68.

As shown in Fig. 1, the '349 Patent describes an aircraft ramp area arrangement including a sensor array 102 having a camera image sensor and a LIDAR/RADAR sensor. EX1001, Fig. 1; 3:53-5:36. The camera sensor provides detection of aircraft from longer distances, and the LIDAR/Radar sensor provides clear guidance to the aircraft to perform precise docking. *Id.*, 5:20-24.

¹ Unless otherwise specified, all bold and bold italics emphasis below has been added.

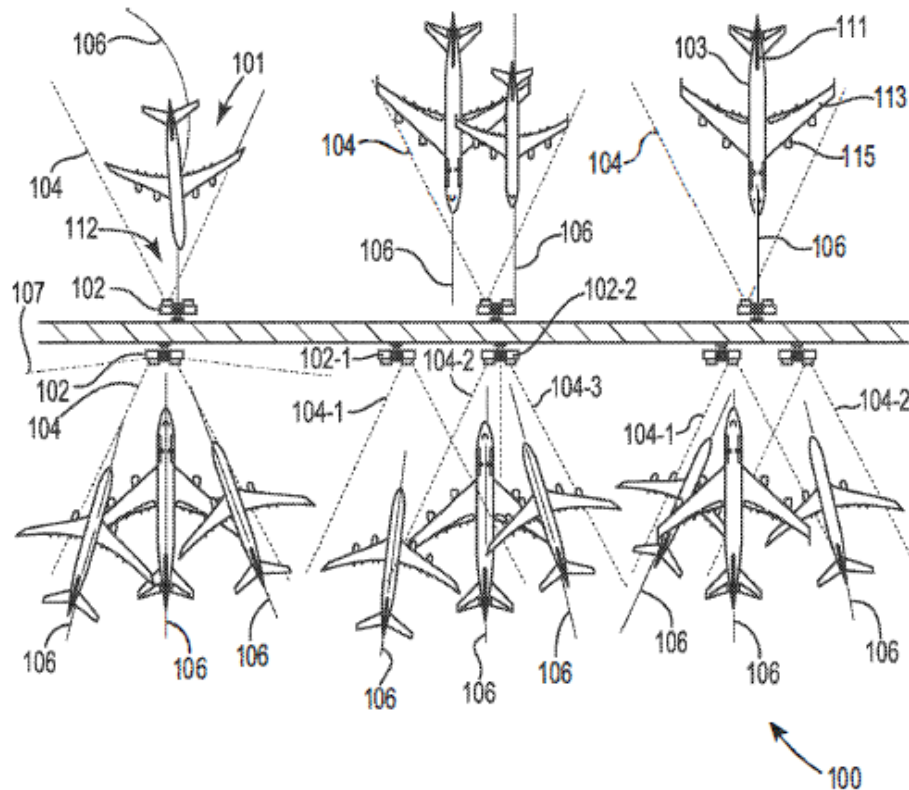


FIG. 1

The use of multiple sensors including cameras, LIDARs, and radars to track and guide an aircraft in a ramp area was well-known prior to the '349 Patent. See EX1003, ¶69.

The '349 Patent discloses that the data from the camera and LIDAR/RADAR sensors are collected and merged via a data fusion process to provide a data set to track and provide guidance to the aircraft from entry into the ramp area to docking. EX1001, 5:25-28. The LIDAR/RADAR provides data as a plurality of LIDAR/Radar data points, which can be referred to as a point cloud, that are collected as the LIDAR/Radar scans surfaces of the aircraft and can include distance information. *Id.*, 6:16-23. The camera provides image data captured from an

imaging sensor that represents frames of video data or one or more still images taken in a sequence and can be used to create a 3D model of the aircraft. *Id.*, 6:41-45; 8:37-43. The LIDAR, radar, and camera producing such data was well-known prior to the '349 Patent. *See* EX1003, ¶70.

Once collected, the '349 Patent describes a data fusion process that uses qualities of each data set together. EX1001, 8:64-67. In one process, a 3D point cloud is formed from the LIDAR/RADAR sensor, a transformation is calculated between the coordinates of the LIDAR/RADAR point cloud and a vision coordinate system of the camera, and an estimated pose of the 3D model is determined. *Id.*, 8:67-9:10. This transformation and correlation can be accomplished by mapping both data sets to a virtual space having a common coordinate system. *Id.*, 9:23-38. Combining, merging, or fusing LIDAR, radar, and camera data was well-known prior to the '349 Patent. *See* EX1003, ¶71.

The merged data is used by the docking system to derive the speed and position of the aircraft and to provide information for pilot unit display messages indicating directional and/or speed guidance to the pilot, although the '349 Patent provides little to no explanation of how such guidance is determined from the merged data. EX1001, 6:57-65; 10:5-15. Using the merged data from the LIDAR, radar, and camera to provide displayed guidance to a pilot was well-known prior to the '349 Patent. *See* EX1003, ¶72.

The '349 Patent describes a computing device, as shown in Fig. 5, to provide ramp area aircraft movement functions. EX1001, 10:47-50. Computing device 543 “is a typical computing device” that can be used as the airport computing system, central docking system controller, ramp docking system controller, and/or pilot unit, as described in FIG. 3. *Id.*, 10:50-54. Computing device 543 includes a processor 545 and memory 547, which can include data 555 and instructions 551 executable by the processor 545. *Id.*, 10:56-60. Computing device 543 and memory 547 are conventional, well-known components. See EX1003, ¶73.

The '349 Patent was filed on August 3, 2020, without claiming priority to any earlier-filed application. EX1001, 1. The '349 Patent therefore has a priority date of August 3, 2020.

B. Prosecution History

The '349 Patent issued on December 27, 2022, from U.S. Patent Application No. 16/983,657 (“the '659 application”) filed August 3, 2020, and does not claim priority to any previous application. The '659 application was filed with 20 claims including three independent claims. EX1002, 214-218.

Without issuing an Office Action or making any substantive rejection of any of the claims, the Examiner issued a Notice of Allowance in conjunction with an Examiner’s Amendment on September 1, 2022. *Id.*, 8-22. The following shows the amendment made to claim 1:

1. (Currently amended) A method for tracking an aircraft, comprising:

receiving camera image data of ~~[[an]]~~ the aircraft while the aircraft is approaching
~~or in the~~ a ramp area for parking the aircraft on an airside of an airport;

receiving ~~LIDAR/Radar~~ Light Detection And Ranging (LIDAR) or RAdio Detection
And Ranging (RADAR) sensor data of ~~[[an]]~~ the aircraft while the aircraft is approaching
~~or in the~~ ramp area;

merging the camera image data and the ~~LIDAR/Radar~~ LIDAR/RADAR-sensor
data into a merged data set; and

wherein the merged data set includes at least one of: data for determining ~~the~~
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.

Id., 13-14. Similar amendments were made to independent claims 10 and 18. *Id.*,
15-16, 18-19.

In the Reasons for allowance, the Examiner stated the Papageorgiou
(EX1006) was the closest prior art. *Id.*, 20-21. An Interview Summary of an
interview conducted on August 25, 2022, identified the Issues Discussed as follows:

35 U.S.C. 101

Examiner suggests, in the interest of compact prosecution, to Applicant amend independent claims 1, 10
, and 18 to overcome 101 rejection by adding a display based on [0046]. Applicant indicated willingness
to consider the suggestion. No agreement has been reached.

Objections

Examiner suggested to Applicant amend the preamble of claims 19 and 20 from "the computing device"
to "The system". Applicant indicated willingness to consider the suggestion. No agreement has been
reached.

Id., 23. While indicating that a 101 rejection would be overcome “by adding a display based on [0046],” no such rejection was ever asserted. Moreover, as explained in greater detail in Section X.A herein, simply adding a step of “displaying messages” in claim 1 and similar language in claims 10 and 18 amounts to nothing more than insignificant extra-solution activity that is insufficient to render the claims patent eligible under § 101.

V. CLAIM CONSTRUCTION

In a Post-Grant Review, claims “shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b); *see also Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). The Board construes claims only to the extent necessary to resolve the underlying controversy. *Toyota Motor Corp. v. Cellport Sys., Inc.*, IPR2015-00633, Paper No. 11, 16 (PTAB August 14, 2015) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). No terms require construction to determine that claims 1-20 are invalid under §§ 101, 102, 103.

VI. PERSON OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (“POSITA”) at the time of the ’349 Patent’s earliest priority date 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. Additional work or research experience can substitute for less or different education, and vice-versa. EX1003, ¶¶18-23.

VII. RELIEF REQUESTED AND THE REASONS FOR THE REQUESTED RELIEF

Petitioner asks that the Board review the following challenges, institute a trial for Post-Grant Review of claims 1-20 of the ’349 Patent and cancel those claims as unpatentable.

VIII. IDENTIFICATION OF GROUNDS

This petition challenges the patentability of claims 1-20 of the ’349 Patent (“the Challenged Claims”) as follows:

Ground	Claims	Basis	Prior Art
#1	1-20	35 U.S.C. § 101	
#2	1, 6-10, 13-20	35 U.S.C. § 102 and/or 103	Berkmo
#3	1-20	35 U.S.C. § 103	Berkmo and Richman

IX. THE BOARD SHOULD INSTITUTE POST-GRANT REVIEW.

A. The Grounds Presented in This Petition Are Not Cumulative to Prosecution of the '349 Patent

The challenges presented in this petition are neither cumulative nor redundant to the prosecution of the '349 Patent. The Examiner never rejected the claims for reciting unpatentable subject matter under §§ 101, 102, or 103, and the prior art asserted in this Petition was never considered or before the U.S. Patent and Trademark Office (the "Office").

1. § 101 challenge is not cumulative

The § 101 challenge cannot be cumulative to the '349 Patent's prosecution because no claim rejection was ever made. While the interview summary notes the Examiner proposed an amendment to address § 101, there is no actual rejection made nor an explanation of how the claims would have been rejected absent the proposed Examiner's Amendment. Moreover, it was error to find the claims satisfied § 101 with the Examiner's Amendment solely by adding the "displaying" limitation.

(a) The Office never raised a § 101 rejection

The Examiner issued a Notice of Allowance without ever asserting any claim rejections including under § 101. Absent an actual 101 rejection, the '349 Patent's prosecution cannot be considered to have addressed § 101. Any conclusion otherwise would be tantamount to rendering all patent prosecution as having considered every possible claim rejection prior to allowance and making any

subsequent post-grant challenge cumulative. Accordingly, Ground 1's 101 challenge is necessarily not cumulative to anything in the '349 Patent's prosecution.

(b) The Office's failure to assert a § 101 rejection was in error

Even if the Examiner's interview summary suggesting an amendment to overcome § 101 could be deemed the assertion of a 101 rejection, it was error not to assert a 101 rejection, even with the Examiner's Amendment.

The "displaying" limitation added by Examiner's Amendment cannot transform the claim into patent eligible subject matter. The Examiner's interview summary suggests that "adding a display" would overcome a 101 rejection, which implies that claims 1, 10 and 18 would have been invalid under § 101 absent "adding a display." In claim 1, for example, the Examiner added "displaying messages to provide directional and speed guidance to a pilot with the merged data set" and did not assert a 101 rejection. But this "displaying" limitation is a well-understood, routine, and conventional step constituting nothing more than insignificant extra-solution activity. See MPEP § 2106.05(g); *Elec. Power Group, LLC v. Alstom S.A.*, 830 F.3d 1350, 1355 (Fed. Cir. 2016) ("merely selecting information, by content or source, for collection, analysis, and display does nothing significant to differentiate a process from ordinary mental processes, whose implicit exclusion from § 101 undergirds the information-based category of abstract ideas.")

Moreover, a detailed 101 analysis of the claims in Section X.A herein demonstrates that, had the Examiner applied a proper evaluation under § 101, the claims would have been found invalid under § 101. That analysis show that the claim limitations, whether considered singly or in combination, do nothing more than claim the abstract idea of collecting, analyzing, and displaying information and only recite well-understood, routine, and conventional functions without requiring any nonconventional computer, sensor, or display components. *See Elec. Power Group, LLC v. Alstom S.A.*, 830 F.3d at 1353-55.

For all of these reasons, Petitioner's 101 challenge is not cumulative or redundant to any action in the '349 Patent's prosecution, and the Office's failure to reject the claims under § 101 was error.

2. § 102/103 challenges are not cumulative

The §§ 102/103 challenges cannot be cumulative to the '349 Patent's prosecution because no §§ 102/103 claim rejections were ever made. In addition, the prior art in the §§ 102/103 challenges was never considered or before the Office and provides teachings not present in the prior art addressed in the Reasons for Allowance.

(a) The Office never raised any § 102/103 rejections

Not only did the Examiner issue a Notice of Allowance without ever asserting any claim rejections including under § 102 or § 103, but none of the Examiner's

Amendment, Reasons for Allowance, and the interview summary indicates or suggests the Examiner even contemplated such a rejection. Accordingly, Petitioner's 10235 U.S.C. § 103 challenges are not cumulative to anything in the '349 Patent's prosecution.

(b) The prior art in the §§ 102/103 challenges was never before the Office and teaches limitations not present in the prior art addressed in the Reasons for Allowance or before the Office

Each of Petitioner's 102/103 challenges relies on U.S. Application No. 2022/0066025 ("Berkmo"), which was never before the Office during the '349 Patent's prosecution. Berkmo was never cited in an IDS and is not listed on the '349 Patent. U.S. Patent No. 5,675,661 ("Richman") applied in Ground 3 also was also never before the Office having never been cited in an IDS nor listed in the '349 Patent.

Berkmo provides teachings relevant to claims of the '349 Patent that are plainly absent in U.S. Application No. 2017/0178520 ("Papageorgiou", EX1006) cited in the Reasons for Allowance. Papageorgiou teaches having sensors ***mounted on the aircraft*** to detect ground hazards. EX1006, Fig. 1; ¶¶0013, 0020, 0022. Berkmo, in contrast to Papageorgiou, specifically teaches those sensors positioned in and around the ramp area to generate image and sensor data ***of the aircraft*** approaching the ramp area. EX1004, Figs. 1-3, 6; ¶¶0117-0119, 0123-0126, 0128-0132, 0134-0135, 0139-0144. This contrasting teaching of Berkmo is directly

relevant to claims 1, 10, and 11 of the '349 patent (e.g., “receiving camera image data *of* the aircraft” and “receiving ... LIDAR[/]RADAR ... sensor data *of* the aircraft” in claim 1).

Although Berkmo claims priority to EP3680689 (“EP’689”, EX1007), which was cited in the '394 Patent (EX1001, 3), Berkmo includes additional disclosures that are not present in EP’689 and are relevant to the claims of '349 Patent. In addition to Figs. 6-8B absent from EP’689, numerous portions of Berkmo are also absent from '349 Patent. See highlighted portions of EX1008 corresponding to portions present in Berkmo but absent from EP’689. Those additional disclosures include teachings relevant to merging sensor data (EX1004, ¶¶0023-0025, 0130) and detecting aircraft speed and direction (EX1004, ¶¶0080, 0136, claim 50) directly related to claim limitations in independent claims 1, 10, and 18 of the '349 Patent.

(c) The Office’s failure to assert a § 102 or § 103 rejection was in error

Had Berkmo been before the Office during the '349 Patent prosecution, claims of the '349 Patent would have been rejected based on Berkmo, and the failure to do so was error. The detailed 102/103 analyses addressed in Grounds 2 and 3 demonstrate that, had Berkmo been before the Office, the claims would have been found invalid under § 102 and/or § 103. Moreover, it was plainly error to identify Papageorgiou as the closest prior art in the Reasons for Allowance as even EP’689

provides more relevant teachings than Papageorgiou. *See, e.g.*, EX1007, Figs. 1-3; ¶¶0046-0064.

For all of these reasons, Petitioner's 102/103 challenges are not cumulative or redundant to any action in the '349 Patent's prosecution, and the Office's failure to reject the claims under §§ 102, 103 was error.

B. No parallel litigation.

Patent Owner has not asserted the '349 Patent against Petitioners nor any other party in any lawsuit. Since discretionary denial under § 314(a) is only considered when there is parallel litigation, the lack of parallel litigation makes § 314(a) denial inapplicable.

X. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

A. Ground #1: Claims 1-20 are invalid under 35 U.S.C § 101

Claims 1-20 of the '349 Patent are unpatentable as being directed to the abstract idea of receiving, merging, and displaying data. Moreover, the claims solely recite well-understood, routine, and conventional functions without requiring any nonconventional computer, sensor, or display components.

A claimed invention is patent-eligible only if it is a “new and useful process, machine, manufacture, or composition of matter.” 35 U.S.C. § 101. This provision, however, includes implicit exceptions: “[l]aws of nature, natural phenomena, and abstract ideas” are not patentable. *See Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208, 216 (2014). The Supreme Court adopted a two-step framework in *Mayo* and *Alice*

to determine whether a claim falls within an excluded category. *Id.* at 217-18 (citing *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 75-77 (2012)).

The first Alice step asks whether the claim at issue is “directed to” a patent-ineligible concept. *Id.* at 218. The Federal Circuit has described Alice Step One as “looking at the ‘focus’ of the claims,” which may be informed by “looking to the specification to understand ‘the problem facing the inventor.’” *ChargePoint, Inc. v. SemaConnect, Inc.*, 920 F.3d 759, 765-66 (Fed. Cir. 2019) (quoting *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353 (Fed. Cir. 2016)).

If the claim is directed to an abstract idea, the Alice Step Two requires an examination of the claim elements to determine whether they contain “an ‘inventive concept’ sufficient to ‘transform’ the claimed abstract idea into a patent-eligible application.” *Alice*, 573 U.S. at 221 (quotation marks omitted). At Step Two, “[s]imply appending conventional steps, specified at a high level of generality, [is] not enough to supply an inventive concept.” *Id.* at 222 (internal quotation marks omitted).

The Office’s current § 101 guidance (“*Guidance*”) is found in the Ninth Edition, Revision 10.2019 (revised June 2020) of the Manual of Patent Examination Procedure (MPEP), sections 2103 through 2106.07(c). *See* <https://www.uspto.gov/patent/laws-and-regulations/examination-policy/subject-matter-eligibility>. The MPEP includes both the 2019 Revised Patent Subject Matter

Eligibility Guidance (issued in January 2019) and the corresponding October 2019 Guidance Update. *See id.* For the Board’s convenience, the analysis below follows the framework set forth in the Guidance as outlined in the MPEP.² *See id.*

For the present § 101 analysis, claim 1 is representative of all three challenged independent claims (claims 1, 10, and 18) because these claims are directed to the same abstract idea—collecting image and sensor data, merging it, and displaying messages—and have substantially similar limitations. *See infra* Section X.A.5. The Board may evaluate a representative claim when other claims are “substantially similar and linked to the same abstract idea.” *Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat. Ass’n*, 776 F.3d 1343, 1348 (Fed. Cir. 2014).

² To the extent the Guidance conflicts with Supreme Court and Federal Circuit case law, the Board should follow the binding precedent issued by those Courts. *See In re Rudy*, 956 F.3d 1379, 1383 (Fed. Cir. 2020) (explaining that the Guidance “cannot modify or supplant the Supreme Court’s law regarding patent eligibility, or [the Federal Circuit’s] interpretation and application thereof”); MPEP 2106(I) (recognizing that “[t]he Alice/Mayo two-part test is the only test that should be used to evaluate the eligibility of claims under examination”).

1. Guidance Step 1: Statutory Category

In Step 1 of the Guidance, the Office looks to whether the claimed subject matter falls within the four statutory categories of patentable subject matter: process, machine, manufacture, or composition of matter. MPEP 2106.03(II). Claims 1-17 recite “a method” (i.e., a process) and claims 18-20 recite “a system” (i.e., a machine). EX1003, ¶76.

2. Guidance Step 2A, Prong 1: The '349 Patent claims recite the abstract idea of receiving data, merging it, and displaying messages with the merged data, a mental process that can be performed in the human mind.

Step 2A, Prong 1 of the Guidance asks “whether the claim recites a judicial exception, i.e., whether a law of nature, natural phenomenon, or abstract idea is **set forth** or **described** in the claim.” MPEP 2106.04(II.1) (emphasis in original). Representative claim 1 is a “method for tracking an aircraft” comprising steps of: (i) receiving camera image data of the aircraft; (ii) receiving LIDAR or RADAR sensor data of the aircraft; (iii) merging the image and sensor data; and (iv) displaying messages with the merged data. EX1001, claim 1. Here, claim 1 describes the abstract idea of receiving image and sensor data, merging it, and displaying messages with the merged data, and thus recites a mental process that can be performed in the human mind. Notably, claim 1 does not even recite any tools for performing the abstract idea. EX1003, ¶¶78-83.

As set forth below, receiving data, merging it, and displaying messages with the merged data is precisely the type of abstract idea that the Office and Federal Circuit have deemed ineligible at Alice Step One.

(a) Receiving image and sensor data, merging it, and displaying messages with the merged data is a mental process and, thus, an abstract idea under the Guidance.

Under the Guidance, the subject matter of a claim is considered abstract if it falls within one or more “enumerated groupings of abstract ideas.” *See* MPEP 2106.04(a). One of these groupings is “mental processes.” *Id.* Among the examples of mental processes is “collecting information, analyzing it, and displaying certain results of the collection and analysis,” which exactly parallels the receiving (“collecting”), merging (“analyzing”), and displaying steps of claim 1. *Id.*; EX1003, ¶¶78-83.

Accordingly, the subject matter of the ’349 Patent claims falls squarely into one of the enumerated groupings of abstract ideas in the Guidance, and thus recites a judicial exception.

(b) The Federal Circuit have has determined that receiving data, merging it, and displaying messages with the merged data is a mental process and, thus, an abstract idea.

The Federal Circuit has consistently held claims directed to mental processes involving collecting, analyzing, and displaying data to be abstract. The *Elec. Power*

Grp. decision is particularly enlightening and on point on this issue. In that decision, the claim at issue recited a method that included “receiving a plurality of data streams,” “detecting and analyzing events in real-time from the plurality of data streams,” “displaying the event analysis results,” “displaying concurrent visualization of measurements from the data streams,” and “deriving a composite indicator of reliability.” *Elec. Power Grp.*, 830 F.3d at 1351-52. Applying the first-stage inquiry of *Alice*, the Federal Circuit held that such a claim is directed to an abstract idea because its focus “is on collecting information, analyzing it, and displaying certain results of the collection and analysis.” *Id.* at 1353.

Multiple other Federal Circuit decisions fully support the conclusion that merely collecting, analyzing, and displaying information is an abstract idea, a mental process that can be performed in the human mind. For example, the Federal Circuit has treated collecting information, regardless of the type or when limiting to a particular type, as an abstract idea. *See, e.g., Trinity Info Media, LLC v. Covalent, Inc.*, 72 F.4th 1355, 1362 (Fed. Cir. 2023); *Internet Patents Corp. v. Active Network, Inc.*, 790 F.3d 1343, 1349 (Fed. Cir. 2015); *OIP Techs., Inc. v. Amazon. com, Inc.*, 788 F.3d 1359, 1363 (Fed. Cir. 2015); *Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat'l Ass'n*, 776 F.3d 1343, 1347 (Fed. Cir. 2014); *Digitech Image Techs., LLC v. Elecs. for Imaging, Inc.*, 758 F.3d 1344, 1351 (Fed. Cir. 2014); *CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1370 (Fed. Cir. 2011).

The Federal Circuit has likewise found that analyzing that collected information, without requiring more than mental steps or mathematical algorithms, as being a mental process and thus an abstract idea. *See, e.g., TLI Commc'ns LLC Patent Litig.*, 823 F.3d 607, 613 (Fed. Cir. 2016); *Trinity Info*, 72 F.4th at 1362; *Digitech*, 758 F.3d at 1351; *SmartGene, Inc. v. Advanced Biological Labs., SA*, 555 F. App'x 950, 955 (Fed. Cir. 2014); *Bancorp Servs., L.L.C. v. Sun Life Assurance Co. of Canada (U.S.)*, 687 F.3d 1266, 1278 (Fed. Cir. 2012); *CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1372 (Fed. Cir. 2011); *SiRF Tech., Inc. v. Int'l Trade Comm'n*, 601 F.3d 1319, 1333 (Fed. Cir. 2010); *see also Mayo*, 132 S. Ct. at 1301; *Parker v. Flook*, 437 U.S. 584, 589-90, 98 S. Ct. 2522, 57 L. Ed. 2d 451 (1978); *Gottschalk v. Benson*, 409 U.S. 63, 67, 93 S. Ct. 253, 34 L. Ed. 2d 273 (1972).

Similarly, merely displaying the results derived from collecting and analyzing information is just as abstract as the collection and analysis. *See, e.g., SAP Am. Inc. v. InvestPic, LLC*, 898 F.3d 1161, 1167 (Fed. Cir. 2018); *Content Extraction*, 776 F.3d at 1347; *Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 715 (Fed. Cir. 2014); *Trinity Info*, 72 F.4th at 1362.

The '349 Patent's claims are directed to the same type of mental process—collecting, analyzing, and displaying information—consistently and

overwhelmingly found to be abstract by the courts, confirming that the claims recite a judicial exception under Guidance Step 2, Prong 1.

3. Under Guidance Step 2A, Prong 2: The '349 Patent claims do not integrate the abstract idea into a practical application.

Where the claims recite a judicial exception, as here, the Guidance asks “whether the claim as a whole integrates the recited judicial exception into a practical application of the exception.” MPEP 2106.04(d). This inquiry focuses on any “additional elements” beyond the judicial exception and determines whether these elements individually or in combination integrate the exception into a practical application—for example, by reflecting an “improvement in the functioning of a computer, or an improvement to other technology or technical field.” MPEP 2106.04(d)(I). It is not enough to “merely use[] a computer as a tool to perform an abstract idea,” or “link the use of the judicial exception to a particular technological environment.” MPEP 2106.04(d)(I), 2106.05(h); *see also Elec. Power Grp.*, 830 F.3d at 1354.

Step 2A of the Guidance is intended to reflect Step 1 of the *Alice/Mayo* test, i.e., whether a claim is “directed to” an abstract idea.³ See MPEP 2106.04(II.A). Analyzing whether claims are “directed to” an abstract idea requires looking to the claim language and the specification to determine whether the “focus” of the claim, as a whole, is the abstract idea. *ChargePoint*, 920 F.3d at 765. This includes understanding “the problem facing the inventor” and “what the patent describes as the invention.” *Id.* at 767-68.

Here, the claims are “directed to” the abstract idea of receiving, merging, and displaying data, and they do not integrate the idea into a practical application. It is not enough to “merely include[] instructions to implement an abstract idea on a computer,” “merely use[] a computer as a tool to perform an abstract idea,” or “add[] insignificant extra-solution activity to the judicial exception.” MPEP 2106.04(d)(I). As shown below, no “additional elements” recited in the challenged claims improve the functioning of the technology involved, but instead merely use well-understood, routine, and conventional components to address perceived inefficiencies in aircraft

³ Where Step 2A of the Guidance may be viewed as inconsistent with *Alice/Mayo* Step 1, as applied by the Federal Circuit, the case law governs. See *In re Rudy*, 956 F.3d at 1383.

turnaround times and aircraft detection under varying conditions. EX1003, ¶¶42-67, 78-83.

(a) The claims do not aim to improve the functioning of a computer or other technology.

The claims do not seek to improve any computer functionalities or resolve a technological problem, but at best “require generic computer components or require operations that a human could not perform as quickly as a computer.” *See Trinity Info*, 72 F.4th 1363-64. The specification’s explanation of the problem the inventors were trying to solve confirms this. *See ChargePoint*, 920 F.3d at 767.

For example, to manage increased airport demand and capacity, the ’349 Patent asserts that embodiments “improv[e] ground operations to reduce aircraft turnaround time. The embodiments also can potentially optimize the amount of the time required for the aircraft to be to complete the turnaround process.” EX1001, 2:61-3:3. Other purported benefits of the disclosed embodiments include “the safety of the aircraft and ground operators during the ramp operations from docking to pushback,” “early detection of aircraft via the docking system's long range capabilities to meet ripple taxiway lines,” “precise and/or accurate docking so that there is no significant time taken for connecting a ramp or the need for tow vehicles to adjust the docking,” “obstacle detection prior to docking,” and “pre-positioning of the ramp area equipment before the docking to reduce turnaround times,” as well as “aircraft detection at all times during the day and night, in all weather conditions,

in all lighting conditions, and for all aircraft types and subtypes with all colors, unlike prior systems.” *Id.*, 3:4-18. Using cameras with laser or radar sensors, “**data** from multiple systems **are collected and merged** via a data fusion process described herein which provides a rich data set to track and provide guidance to the aircraft, from entry into the ramp area to docking.” *Id.*, 3:25-28.

Thus, the ’349 Patent does not purport to address any sort of “technological problem.” See MPEP 2106.05(a). Rather, at best, it seeks to improve what data to collect and combining it without any technological improvement. In the case of the challenged claims of the ’349 Patent, none of the purported advantages described above result in any improvement to the operation of a camera, laser sensor, or radar sensor nor any improvement to the operation of a computing device or memory. EX1003, ¶¶42-67, 78-83.

Whether or not such improvements or benefits are actually provided by any embodiments, there are no “additional elements” recited in the claims that go beyond the judicial exception to integrate it into a practical application. *Elec. Power Grp.*, 830 F.3d at 1354 (“the focus of the claims is not on [] an improvement in computers as tools, but on certain independently abstract ideas that use computers as tools.”) In fact, other than claim 18 and claims 19-20 depending therefrom, none of the challenged claims even recite any “additional elements” but merely recite steps for collecting, combining, analyzing, and displaying data. Moreover, the additional

elements recited in claim 18 (camera image sensor, LIDAR sensor, RADAR sensor, computing device, memory) are simply tools for performing the abstract idea and directly reflect the functions of method claim 1. Nothing in the claims nor in the specification discloses or suggests an improvement to these tools. EX1003, ¶¶42-67, 78-83.

The challenged claims are also unlike those in *Enfish, LLC v. Microsoft Corp.* because they do not recite a “specific asserted improvement in computer capabilities” related to aircraft tracking. See 822 F.3d 1327, 1335-36 (Fed. Cir. 2016). The specification is silent as to any known problem with LIDAR, radar, or camera capabilities. The claims simply use the data produced by these sensors rather than improve their capabilities. As such, “the focus of the claimed advance over the prior art”—collecting and merging data from multiple sensors and displaying messages with the merged data—reveals that the claims’ “character as a whole” is directed to excluded subject matter. See *Affinity Labs of Texas, LLC v. DIRECTV, LLC*, 838 F.3d 1253, 1257-58 (Fed. Cir. 2016).

(b) The claims employ standard components to implement an abstract idea.

The performance of the claimed steps by conventional and off-the-shelf electronic components further confirms that the abstract idea of collecting sensor data, merging it, and displaying messages with the merged data is the “focus” of the claims. EX1003, ¶¶42-67, 78-83.

Although most of the claims do not positively recite any hardware elements, the hardware elements that are recited in the challenged claims are described by the '349 Patent as either commercially-available, conventional, or well-known to a POSITA. For example, the “computing device” (see claims 2 and 16-20 of the '349 Patent) is described as “a typical computing device that can be used as the airport computing system.” EX1001, 10:50-51. The '349 Patent describes the “memory” (see claims 2 and 18 of the '349 Patent) as simply a location in which to store data and instructions. *See, e.g., id.*, 10:56-62; 11:14-24; 11:32-50. The '349 Patent also fails to identify or describe the “camera image sensor” or the “LIDAR or RADAR sensor” (see claim 18 of the '349 Patent)⁴ as being anything other than conventional versions of the sensors. *See, e.g., id.*, 1:57-64 (“conventional laser/LIDAR systems);

⁴ All references to “camera” and “LIDAR/RADAR” other than claim 18 recite “camera image data” or “LIDAR/RADAR sensor data,” respectively. In other words, every claim but claim 18 positively recites the **data**, not the camera or LIDAR/RADAR. That the claims focus on the data, as opposed to any technical improvement to the operation of a hardware element, is consistent with the focus of the '349 Patent of collecting data, merging it, and displaying messages with the merged data.

6:9-45 (describing standard components and functionality for a LIDAR/Radar system and camera image system).

In all of these hardware elements, the specific type used is unimportant. EX1003, ¶¶42-67, 78-83. All functionality for the computing device, memory, camera image sensor, and LIDAR/RADAR sensor as recited in the claims or described in the '394 Patent can be performed by conventional, commercial off-the-shelf versions of each. *Id.* In other words, the challenged claims rely solely upon pre-existing hardware tools to perform the abstract idea of collecting sensor data, merging it, and displaying messages with the merged data. *Id.* The specification does not suggest that existing devices or software used are “improved from a technical perspective, or that [they] would operate differently than [they] otherwise could.” *See ChargePoint*, 920 F.3d at 768. The Federal Circuit has consistently held that “using off-the-shelf technology for its intended purpose” is “not enough to save the claims from abstractness.” *Chamberlain Grp. v. Techtronic Indus. Co.*, 935 F.3d 1341, 1348 (Fed. Cir. 2019); *Customedia Techs., LLC v. Dish Network Corp.*, 951 F.3d 1359, 1364 (Fed. Cir. 2020) (“[I]t is not enough ... to merely improve a fundamental practice or abstract process by invoking a computer merely as a tool.”).

In short, the challenged claims of the '349 Patent focus on collecting sensor data, merging it, and displaying messages with the merged data, rather than solving a technological problem, and do so using conventional, off-the-shelf tools

functioning as expected. The claims therefore are “directed to” the abstract idea of collecting sensor data, merging it, and displaying messages with the merged data.

4. Guidance Step 2B: The ’349 Patent claims do not provide an “inventive concept.”

Where, as here, the claims recite an abstract idea, the Guidance asks whether the additional elements or combination of elements “simply append[] well-understood, routine, conventional activities previously known to the industry, specified at a high level of generality, to the judicial exception.” MPEP 2106.05(I)(A). If so, “the claims at issue amount to ‘nothing significantly more’ than an instruction to apply the abstract idea.” *Alice*, 573 U.S. at 225-26. Indeed, even “adding novel or non-routine components is not necessarily enough to survive a § 101 challenge.” *See ChargePoint*, 920 F.3d at 773. “Instead, the inventive concept must be ‘sufficient to ensure that the patent in practice amounts to significantly more’ than a patent on the abstract idea.” *Id.* (quoting *Mayo*, 566 U.S. at 72-73).

By 2020, the functions recited in the challenged claims were already well-known and conventional in aircraft tracking systems. In particular, it was already well-known in aircraft tracking to use sensor data from multiple sensor types, combine that data together, and determine and display guidance messages based on the combined data. EX1003, ¶¶42-67, 83. There is nothing “inventive” about relying upon industry-standard technology.

(a) The additional claim elements simply append well-understood, routine, and conventional aircraft tracking activities to the abstract idea.

As illustrated above in Section X.A.3.(b), the hardware elements recited in the challenged claims are unimproved, “off-the-shelf” tools. See EX1003, ¶¶42-67, 78-87. The camera sensor, LIDAR sensor, and RADAR sensor may be implemented with any commercially available version of any of those sensors, and neither the claims nor the specification provide any limitation on the type of sensors. *Id.* Similarly, the computing device can be any “typical” computing device having a processor and memory. EX1001, 10:47-60; EX1003, ¶87. The ’349 Patent does not claim any improvements or modifications to these conventional components, and thus the claims do not add anything inventive to the abstract idea. See *Alice*, 573 U.S. at 224-26. Moreover, the functionality recited in connection with these hardware elements is likewise conventional in aircraft tracking systems, and thus does not add “significantly more” to the abstract concept to render it patent eligible. *Id.*; EX1003, ¶¶42-67, 87.

Elements [1.1, 1.2]: “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;”

Elements [1.1, 1.2] of representative claim 1 merely recite the well-known steps of receiving (i.e., collecting) data from multiple different sensors. EX1003,

¶88. “[T]he use of a computer to obtain data” is a “well-understood, routine, conventional activit[y] previously known to the industry.” *Alice*, 573 U.S. at 225 (quoting *Mayo*, 566 U.S. at 73). These limitations merely reflect the *content* of the data being captured and transmitted. “Information as such is an intangible.” *Cf. Elec. Power Grp.*, 830 F.3d at 1353 (noting that limiting information to “particular content” “does not change its character as information”). It therefore cannot provide an inventive concept. *See C R Bard Inc. v. AngioDynamics, Inc.*, 979 F.3d 1372, 1383 (Fed. Cir. 2020) (“[T]he mere conveyance of information that does not improve the functioning of the claimed technology is not patent-eligible subject matter under § 101.”). And regardless, by 2020, collecting data from multiple sensors for tracking and guiding aircraft to a gate was routine. EX1003, ¶42-67, 88. Accordingly, elements [1.1, 1.2] fail to supply an inventive concept.

Element [1.3]: “merging the camera image data and the LIDAR/RADAR-sensor data into a merged data set; and”

Element [1.3] of representative claim 1 recites merging the camera image data and sensor data into a merged data set. But there is no limitation at all on how they are merged, no limitation on the structure of the merged data, and no limitation on how the data is stored or accessed. EX1003, ¶89. Rather, like in *Elec. Power Grp.*, the “claims in this case do not even require a new source or type of information, or new techniques for analyzing it.” 830 F.3d at 1355. Similarly, “they do not require an arguably inventive set of components or methods, such as measurement devices

or techniques, that would generate new data. They do not invoke any assertedly inventive programming.” *Id.* “Merely requiring the selection and manipulation of information—to provide a ‘humanly comprehensible’ amount of information useful for users” does not transform an abstract process of information collection and analysis, like in element [1.3], into an inventive concept. *Id.*

Element [1.4]: “*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*”

Element [1.4] of representative claim 1 recites the type of data included in the merged data. In other words, this limitation is to the data itself. But “[c]laim limitations directed to the ***content of information*** and lacking a requisite functional relationship are not entitled to patentable weight because such information is not patent eligible subject matter under 35 U.S.C. § 101.” *Praxair Distribution, Inc. v. Mallinckrodt Hosp. Prod. IP Ltd.*, 890 F.3d 1024, 1032 (Fed. Cir. 2018). Moreover, “merely selecting information, by content or source, for collection, analysis, and display does nothing significant to differentiate a process from ordinary mental processes, whose implicit exclusion from § 101 undergirds the information-based category of abstract ideas.” *Elec. Power Grp.*, 830 F.3d. at 1355. Accordingly, Element [1.4] cannot be an inventive concept.

Element [1.5]: “displaying messages to provide directional and speed guidance to a pilot with the merged data set.”

Element [1.5] of representative claim 1 recites displaying messages to provide guidance with the merged data set. Again, displaying information does nothing to differentiate Element [1.5] from an ordinary mental process and fails to transform this limitation into an inventive concept. See *Elec. Power Grp.*, 830 F.3d at 1355. Neither the '349 Patent nor its claims contain any suggestion that the displays needed for displaying messages in Element [1.5] are anything but readily available, and without even being arguably inventive are “insufficient to pass the test of an inventive concept in the application” of an abstract idea. *buySAFE, Inc. v. Google, Inc.*, 765 F.3d 1350, 1353, 1355 (Fed. Cir. 2014); see, e.g., *Mortg. Grader, Inc. v. First Choice Loan Servs. Inc.*, 811 F.3d 1314, 1324-25 (Fed. Cir. 2016); *Elec. Power Grp.*, 830 F.3d at 1355.

The functions performed in representative claim 1 were well-known, routine, and conventional functions for performing aircraft tracking and guidance to a gate by 2020, and, therefore, fail to provide an inventive concept sufficient to ensure that patent amounts to significantly more than a patent on the abstract idea of collecting data, merging data, and displaying messages with the merged data. EX1003, ¶¶42-67, 92.

(b) The ordered combination of elements does not add “significantly more” to the abstract idea of presenting and settling an invoice.

The ordered combination of these conventional functions for performing aircraft tracking and guidance to a gate is likewise conventional and does not add an inventive concept. In particular, the ordering of claim 1 is dictated entirely by the underlying abstract idea: collecting the data, merging it, and then displaying messages with the merged data. The sequence of the steps simply reflects the ordinary course of using sensor data to track and guide an aircraft to a gate. EX1003, ¶94. The claimed ordering therefore cannot supply an inventive concept. *See ChargePoint*, 920 F.3d at 774 (holding that “the abstract idea itself ... cannot supply the inventive concept at step two”); *BSG Tech LLC v. Buyseasons, Inc.*, 899 F.3d 1281, 1290 (Fed. Cir. 2018). Accordingly, because claim 1 does not supply an inventive concept sufficient to save the claim from abstraction, claim 1 is unpatentable under § 101.

5. Independent claims 10 and 18 are substantially similar to representative claim 1 and are thus patent ineligible.

Independent claims 10 and 18 are substantially similar to representative claim 1 and are directed to the same abstract idea. EX1003, ¶96. Claim 10 recites the same steps as claim 1 and adds steps of “determining a portion of the camera image data associated with the aircraft” and “determining a portion of the LIDAR/RADAR sensor data associated with the aircraft.” But this functionality is part of the same

basic process recited in claim 1. EX1003, ¶96. Claim 18 recites the exact same functionality as claim 1 while adding conventional, well-known elements for performing that functionality, i.e., camera image sensor, LIDAR sensor, RADAR, sensor, computing device, and memory. Since these hardware elements well-understood, routine, and conventional, they do nothing to transform claim 18 into an inventive concept. Because independent claims 1, 10, and 18 in the '349 Patent “contain only minor differences in terminology but require performance of the same basic process, . . . they should rise or fall together” under §101. *Smart Systems Innovations, LLC v. Chi. Transit Auth.*, 873 F.3d 1364, 1368 n.7 (Fed. Cir. 2017).

6. The dependent claims of the '349 Patent are directed to the same abstract idea and add only trivial and conventional elements

The dependent claims of the '349 Patent are directed to the same abstract idea as independent claims 1, 10, and 18 without anything meaningful to transform the abstract idea into an inventive concept.

(a) Claims 2-3, 5-7, 11-12, 20

Claims 2-3, 5-7, 11-12, and 20 all recite steps for comparing or analyzing data to identify aircraft type or presence. These claims all involve nothing more than mental processes and do not add any hardware elements. Rather, these claims simply “select[] information, by content or source, for collection, analysis, and display” and

thus do nothing to differentiate the claims from ordinary mental processes that are excluded under § 101. *Elec. Power Grp.*, 830 F.3d. at 1355.

(b) Claim 4

Claim 4 recites that the LIDAR/RADAR sensor scans the aircraft in at least a horizontal or vertical direction. That the LIDAR/RADAR sensor scans an object in this manner is entirely well-known, routine, and conventional. EX1003, ¶¶42-67, 100.

(c) Claims 8-9

Claims 8 and 9 recite that the proximity data includes proximity of a certain type. But “[c]laim limitations directed to the ***content of information*** and lacking a requisite functional relationship are not entitled to patentable weight because such information is not patent eligible subject matter under 35 U.S.C. § 101.” *Praxair*, 890 F.3d at 1032.

(d) Claims 13-17

Claims 13-17 simply require sending information to a device. There is no limitation to the manner of sending nor any hardware elements to perform sending. Sending information to a device is entirely well-known, routine, and conventional. EX1003, ¶¶42-67, 102.

(e) Claim 19

Claim 19 recites analyzing sensor data using a point cloud process. A point cloud process is entirely well-known, routine, and conventional. EX1003, ¶¶42-67, 103.

In sum, the dependent claims of the '349 Patent are directed to the same abstract idea as independent claims 1, 10, 18, and add only trivial and conventional elements that are insufficient to transform the abstract idea into an inventive concept.

B. Ground #2: Claims 1, 6-10, and 13-20 Are Invalid as Anticipated by and/or Obvious Over Berkmo

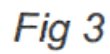
Berkmo teaches every limitation of claims 1, 6-10, and 13-20, either expressly or inherently, and thus anticipates those claims under 35 U.S.C. § 102. To the extent any limitations of claims 1, 6-10, and 13-20 are not expressly or inherently taught by Berkmo, Berkmo renders such limitations obvious such that claims 1, 6-10, and 13-20 are obvious under 35 U.S.C. § 103.

1. Summary of Berkmo

U.S. Published Application No. 2022/0066025 to Berkmo was filed as U.S. Application No. 17/420,147 on July 1, 2021, and claims priority to PCT/EP2020/050407 filed on January 9, 2020, which is prior to the August 3, 2020, filing date of the '349 Patent. Berkmo is therefore prior art to the '349 Patent under 35 U.S.C. § 102(a)(2).

Like the '349 Patent, Berkmo discloses an airport stand (i.e., ramp) arrangement configured to aid a pilot to maneuver an aircraft to a stand parking

position. EX1004, Abstract; ¶0001. More specifically, Berkmo teaches an airport stand arrangement 300 includes a combined system 310 employing a radar system 110R, a laser system 110L, and an imaging system 110C having a camera, each one having respective coverage areas 312R, 312L, and 312C, as shown in annotated Fig. 3 below. *Id.*, ¶¶0116-0119, 0131-0132. The imaging system 110C (in blue), radar system 110R (in green), and laser system 110L (in red) are arranged at different positions to detect an approaching aircraft 10 using different collection angles. *Id.*, ¶0132. This use of three sensor systems at three different locations and viewing angles provides multiple advantages including the ability to detect the full aircraft instead of just a portion and mitigating the impact of obstructions such as a passenger ramp or luggage truck in the way of a sensor. EX1003, ¶107.



Airport stand arrangement 300 detects and tracks an approaching aircraft 10 based on the combined output data of the combined system 310. EX1001, ¶¶0129-0130, 0134. Airport stand arrangement 300 is also configured to detect and track other objects within stand area 20, such as dolly 11 and truck 12, in parallel with the detection and tracking of aircraft 10 based on the combined output data. *Id.*, ¶¶0132-0134.

To combine or merge the output data, Berkmo discloses determining a spatially resolved weighted average of the combined output data, such as based on statistical weights for each system of combined system 310. *Id.*, ¶¶0022-0025, 0129-0130. The weighted average can be a matrix of average data values, where each average data value corresponds to a specific spatial location on the stand area and is calculated as a sum of weighted data values corresponding to the same spatial location. *Id.*, ¶¶0025, 0130.

The combined data from the combined system includes data for determining position, orientation, speed, and direction of the aircraft 10. *Id.*, ¶¶0126, 0136. The combined data also includes data for determining proximity of aircraft 10 to objects (e.g., dolly 11, truck 12) in stand area 20. *Id.*, ¶¶0134-0135. Although Berkmo does not expressly disclose forming a 3D model of aircraft 10, at least the laser-based system 110L necessarily and inherently produces data sufficient to form a 3D mode of aircraft 10. EX1003, ¶110.⁵

⁵ Berkmo does disclose “controller 120 may also perform a data analysis of the received output data to determine the dimensions of the aircraft 10.” EX1004, ¶0126. A POSITA would understand that determining dimensions of aircraft 10 corresponds to 3D information of aircraft 10. EX1003, ¶110.

Based on the detection and tracking of aircraft 10 and other objects in stand area 20, Berkmo discloses providing maneuvering guidance information for aiding the pilot to maneuver aircraft 10 to a parking position 160. EX1004, ¶0127. A control unit 120 determines the pilot maneuvering guidance information by analyzing the combined data from the combined system. *Id.* The pilot maneuvering guidance information can be displayed on display 130 of airport stand arrangement 100 or wirelessly transmitted to aircraft 10 to view on a cockpit display. *Id.*, ¶¶0120, 0128.

2. Claim 1

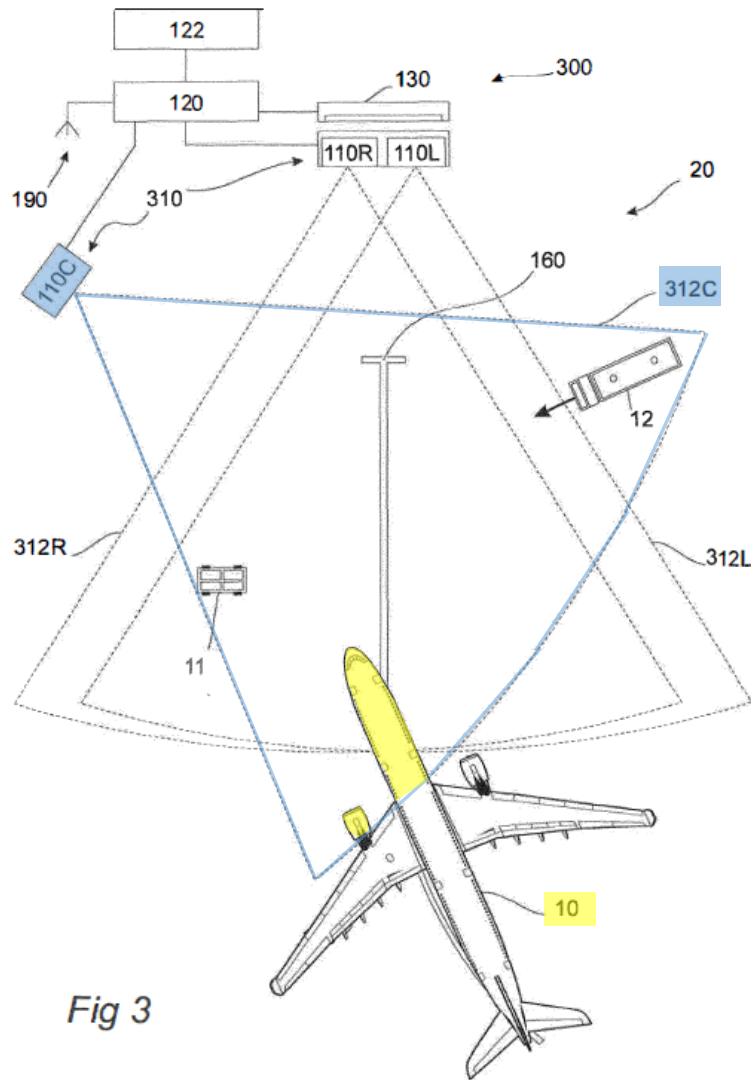
(a) “A method for tracking an aircraft, comprising:”

To the extent the preamble is limiting on claim 1, the preamble is taught by Berkmo. EX1003, 112. Berkmo teaches “an airport stand arrangement (100) is configured, based on output data from said combined system (110), to ***detect and track*** (S108,S110) ***an aircraft*** (10) within a stand area (20) when said aircraft (10) is approaching a stand within the stand area (20). EX1004, Abstract; *see also* Figs. 1-3, ¶¶0125-0126, 0129, 0143; EX1003, ¶112.

(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;”

This limitation is met by Berkmo’s imaging system 110C. EX1003, ¶113. Berkmo discloses imaging system 110C includes “a camera sensitive to optical or

infrared radiation” that “provides output data pertaining to an imaging system coverage 112C at the stand area 20.” EX1004, Figs. 2-3, ¶0131.



As shown in Fig. 3, imaging system 110C produces image data of the aircraft 10 while the aircraft 10 is approaching stand area 20 (i.e., a ramp area) for parking aircraft 10 at parking position 160, as shown by portion of aircraft 10 (highlighted in yellow) inside imaging system coverage 312C (outlined in blue). *Id.*, ¶¶0131, 0132, 0140; EX1003, ¶¶113, 114.

- (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;”**

This limitation is met by Berkmo’s laser system 110L and/or radar system 110R. EX1003, ¶115. Berkmo discloses laser system 110L “emit[s] continuous or pulsed laser radiation towards a target,” “capture[s] and detect[s] laser radiation backscattered from the target,” and “provides output data pertaining to a laser-based system coverage 112L at the stand area 20.” EX1004, Figs. 1, 3, ¶0118. A POSITA would understand that since laser system 110L emits pulsed laser radiation towards a target and captures and detects backscattered laser radiation, laser system 110L is a LIDAR sensor. EX1003, ¶115. Radar system 110R “emit[s] continuous or pulsed radar signals towards a target, “capture[s] and detect[s] radar pulses backscattered from the target,” and “provides output data pertaining to a radar-based system coverage 112R at the stand area 20.” EX1004, Figs. 1-3, ¶0117.



As shown in Fig. 3, both laser system 110L and radar system 110 produce sensor data of the aircraft 10 while the aircraft 10 is approaching stand area 20 (i.e., a ramp area) for parking aircraft 10 at parking position 160, as shown by the portion of aircraft 10 (highlighted in yellow) inside laser system coverage 312L (outlined in red) and radar system coverage 312R (outlined in green). *Id.*, ¶¶0131, 0132, 0140; EX1003, ¶115, 116.

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

Berkmo teaches merging the camera image data of imaging system 110C and the sensor data of laser system 110L and radar system 110R into combined output data (i.e., a merged data set). EX1003, ¶117. Berkmo discloses detecting and tracking aircraft 10 “based on **combined output data** from said radar-based system 110R, on the one hand, and from the one or more additional systems” such as imaging system 110C and laser system 110L. EX1004, ¶0129; *see also* ¶¶0126-0127, 0130, 0134, 0137-0139.

Berkmo also discloses the combined output can be combined or merged by determining a spatially resolved weighted average of the combined output data, such as based on statistical weights for each of imaging system 110C, laser system 110L and radar system 110R. *Id.*, ¶¶0022-0025, 0129-0130. The weighted average can be a matrix of average data values, where each average data value corresponds to a specific spatial location on the stand area and is calculated as a sum of weighted data values corresponding to the same spatial location. *Id.*, ¶¶0025, 0130; EX1003, ¶¶117, 118.

- (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,”**

Berkmo teaches the combined output data (i.e., the merged data set) includes data for determining position and orientation of aircraft 10 relative to the position and orientation of stand area 20 (i.e., the ramp area). EX1003, ¶119. As airport stand arrangement detects and tracks aircraft 10 approaching stand area 20 to park at parking position 160, a controller 120 receives the combined output data and “performs a data analysis of it so as to determine tracking data of the aircraft 10,” where the “tracking data include[es] the ***position of the aircraft 10***, the velocity of the aircraft 10 etc.” EX1004, ¶0126; *see also* ¶0025 (“[t]he weighted average of ***the combined output data may be used to determine*** spatially resolved information pertaining to ***the position of the approaching aircraft.***”), ¶0082, 0089; EX1003, ¶119.

Berkmo also teaches that the combined output data includes data for *determining* the orientation of aircraft 10 relative to stand area 20. EX1003, ¶120. Berkmo’s airport stand arrangement uses a combination of imaging system 110C, laser system 110L and radar system 110R to detect and track aircraft 10 and collectively provide combined output data regarding position, speed, and direction of aircraft 10 relative to stand area 20 and parking position 160. EX1004, ¶¶0025, 0080, 0082, 0089, 0126, 0136. This combined output data used to track aircraft 10

inherently includes *data for determining orientation* of aircraft 10. EX1003, ¶120.

Given the type of data produced by imaging system 110C, laser system 110L and radar system 110R, and that their combined output data includes data for determining position, speed, and direction, that combined output data is necessarily sufficient to **determine** the orientation of aircraft 10. *Id.* In other words, if the combined output data from these systems is sufficient to determine aircraft position, speed, and direction, then that same combined output data must also be sufficient to determine aircraft orientation. *Id.*

To the extent that Berkmo alone does not necessarily and inherently teach that the combined output data includes data for *determining* aircraft orientation, it would have been obvious to a POSITA. The traditional definition of tracking is the “estimation of the state of a moving object based on remote measurements. This is done using one or more sensors at fixed locations or on moving platforms.” EX1030, 23. The state of an object is a vector or variables that are used to fully define the time evolution of the dynamic system, such as aircraft 10 taxiing to stand area 20. EX1003, ¶121. Traditional radar tracking typically included position and velocity information in three dimensions, and with the advent of 3D sensors (e.g., laser, stereo cameras, etc.), the “state” of a tracker in some applications, such as self-driving cars and taxiing aircraft, has evolved to include the (2D or 3D) position, orientation, velocity, and direction of the object over time (as well as the 3D shape for collision

prediction). *See* EX1031, 1, 4-5, 7, 9, 11, 16-17; EX1019, 2-4, 7-11 (using this formulation for tracking cars, equally applicable to taxiing aircrafts); EX1003, ¶121.

With respect to Berkmo, it would have been obvious to apply a Kalman filter to the output data from imaging system 110C, laser system 110L and radar system 110R, whether individually or combined, to determine aircraft orientation. EX1003, ¶122. The use of a Kalman filter to determine orientation from the output data of a camera, lidar, or radar is well within the skill of a POSITA. *Id.* Berkmo also explicitly teaches the use of a Kalman filter on the combined output data over time. *See* EX1004, ¶0135.

A POSITA also would have been motivated to determine aircraft orientation from the combined output data. EX1003, ¶123. A general, unassailable proposition for a POSITA is more measurements is always better. Having orientation data, in addition to position, speed, and direction, provides greater accuracy and better information. *Id.* For example, position data alone may create uncertainty, but combining with orientation provides greater accuracy to make determinations, particularly in the context of collision avoidance. *Id.* A POSITA would also have been motivated to determine orientation from the combined output data for the purposes of collision avoidance, which Berkmo expressly teaches for aircraft 10 and objects 11, 12 in stand area 20. *Id.*; EX1004, ¶¶0134-0136. A POSITA would have understood that orientation is needed to predict future movement of objects and thus

potential collisions, and thereby provide pilot maneuvering guidance information to avoid a collision. EX1003, ¶123.

(f) “data for determining speed of the aircraft,”

Berkmo teaches the combined output data (i.e., the merged data set) includes data for determining speed of aircraft 10. EX1003, ¶124. Berkmo’s airport stand arrangement determines if other objects 11,12 are predicted to leave the stand area 20 before aircraft 10 arrives “based on at least a speed and direction of each of said other objects 11,12 and *a speed and direction of the approaching aircraft 10.*” EX1004, ¶0136, 0080, claim 50. In addition, controller 120 performs a data analysis of the combined output data “to determine tracking data of the aircraft 10, said tracking data including the position of the aircraft 10 [and] *the velocity of the aircraft 10.*” EX1004, ¶0126; EX1003, ¶124.

(g) “data for determining direction of the aircraft,”

Berkmo teaches the combined output data (i.e., the merged data set) includes data for determining direction of aircraft 10. EX1003, ¶125. Berkmo’s airport stand arrangement determines if other objects 11,12 are predicted to leave the stand area 20 before aircraft 10 arrives “based on at least a speed and direction of each of said other objects 11,12 and a speed and *direction of the approaching aircraft 10.*” EX1004, ¶0136, 0080, claim 50. In addition, controller 120 performs a data analysis of the combined output data “to determine tracking data of the aircraft 10, said

tracking data including the position of the aircraft 10 [and] ***the velocity of the aircraft 10.***” EX1004, ¶0126; EX1003, ¶125 (velocity is a vector that includes both the speed and direction of an object).

(h) “data for determining proximity of the aircraft to a particular object within the ramp area, and”

Berkmo teaches the combined output data (i.e., the merged data set) includes data for determining proximity of aircraft 10 to a particular object (e.g., objects 11, 12) in stand area 20. EX1003, ¶126. Berkmo’s airport stand arrangement detects and tracks other objects 11,12 within the stand area 20 in parallel with the detection and tracking of aircraft 10 during the maneuvering of aircraft 10 towards parking position 160 based on the combined output data. EX1004, ¶0134.

This detection and tracking provides the basis for collision avoidance:

“The arrangement 300 is further configured to predict if the approaching aircraft 10 is on a collision course with any of said other objects 11,12, and, in response to a collision course being predicted, to provide further pilot maneuvering guidance information instructing the pilot to stop the aircraft 10. The prediction may be achieved using tools readily available to the skilled person. For example, the evaluation may be performed based on the use of a Kalman filter acting as a time filter to combine measurements (observations) and a model of the dynamics of the detected obstacles. The Kalman filter may

be used to combine a set of measurements over time to create the most likely positions or trajectories of the obstacles.”

Id., ¶0135; *see also* ¶0136. By using position and trajectories of aircraft 10 and objects 11, 12 to predict collisions and thereby provide pilot maneuvering guidance information, Berkmo necessarily determines the proximity of aircraft 10 to objects 11, 12. EX1003, ¶¶127, 128. Put differently, without data for determining their proximity, it is not possible provide pilot maneuvering guidance information to enable aircraft 10 to avoid colliding with objects 11, 12.

Id.

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

This limitation requires that combined output data includes *data for forming* a 3D virtual model, not that the combined output actually forms the 3D virtual model. 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 of at least an aircraft portion. EX1003, ¶129.

To form a 3D model of an object from sensor data (such as lidar or stereo cameras), multiple sensor measurements of the object are collected in which measurement can vary based on sensor location or over time. EX1016, 2, 6, 10, 12. The spatial data from the sensors can be fused into a 3D model of the object by

transforming the data into a common reference frame using the sensor pose (position and orientation). *Id.*

Berkmo teaches each of the key components for forming a 3D model from sensor data. EX1003, ¶131. One or more sensors (110C, 110R, 110L) are used to detect and track aircraft 10, and each sensor can have the same location (Figs. 1-2) or different locations (Figs. 3, 6) with a wider field of view to take measurements of aircraft 10 and stand area 20. EX1004, ¶¶0037, 0129-0130, 0132-0134, 0143. Berkmo also teaches that “[t]he airport stand arrangement is configured to detect and track the approaching aircraft based on a spatially resolved weighted average of the combined output data.” *Id.*, ¶0130. Given the spatially-distributed measured data produced by Berkmo’s sensors, Berkmo further teaches that “an algorithm may run ... to determine corresponding spatial regions of the output data (e.g., pixel-to-pixel matching)” (*id.*, ¶0129), which is the same process as described in Aldoma where data from multiple sensors is combined into a 3D model using the sensor pose information. EX1016, 2, 6-7; EX1003, ¶131.

Berkmo therefore teaches combined output data from imaging system 110C, laser system 110L and radar system 110R includes data sufficient to form a 3D virtual model of at least an aircraft portion. *Id.*, ¶¶129-132.

(j) **“displaying messages to provide directional and speed guidance to a pilot with the merged data set.”**

Berkmo teaches displaying messages to provide directional and speed guidance to a pilot with the combined output data. EX1003, ¶133. Berkmo’s airport stand arrangement includes **“a display 130 for providing pilot maneuvering guidance information to a pilot** of the approaching aircraft 10” that is “mounted on the wall of the terminal building ... in clear view of the pilot of the approaching aircraft 10.” EX1004, ¶ [0120]. To “aid[] the pilot of the approaching aircraft 10 in maneuvering the aircraft 10 towards the parking position 160 ... [t]he pilot maneuvering guidance information is determined by the control unit 120 by analyzing the output data received from the combined system 110.” *Id.*, ¶0127. Instead of providing guidance information on display 130, wireless transmitting means 190 connected to control unit 120 can wirelessly transmit the guidance information to aircraft 10 for viewing on a display in the aircraft cockpit. *Id.*, ¶0128. Berkmo therefore teaches using the combined output data to determine pilot maneuvering guidance information, including directional and speed guidance, and displaying it on display 130 or on an aircraft cockpit display. EX1003, ¶¶133-134; *see also* EX1004, Figs. 2-4, ¶¶0135-0136, 0143 (“instructing the pilot to stop the aircraft [i.e., speed is 0]” or “instruct the pilot to continue approaching the stand [i.e., direction toward stand]”).

Since Berkmo meets every limitation of claim 1 either expressly or inherently, as explained above, claim 1 should be found invalid under 35 U.S.C. § 102 as anticipated by Berkmo. EX1003, ¶¶112-135. To the extent any limitation is not expressly or inherently taught, claim 1 should alternatively be found invalid under 35 U.S.C. § 103 as obvious over Berkmo. *Id.*

3. Claim 6: “The method of claim 1, wherein a gate arrival information is received from an airport computing system.”

Berkmo’s airport stand arrangement includes control unit 120 connected to database 122 in which “*database 122 may be an airport operational database AODB comprising flight plans of arriving and departing aircrafts. This way, the control unit 120 may access information pertaining to the type of aircraft which will be approaching the stand area 20.*” EX1004, ¶0121. The ’349 Patent specifically discloses that its “docking system can then compare the determined aircraft type with *an aircraft type provided in gate arrival information* (e.g., from the airport computing system) to determine that the aircraft type that is approaching or in the ramp area is the correct aircraft type.” EX1001, 7:51-55. Thus, in the same manner as Berkmo, the ’349 Patent recognizes that aircraft type provided by an airport operational database (i.e., an airport computing system) is “gate arrival information.” EX1003, ¶¶136, 137.

4. Claim 7: “The method of claim 1, further comprising: 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.”

Berkmo teaches its airport stand arrangement detects and tracks objects “based on output data from the imaging system 110C” and “verif[ies] the existence of said detected and tracked object based on output data from a further system 110L of the one or more additional systems and/or output data from the radar-based system 110R.” EX1004, ¶¶0138, 0035. Since objects detected and tracked by Berkmo’s airport stand arrangement in stand area 20 include aircraft 10, Berkmo therefore teaches verifying aircraft 10 by comparing camera image data of imaging system 110C with sensor data of laser system 110L and/or radar system 100R. EX1003, ¶138.

Berkmo also teaches performing this verification by comparing data before combining the data of imaging system 110C, laser system 110L, and radar system 110R. *Id.*, ¶139. Berkmo discloses combining the output data of all three systems by using a spatially resolved weighted average, resulting in a combined data value different from the original output data of each system. EX1004, ¶0130; EX1003, ¶139. Accordingly, verifying an object by comparing output data of imaging system 110C to output data of laser system 110L and/or radar system 110R, as taught by Berkmo, necessarily and inherently requires the comparison be made before combining the output data of these systems. *Id.*

To the extent claim 7 is not expressly or inherently met by Berkmo, claim 7 would have been obvious over Berkmo. If the verification of objects does not expressly or inherently include aircraft 10, a POSITA would have been motivated to perform the verification of aircraft 10 in view of Berkmo's teachings. *Id.*, ¶140. Berkmo teaches that verifying the existence of an object detected by imaging system 110C with radar system 110R or laser system 110L can overcome a drawback of imaging system 110C mistakenly detecting and identifying image artifacts, such as shadows, as real objects. EX1004, ¶¶0035-0036. Accordingly, a POSITA would have been motivated to compare data of imaging system 110C to data of radar system 110R or laser system 110L to verify existence of aircraft 10 to ensure imaging system 110C has detected and identified aircraft 10 correctly and not an image artifact. EX1003, ¶140.

Similarly, if Berkmo does not expressly or inherently teach performing the data comparison before merging, it would have been obvious for a POSITA to make the comparison prior to merging. *Id.*, ¶141. It would have been obvious to a POSITA to try the comparison before merging data as the temporal limitation on the comparison is limited to a finite number of options, i.e., either before or after merging, and doing the comparison before merging would have a reasonable expectation of success. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007) (when there is "a finite number of identified, predictable solutions, a person of

ordinary skill has good reason to pursue the known options within his or her technical grasp.”); MPEP § 2143; EX1003, ¶141. Moreover, with only two options and given that the Berkmo’s data merging alters the combined data, a POSITA would have been motivated to perform the data comparison prior to merging data to ensure that it is imaging system output data that is actually compared to radar or laser system output data as opposed to altered versions of such output data. *Id.*

5. **Claim 8: “The method of claim 1, wherein the data for determining proximity of the aircraft to a particular object within the ramp area include data for determining proximity of the aircraft to a stop point.”**

Berkmo teaches the combined output data includes data for determining proximity of aircraft 10 to a stop point. EX1003, ¶142. In addition to Berkmo’s airport stand arrangement provides “*pilot maneuvering guidance information for aiding the pilot of the approaching aircraft 10 in maneuvering the aircraft 10 towards the parking position 160.* The *pilot maneuvering guidance information is determined* by the control unit 120 by *analyzing the output data received from the combined system 110.*” EX1004, ¶0127. To provide guidance information to parking position 160 (i.e., stop point) based on the combined output data, that combined data necessarily includes data for determining proximity of aircraft 10 to parking position 160. EX1003, ¶142. In other words, without knowing the location of aircraft 10 proximate to parking position 160, it is not possible to guide aircraft 10 to parking position 160. *Id.*

6. **Claim 9: “The method of claim 1, wherein the data for determining proximity of the aircraft to a particular object within the ramp area include data for determining proximity of the aircraft to a piece of equipment on a ramp area tarmac surface.”**

Berkmo teaches the combined output data includes data for determining proximity of aircraft 10 to a piece of equipment on stand area (i.e., ramp area tarmac surface). EX1003, ¶143; *see also* discussion in Section X.B.2(h). Berkmo’s airport stand arrangement is “configured to ***detect and track other objects*** within the stand area 20,” where other objects include “***a luggage dolly 11***, and a food delivery truck 12.” EX1004, ¶0133. Stand area 20 is continuously monitored “for potential objects which may be involved in causing accidents at the stand.” *Id.*

Berkmo’s airport stand arrangement is “further configured to ***predict if the approaching aircraft 10 is on a collision course with any of said other objects 11,12, and***, in response to a collision course being predicted, to ***provide further pilot maneuvering guidance information*** instructing the pilot to stop the aircraft 10.” *Id.*, ¶0135. To provide guidance information based on the combined data to avoid colliding with objects in stand area 20, the combined data necessarily includes data for determining proximity of aircraft 10 to those objects. EX1003, ¶144. In other words, without knowing the location of aircraft 10 proximate to objects in stand area 20, it is not possible to guide aircraft 10 to avoid collisions. *Id.*

7. Claim 10

For all but the following limitations, each other limitation of claim 10 is the same as corresponding limitations in claim 1 and is therefore met by Berkmo for the same reasons as discussed in Section X.B.2.

(a) “determining a portion of the camera image data associated with the aircraft:”

Berkmo determines the portion of the camera image data output from imaging system 110C associated with aircraft 10. EX1003, ¶146. Berkmo discloses the imaging system 110C is configured to detect and track objects, including aircraft 10, in stand area 20. EX1004, Figs. 1-3, ¶¶0027, 0032, 0048, 0116, 0126, 0131-0132. Berkmo also discloses analyzing its output data to provide guidance to aircraft 10. *Id.*, ¶¶0097, 0120, 0127, 0134-0136, 0143-0145. Since Berkmo discloses imaging system 110C detects and tracks objects in stand area 20 including aircraft 10, and that data is used to provide pilot maneuvering guidance information to aircraft 10 to avoid collision with objects in stand area 20 and to guide to parking position 160, Berkmo necessarily discloses determining the portion of the camera image data output by imaging system 110C corresponding to aircraft 10. EX1003, ¶146. If Berkmo failed to determine which portion of the camera image data output by imaging system 110C corresponded to aircraft 10, Berkmo could not detect and track aircraft 10 and objects 11, 12, nor provide guidance information to aircraft 10 to avoid collision with objects 11, 12 and park at parking position 160. *Id.*

(b) “determining a portion of the LIDAR/RADAR sensor data associated with the aircraft:”

Berkmo determines the portion of the sensor data output from laser system 110L and radar system 110R associated with aircraft 10. EX1003, ¶147. Berkmo discloses the laser system 110L and radar system 110R are configured to detect and track objects, including aircraft 10, in stand area 20. EX1004, Figs. 1-3, ¶¶0027, 0032, 0048, 0116, 0126, 0131-0132. Berkmo also discloses analyzing their output data to provide guidance to aircraft 10. *Id.*, ¶¶0097, 0120, 0127, 0134-0136, 0143-0145. Since Berkmo discloses laser system 110L and radar system 110R detect and track objects in stand area 20 including aircraft 10, and that data is used to provide pilot maneuvering guidance information to aircraft 10 to avoid collision with objects in stand area 20, Berkmo necessarily discloses determining the portion of the sensor data output by laser system 110L and radar system 110R corresponding to aircraft 10. EX1003, ¶147. If Berkmo failed to determine which portion of the sensor data output by laser system 110L and radar system 110R corresponded to aircraft 10, Berkmo could not detect and track aircraft 10 and objects 11, 12, nor provide guidance information to aircraft 10 to avoid collision with objects 11, 12. *Id.*

8. Claim 13: “The method of claim 10, further comprising: sending at least the determined speed and direction to a ramp docking system controller device.”

Berkmo discloses sending combined output data, including determined speed and direction, to a ramp docking system controller device. EX1003, ¶148; *see also*

discussion in Sections X.B.2(f), (g). Berkmo discloses that its “airport stand arrangement may be an *aircraft docking system*.” EX1004, ¶0012. Berkmo’s airport stand arrangement includes a controller 120 that “receives said output data and performs a data analysis of it so as to determine tracking data of the aircraft 10, said tracking data including the position of the aircraft 10, the velocity of the aircraft 10 etc.” *Id.*, ¶0126. Berkmo further discloses that its airport stand arrangement predicts collisions and provides pilot maneuvering guidance information based on the determined speed and direction of aircraft 10 and objects 11, 12. *Id.*, ¶¶0080, 0136. Since Berkmo discloses its airport stand arrangement can be an aircraft docking system (i.e., a ramp docking system controller device), includes controller 120 that receives and analyzes the combined output data, and that airport stand arrangement uses determined speed and direction to predict collisions and provide pilot maneuvering guidance information, Berkmo sends determined speed and direction to a ramp docking system controller device. EX1003, ¶148.

9. Claim 14: “The method of claim 13, further comprising: sending at least the determined position and orientation to a ramp docking system controller device.”

Berkmo discloses sending combined output data, including determined speed and direction, to a ramp docking system controller device. EX1003, ¶149; *see also* discussion in Sections X.B.2(e), X.B.8. Berkmo discloses that its “airport stand arrangement may be an *aircraft docking system*.” EX1004, ¶0012. Berkmo’s

airport stand arrangement includes a controller 120 that “receives said output data and performs a data analysis of it so as to determine tracking data of the aircraft 10, said tracking data including the position of the aircraft 10, the velocity of the aircraft 10 etc.” *Id.*, ¶0126. Berkmo further discloses that the combined output data includes position and orientation. *Id.*, ¶¶0025, 0080, 0082, 0089, 0126, 0134-0136. Since Berkmo discloses its airport stand arrangement can be an aircraft docking system (i.e., a ramp docking system controller device), includes controller 120 that receives and analyzes the combined output data, and that airport stand arrangement uses determined position and orientation to predict collisions and provide pilot maneuvering guidance information, Berkmo sends determined position and orientation to a ramp docking system controller device. EX1003, ¶149.

10. Claim 15: “The method of claim 10, further comprising: sending at least the determined position and orientation to a ramp docking system controller device.”

Claim 15 is met by Berkmo for the same reasons as claim 14. *See* Section X.B.9.

11. Claim 16: “The method of claim 10, further comprising: sending at least one of the determined speed, direction, position, and orientation to a pilot unit computing device on the aircraft.”

Berkmo sends at least one of determined speed, direction, position, and orientation to a pilot unit computing device on aircraft 10. EX1003, ¶151; *see also* discussion in Section X.B.2(j). Berkmo’s airport stand arrangement “*is configured*

to wirelessly transmit S116 a signal comprising said pilot maneuvering guidance information to the approaching aircraft 10” and can be “wirelessly transmitted as a part of the radar signals emitted from the radar-based system 110R.” EX1004, ¶¶ 0128, 0068. *“The signal may be received by equipment installed within the aircraft 10 and viewed on a display in the cockpit of the aircraft.” Id; see also ¶¶ 0135-0136, 0143.*

To receive and display the guidance information on the aircraft cockpit display, the signal is necessarily received by a pilot unit computing device on aircraft 10. EX1003, ¶152. To the extent Berkmo does not expressly or inherently teach sending the signal to an aircraft computing device, it would have been obvious to a POSITA that the signal would be received by an aircraft computing device because a display alone cannot receive, interpret, and cause guidance information to be displayed without a computing device to perform those functions. *Id.*

12. Claim 17: “The method of claim 10, further comprising: sending at least one of the determined speed, direction, position, and orientation to a passenger computing device on the aircraft.”

Claim 17 is met by Berkmo for the same reasons as claim 16. *See* Section X.B.21. To the extent Berkmo does not expressly teach sending determined speed, direction, position, or orientation to a passenger computing device on aircraft 10, it would have been obvious to a POSITA to do so. EX1003, ¶153. Berkmo expressly teaches sending such information wirelessly to aircraft 10 for viewing on the aircraft

cockpit display. EX1004, ¶¶0135-0136, 0145. It would have been obvious to a POSITA that this information could be sent and received to any computing device on aircraft 10 including a passenger computing device. *Id.* In addition to the presence of passenger computing devices and displays for each passenger on an aircraft being well-known and commonly present, a POSITA would have been motivated to send this information to a passenger computing device for multiple reasons including providing passengers with aircraft status relative to gate arrival, to enable passengers to better prepare for disembarkation by knowing distance and time to gate arrival, and to provide passengers with information of interest. *Id.* Providing this information to a passenger computing device is also well within the skill of a POSITA, would not require undue experimentation, and would yield predictable results. *Id.*

13. Claim 18

For all but the following limitation, each other limitation of claim 10 is substantially the same as corresponding limitations in claim 1 and is therefore met by Berkmo for the same reasons as discussed in Section X.B.2.

- (a) **“a computing device having memory associated therewith for receiving the camera image data from the camera image sensor; ... the computing device for receiving the LIDAR/RADAR sensor data and merging the camera image data and the LIDAR/RADAR sensor data associated with the aircraft into a merged data set”**

Berkmo includes control unit/controller 120 (i.e., a computing device having memory) that receives data from combined system 110 and merges the collected data. EX1003, ¶155; *see also* discussion in Sections X.B.2(b-d). Berkmo discloses control unit/controller 120 is connected to combined system 110 and to database 122. EX1004, ¶0121. “[C]ontroller 120 receives said output data [from combined system 110] and performs a data analysis of it so as to determine tracking data of the aircraft 10, said tracking data including the position of the aircraft 10, the velocity of the aircraft 10 etc.” *Id.*, ¶0126, *see also* ¶¶0129-0130 (merging data as “spatially resolved weighted average of the combined output data”). Control unit/controller 120 is therefore a computing device having a memory that receives output data from each sensor and merges the data. EX1003, ¶155.

14. Claim 19: “The system of claim 18, wherein the LIDAR/RADAR sensor data is analyzed using a point cloud process to correlate points in the LIDAR/RADAR sensor data to points in the camera image data.”

Berkmo teaches using a point cloud process to correlate data points from laser system 110L, radar system 110R, and imaging system 110C. EX1003, ¶156. Berkmo discloses “[a]n algorithm may run a pre-processing sub-algorithm to determine *corresponding spatial regions* of the output data (e.g. *pixel-to-pixel matching*).” EX1004, ¶0129. Using the data points from each system, Berkmo teaches determining a weighted average as a matrix of average data values in which “each average data value pertains to a *specific spatial location* on the stand area and

is calculated as a sum of weighted data values (of an associated output data) ***pertaining to the same spatial location*** but detected ***using the radar system, and the one or more additional systems*** [i.e., laser system 110L and imaging system 110C].” *Id.*, ¶0130. This matching of spatial locations from data of each system corresponds to using a point cloud process to correlate points. EX1003, ¶156.

15. Claim 20: “The system of claim 18, wherein the computing device analyzes the camera image data to identify that the aircraft is approaching the ramp area.”

Berkmo discloses controller/control unit 120 analyzes the camera image data to identify aircraft 10 in stand area 20. EX1003, ¶157. Berkmo discloses “controller 120 may also perform a ***data analysis of the received output data*** [which includes imaging system 110C data] to determine the dimensions of the aircraft 10. Said dimensions may be compared to dimensions of aircraft models stored locally in the airport stand arrangement, or in the AODB 122, to ***establish an aircraft type*** and model of the aircraft 10.” EX1004, ¶0126; see also ¶0048, 0054, 0121, 0137, claim 43; EX1003, ¶157.

C. Ground #3: Claims 1-20 Are Invalid as Obvious Over Berkmo in View of Richman

Berkmo teaches every limitation of claims 1, 6-10, 13-16, and 18-20, either expressly or inherently, and thus anticipates those claims under 35 U.S.C. § 102. To the extent any limitations of claims 1, 6-10, 13-16, and 18-20 are not expressly or

inherently taught by Berkmo, Berkmo in view of Richman renders such limitations obvious such that claims 1-20 of the '349 Patent are obvious under 35 U.S.C. § 103.

1. Summary of Richman

U.S. Patent No. 5,675,661 to Richman issued on October 7, 1997, which is prior to the August 3, 2020, filing date of the '349 Patent. Richman is therefore prior art to the '349 Patent under 35 U.S.C. § 102(a)(1).

Like Berkmo, Richman discloses an aircraft docking system configured to guide an aircraft to a dock. EX1005, Abstract. Recognizing the difficulties of guiding an aircraft, particularly larger ones, to a precise position in a dock, Richman teaches an aircraft docking system installed in full view of approaching aircraft and the pilot as a large and simple display. *Id.*, 1:54-64. Richman's docking system uses templates of 3D images of candidate aircraft and selects a template as a model that a computer rotates and scales. *Id.*, 1:65-2:2. Laser radar (ladar) obtains an image of the approaching aircraft and compares the image with the rotated and scaled model to determine the location and orientation of the approaching aircraft. *Id.*, 2:2-7. The system determines the aircraft travel path as updated by the ladar over successive locations and orientations of the aircraft and compares it with the required travel path. *Id.*, 2:7-11. The pilots sees corrective display signals, such as arrows, determined by deviations between the two travel paths. *Id.*, 2:11-15.

Richman's Fig. 1, annotated below, includes an aircraft docking system 46 to provide guidance information to a pilot including steering and speed commands and obstacle warnings. *Id.*, 3:21-24. System 46 is positioned to view a dock 18 and to be seen by a pilot as an aircraft 20 advances along a taxiway 22 before turning into dock 18. *Id.*, 3:24-28. System 46 includes a laser radar 54 to scan the dock area in both elevation and in azimuth with a beam 56 to obtain an aircraft image or obstacle image present within dock 18 and includes a display 60 to present instructions to a pilot. *Id.*, 3:32-39.

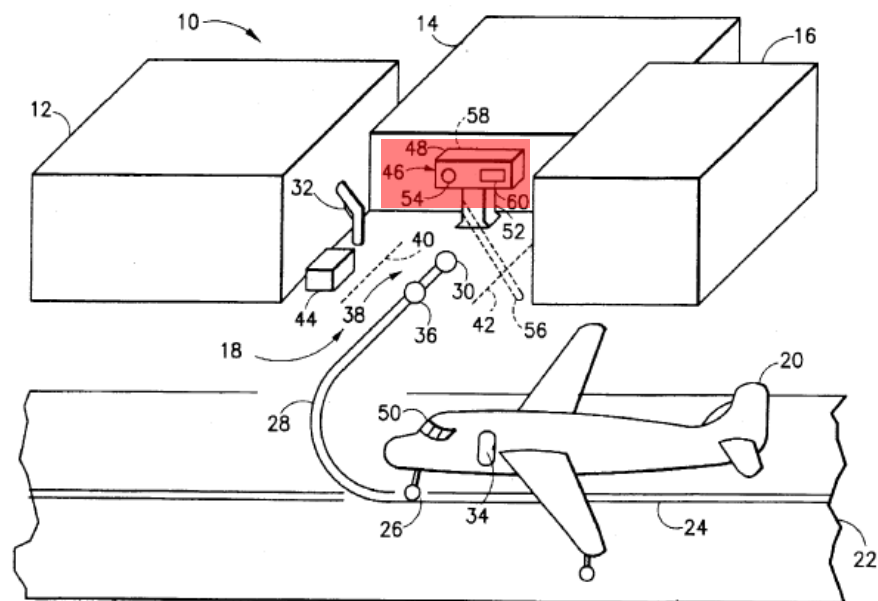


FIG. 1

Ladar 54 outputs and stores in memory 62 target data in the form of elevation (EL), azimuth (AZ) and range (R) data for each point of a target that reflects light from the beam 56 back to the ladar 54. *Id.*, 3:48-53. The collection of target data points stored in memory 62 constitutes a 3D target image. *Id.*, 3:53-

55. A memory 64 stores a library of aircraft templates corresponding to 3D representations of candidate aircraft, and a coordinate converter 66 converts the view of a selected template by rotation, scaling, and/or translating the template to match the target image stored in memory 62. *Id.*, 3:57-62. A correlator 68 compares the template output by converter 66 with the target image in memory 62 to determine the quality of the match, and a match driver 70 makes adjustments to improve the match. *Id.*, 3:64-67; 4:8-22. Feature extraction, such as nose and wing wheel distances and/or height and size of wings, fuselage and rudder can be used to determine type of aircraft. *Id.*, 4:1-7.

2. Motivation to Combine

It would have been obvious to a POSITA to combine Berkmo and Richman because both are directed to aircraft guidance docking systems using laser sensors for detecting approaching aircraft. EX1004, Figs. 1-3, ¶¶0116-0132; EX1005, 2:4-24, 3:48-4:34; EX1003, ¶163. A POSITA would have been motivated to incorporate Richman's 3D modeling, orientation detection, and template matching functionality in Berkmo's arrangement because that functionality is provided by using laser sensor data, Berkmo already includes a laser sensor (i.e., laser system 110L), and incorporating that functionality in Berkmo's laser sensor results in a predictable combination of familiar elements according to known methods. *Id.*; KSR, 550 U.S. at 416 ("The combination of familiar elements according to known methods is likely

to be obvious when it does no more than yield predictable results,” “a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result”).

Combining Richman’s 3D modeling, orientation detection, and template matching functionality in Berkmo’s airport stand arrangement also provides multiple benefits. EX1003, ¶164. A key improvement in object detection using 3D models is the ability to return both location and *orientation* of the object, which Richman teaches: “By comparing the image with the rotated and scaled model, the image can be interpreted to show the present location and orientation of the approaching aircraft.” *Id.*, EX1005, 2:3-6. Without 3D models, orientation is typically inferred within the tracking algorithm using consecutive detections and a dynamics model of the object, which is less accurate. EX1003, ¶164. The use of 3D models for detection also lowers the number of missed detections due to *partial sensor returns* (e.g., partial point clouds) because it is easier to match partial shape sensor data to the 3D model as compared to detection based only on prior training data, which is less accurate. *Id.*, ¶165

3D models or templates are also very good at identifying the “type” of aircraft or classification. *Id.*, ¶166. While it is common to use raw sensor detections to match a template in the library, Richman suggests using “feature extraction” from

the data to match aircraft type within the library, which improves results. *Id.* “Features such as nose wheel and wing wheel intra-wheel distances and height and size of wings, fuselage and rudder would be used to determine type of aircraft.” EX1005, 4:1-7. Using multiple specific parts of an object is an improvement over Berkmo because more detailed aircraft information is used to match the sensor data to the aircraft in the library of 3D models. EX1003, ¶166.

Finally, given location and orientation information from detections of objects as taught by Richman, each object can be tracked by simply arranging these detections in series over time. *Id.*, ¶167. Richmond teaches detecting an aircraft by “match[ing] to stored models of the aircraft with the aircraft to determine ... a tracking point of the aircraft such as the nose wheel.” EX1005, 1:4-13. The specific tracking is provided as an “aircraft travel path, as represented by successive locations and orientations of the aircraft.” *Id.*, 2:7-11. In aircraft tracking, the more common but less accurate tracking approach uses consecutive location detections only in combination with a dynamics model of how the object moves to infer each variable in tracking (location, orientation, velocity, and direction). EX1003, ¶0168. Thus, the use of 3D models and orientation information, as taught by Richman, would clearly improve the accuracy of aircraft tracking in the Berkmo stand area. *Id.*

In sum, for all of these reasons, a POSITA would have been motivated to incorporate Richman's 3D modeling, orientation detection, and template matching functionality in Berkmo's airport stand arrangement. *Id.*, ¶¶163-168.

3. Claim 1

As explained in Section X.B.2, every limitation of claim 1 is expressly or inherently met by Berkmo and/or obvious over Berkmo. To the extent any limitation is not anticipated by or obvious over Berkmo, they are expressly met by Richman.

- (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,”**

To the extent this limitation is not met by Berkmo, Richman teaches it. EX1003, ¶170. Richman's docking system detects arriving aircraft and “matches stored models of the aircraft with the aircraft to ***determine orientation of the aircraft and a tracking point of the aircraft*** such as the nose wheel.” EX1005, 1:4-14. By comparing the detected aircraft image with a rotated and scaled model, “the image can be interpreted to show the present ***location and orientation*** of the approaching aircraft.” *Id.*, 2:4-11; *see also* Abstract; 1:54-2:24; 7:55-8:13; 8:32-52; 8:65-10:11; Section X.C.2 (motivation to combine this teaching with Berkmo; EX1003, ¶170.

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

To the extent this limitation is not met by Berkmo, Richman teaches it. EX1003, ¶171. Richman’s docking system includes ladar 54 that “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 ... [where t]he collection of target data points stored in the memory 62 constitute a *three-dimensional image of the target.*” EX1005, 3:49-55. A memory 64 stores *templates as a 3D representation of candidate aircraft*, and a “correlator 68 compares the template outputted by the converter 66 with the target image outputted by the memory 62 to determine the quality of the match between the template and the image.” *Id.*, 3:57-67; *see also* Fig. 2; Abstract; 1:65-2:24; 4:23-34; 6:59-7:5; 8:13-17; 8:31-52; 8:65-10:11; Section X.C.2 (motivation to combine this teaching with Berkmo; EX1003, ¶171.

4. Claim 2: “The method of claim 1, further comprising: comparing the three dimensional virtual model to one or more aircraft reference models stored in memory of a computing device to find a match between the three dimensional virtual model and one of the aircraft reference models to determine an aircraft type.”

Richman teaches this limitation. Richman’s docking system includes ladar 54 that outputs target data points of the aircraft and stores the collection of target data points as a 3D target image of the aircraft. EX1005, 3:47-55. Memory 64 stores a library of aircraft templates (i.e., aircraft reference models) corresponding

to 3D representations of candidate aircraft. *Id.*, 3:55-64. Correlator 68 and match driver compare the target image to the templates to determine aircraft type, such as by using aircraft features. *Id.*, 3:65-4:22; *see also* Fig. 2; Abstract; 1:65-2:24; 4:23-34; 6:59-7:5; 8:13-17; 8:31-52; 8:65-10:11; Section X.C.2 (motivation to combine this teaching with Berkmo; EX1003, ¶172. Berkmo also teaches comparing information based on the combined output data with aircraft models in a database to determine aircraft type. EX1004, ¶¶0121, 0126; EX1003, ¶0173.

5. **Claim 3: “The method of claim 2, further comprising: comparing the determined aircraft type with an aircraft type provided in gate arrival information to determine that the aircraft type that is approaching or in the ramp area is a correct aircraft type.”**

Berkmo teaches this limitation. Berkmo teaches control unit/controller 120 is connected to database 122 comprising flight plans with information pertaining to aircraft type approaching stand area. EX1004, ¶0121. Control unit/controller 120 “perform[s] a data analysis of the received output data to determine the dimensions of the aircraft 10. Said dimensions may be **compared** to dimensions of aircraft models stored locally in the airport stand arrangement, or in the AODB 122, to establish an aircraft type and model of the aircraft 10.” *Id.*, ¶0126. Berkmo’s comparison of the determined dimensions of aircraft 10 to aircraft type from flight plan information necessarily confirms whether approaching aircraft 10 is the correct aircraft type. EX1003, ¶174. Moreover, it would have been obvious to a

POSITA that establishing aircraft type and model of aircraft 10 by making this comparison with the flight plan information identifying aircraft type would necessarily confirm whether approaching aircraft 10 is the correct aircraft type. *Id.*

6. **Claim 4: “The method of claim 1, further comprising: scanning the aircraft with a LIDAR/RADAR sensor with a sweep of the LIDAR/RADAR across the aircraft in at least one of a horizontal or vertical direction or both.”**

Richman teaches this limitation. Richman teaches that the beam from ladar 54 (i.e., LIDAR/RADAR sensor) is deflected “in ***both horizontal and vertical direction.***” EX1005, ¶2:45-49. Laser radar 54 “scans the area of the dock 18 in ***both elevation and in azimuth with a beam 56***, such as a pencil beam of infrared radiation, to obtain an image of any aircraft or obstacle which may be present within the dock 18.” *Id.*, 3:32-36. Richman thus teaches sweeping beam 56 of ladar 54 across an aircraft in both horizontal and vertical directions. EX1003, ¶175.

7. **Claim 5: “The method of claim 4, further comprising: 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.”**

This limitation is anticipated by and/or obvious over Berkmo. Berkmo’s airport stand arrangement is “configured to detect and track an object of said other objects 11,12 ***based on output data from the imaging system 110C***, and ***verify the existence of said detected and tracked object based on output data from a further***

system 110L of the one or more additional systems and/or output data from the radar-based system 110R.” EX1004, ¶0138; *see also* ¶¶0023-0024, 0036. Berkmo thus compares camera image data from imaging system 110C with sensor data from laser system 110L/radar system 110R to confirm an object in stand area 20 is present in both sets of data. EX1003, ¶176.

Since Berkmo teaches that objects detected in stand area 20 include aircraft 10 (e.g., EX1004, ¶¶0125-0127, 0130, 0132-0134), Berkmo’s verification by comparison of output data from imaging system 110 and laser system 110L/radar system 110R would necessarily include verification that aircraft 10 is present in both sets of data. EX1003, ¶177. To the extent such verification for aircraft 10 is not necessarily performed, it would have been obvious to a POSITA to perform aircraft verification for multiple reasons including ensuring approaching aircraft 10 is properly distinguished from other objects in stand area 20 and thereby ensure pilot maneuvering guidance information is properly determined and provided to the correct aircraft. *Id.*

8. Claim 6

Claim 6 is met by Berkmo in view of Richman for the same reasons as claim 6 in Ground 2. *See* Section X.B.3.

9. Claim 7

Claim 7 is met by Berkmo in view of Richman for the same reasons as claim 7 in Ground 2 and claim 5 in Ground 3. *See* Sections X.B.4, X.C.7.

10. Claim 8

Claim 8 is met by Berkmo in view of Richman for the same reasons as Ground 2. *See* Section X.B.5.

11. Claim 9

Claim 9 is met by Berkmo in view of Richman for the same reasons as claim 9 in Ground 2. *See* Section X.B.6.

12. Claim 10

Claim 10 is met by Berkmo in view of Richman for the same reasons as claim 10 in Ground 2 and claim 1 in Ground 3. *See* Sections X.B.7, X.C.3.

13. Claim 11

Claim 11 is met by Berkmo in view of Richman for the same reasons as claim 2 in Ground 3. *See* Section X.C.4.

14. Claim 12: “The method of claim 11, wherein comparing the three dimensional virtual model to one or more aircraft reference models includes comparing at least one of: wing edge to nose end distance; tail tip height; number of windows; position of windows; size of windows: number of pilot windows; position of pilot windows; number of engines; engine cowl type; engine cowl size; fuselage length; number of windows in fuselage; wing span size; height of

the nose from ground; position of engines; and nose dimensions.”

This limitation is met by Richman. Richman teaches comparing the 3D target image (i.e., 3D virtual model) to 3D candidate aircraft templates (i.e., aircraft reference models) by comparing features of each. EX1005, 3:48-4:34.

“Features such as nose wheel and wing wheel intrawheel distances and height and size of wings, fuselage and rudder would be used to determine type of aircraft.” *Id.*, 4:1-7. Richman’s compared features thus meet multiple ones listed in claim 12 including at least tail tip height, fuselage length, wing span size, height of nose from ground, and nose dimensions. EX1003, ¶184.

15. Claim 13

Claim 13 is met by Berkmo in view of Richman for the same reasons as claim 13 in Ground 2. *See* Section X.B.8. In addition, Richman teaches providing speed and direction information. *See* EX1005, 2:7-18, 3:21-24, 4:50-55, 5:22-37; EX1003, ¶185.

16. Claim 14

Claim 14 is met by Berkmo in view of Richman for the same reasons as claim 14 in Ground 2 and claims 1 and 13 in Ground 3. *See* Sections X.B.9, X.C.3, X.C.15.

17. Claim 15

Claim 15 is met by Berkmo in view of Richman for the same reasons as claim 14 in Ground 3. *See* Section X.C.16.

18. Claim 16

Claim 16 is met by Berkmo in view of Richman for the same reasons as claim 16 in Ground 2. *See* Section X.B.21.

19. Claim 17

Claim 17 is met by Berkmo in view of Richman for the same reasons as claim 17 in Ground 2. *See* Section X.B.22.

20. Claim 18

Claim 18 is met by Berkmo in view of Richman for the same reasons as claim 18 in Ground 2. *See* Section X.B.23. In addition, Richman's docking system includes electronics 58 having memory 76 and processor 80 (i.e., a computing device having memory) to perform the recited functions. *See* EX1005, Fig. 2, 4:35-58; 5:9-57; EX1003, ¶190.

21. Claim 19

Claim 19 is met by Berkmo in view of Richman for the same reasons as claim 19 in Ground 2. *See* Section X.B.24.

22. Claim 20

Claim 20 is met by Berkmo in view of Richman for the same reasons as claim 20 in Ground 2. *See* Section X.B.25.

XI. CONCLUSION

In view of the foregoing, Patent Owner respectfully submits that the Board should deny institution of all Grounds of the Petition.

Dated: September 27, 2023

/Marc Weinstein/

Marc K. Weinstein (Reg. No. 43,250)

Xsensus LLP

Attorneys for Patent Owner

CERTIFICATE OF LENGTH (37 C.F.R. §§ 42.24(D))

The undersigned hereby certifies that, according to the word-processing system used to prepare the foregoing document, this document has 17,295 words and thus complies with the applicable word limit.

Dated: September 27, 2023

/Marc Weinstein/

Marc K. Weinstein (Reg. No. 43,250)

Xsensus LLP

Attorneys for Patent Owner

CERTIFICATE OF SERVICE (37 C.F.R. §§ 42.6(E), 42.105(A))

The undersigned hereby certifies that on September 27, 2023, a complete and entire copy of this Petition for Post Grant Review including all exhibits was provided via Federal Express to the Patent Owner by serving the correspondence address of record for the '349 patent:

Honeywell/Brooks
Intellectual Property Services Group
855 S. Mint Street
Charlotte, NC 28202
United States

c/o Colleen Szuch

Dated: September 27, 2023

/Marc Weinstein/

Marc K. Weinstein (Reg. No. 43,250)

Xsensus LLP

Attorneys for Patent Owner