

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Axon Enterprise, Inc. and Dedrone Holdings, Inc.

Petitioners,

v.

Airspace Systems, Inc.

Patent Owner

Case No. IPR2025-00530

U.S. Patent No. 10,249,199

**DECLARATION OF NIKOLAOS PAPANIKOLOPOULOS, PH.D.
IN SUPPORT OF PATENT OWNER MOTION TO AMEND**

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List of Patent Owner Exhibits

Exhibit No.	Description
EX2001	Declaration of Nikolaos Papanikolopoulos, Ph.D., in support of this Motion to Amend
EX2002	U.S. Patent Application No. 15/598,303 (from which U.S. Patent No. 10,249,199 issued) (annotated to include page and line nos.) (the “’303 App.”)
EX2003	U.S. Provisional Patent Application No. 62/309,838 (the “’838 Prov.”)
EX2004	Curriculum Vitae of Dr. Nikolaos Papanikolopoulos

I, Nikolaos Papanikolopoulos, of Minneapolis, Minnesota, declare that:

I. INTRODUCTION

1. I have been retained by Patent Owner Airspace Systems, Inc. in this *inter partes* review (IPR) proceeding number IPR2025-00530, filed by Petitioners Axon Enterprise, Inc. and Dedrone Holdings, Inc. I understand that this IPR proceeding relates to U.S. Patent No. 10,249,199 (the '199 patent).

2. I have been asked to provide my objective, independent analysis of the '199 patent in view of the prior art references cited in the Petition and to provide my opinion regarding the allegations in the Petition and substitute claims proposed by Patent Owner.

3. I have based my opinions on the information available to me as of the date of this declaration. I understand that additional information may become available after this declaration is submitted. If I become aware of additional information following my submission of this declaration I may, if I am permitted, offer additional opinions (including by amending and/or supplementing this declaration) taking into account such new information.

4. I am not currently, nor have I ever been, an employee of Airspace Systems, Inc., its subsidiaries, parent organizations, or affiliates. I received no compensation for this declaration beyond my normal hourly compensation based on my time actually spent working on this IPR. I will not receive any added

compensation based on the outcome of this or any other IPR, or any other proceeding, involving the '199 patent.

II. BACKGROUND AND QUALIFICATIONS

5. My qualifications are most accurately reflected in my curriculum vitae (EX2004). The following is a brief summary of some of my relevant experience and qualifications.

6. I am the McKnight Presidential Endowed Professor and Distinguished McKnight University Professor in the Department of Computer Science and Engineering of the University of Minnesota in Minneapolis, Minnesota. I am also the Director for the Minnesota Robotics Institute.

7. I have been a professor at the University of Minnesota (originally as an assistant professor, and then as an associate professor) since the Fall 1992. Between Fall 2001 and Spring 2004, and between Fall 2010 and Spring 2013, I was the Director of Undergraduate Studies of the Department of Computer Science and Engineering.

8. In 1992, I received my Ph.D. in Electrical and Computer Engineering from Carnegie Mellon University. My thesis was entitled "Controlled Active Vision" and focused on using computer vision in a controlled fashion to detect, track, and manipulate objects in the environment. In 1988, I also received my M.S. in Electrical and Computer Engineering from Carnegie Mellon University. My

B.S. in Electrical and Computer Engineering was received in 1987 from the National Technical University in Athens, Greece.

9. For over thirty years, my research and teaching work has focused on robotics, image processing, computer vision, and intelligent transportation systems. This research has included a wide variety of topics ranging from drones to detection and tracking of humans and objects such as faces using information from stationary or moving cameras. It has also included object detection and recognition including work with artificial intelligence and pattern recognition systems for surveillance applications.

10. I currently teach or have been teaching three courses related to image processing and computer vision: (i) CSci 5561 Computer Vision, (ii) CSci 5511 Artificial Intelligence, and (iii) CSci 5551 Introduction to Intelligent Robotic Systems. In particular, I have been teaching the class in Computer Vision since 1992.

11. I am currently serving as a Senior Editor in the IEEE Transactions on Intelligent Transportation Systems with responsibility in the area of imaging. I was Associate Editor in the same journal for twelve years.

12. I have received research grants for various projects involving robotics, computer vision and image processing as applied to medicine and surveillance, including face detection and tracking of humans. My industrial experience

includes founding a robotics company in 2005 named ReconRobotics Inc. that develops different robotic platforms. I have also been a consultant since 1997 for numerous companies and provided technical expertise in developing computer vision algorithms for human tracking, object recognition, fingerprint recognition, vehicle tracking, camera calibration, inspection, and precision agriculture.

13. In one of my consulting assignments, I developed computer vision algorithms for inspection of industrial parts by using different illumination sources (Banner Engineering). I have licensed my algorithms to several industries with the most recent one being Sentra Inc., which is using image processing and image segmentation for precision agriculture.

14. My research has produced more than 400 journal and conference publications. More than 90 publications are in refereed journals including top journals in robotics and imaging such as IEEE Trans. on Robotics and Automation, IEEE Trans. on Pattern Analysis and Machine Intelligence, IEEE Trans. on Image Processing, and International Journal of Computer Vision. Many of my publications and research grants relate to drones and human detection and tracking systems.

15. Some examples include:

- Henderson, T., Favour, R., Hamlen, B., Mitha, I., Bowe, E., and Papanikolopoulos, N.P., "Hovering Locomotion for UAVs with Thrust-Vectoring Control Surfaces", IEEE Robotics and Automation Letters, Volume

7, No. 2, April 2022, PP. 5214-5221. The paper was also presented at the 2022 IEEE Int. Conference on Robotics and Automation.

- D'Sa, R., and Papanikolopoulos, N., "Design and Experiments for Multi-Section-Transformable (MIST)-UAV", Proceedings of the 2019 IEEE Int. Conference on Robotics and Automation, Montreal, Canada, May 20-24, 2019, PP. 1878-1883.
- Walczak, N., Fasching, J., Cullen, K., Morellas, V., and Papanikolopoulos, N.P., "Toward Identifying Behavioral Risk Markers for Mental Health Disorders: An Assistive System for Monitoring Children's Movements in a Preschool Classroom," Machine Vision and Applications, Volume 29, No. 4, May 2018, PP. 703-717.
- Andersh, J., Cherian, A., Mettler, B., and Papanikolopoulos, N.P., "A Vision Based Ensemble Approach to Velocity Estimation for Miniature Rotorcraft", Autonomous Robots, Volume 39, No. 2, August 2015, PP. 123-138.
- Cook, D., Morris, T., Morellas, V., and Papanikolopoulos, N., "An Automated System for Persistent Real-Time Truck Parking Detection and Information Dissemination," Proceedings of the 2014 IEEE Int. Conference on Robotics and Automation, Hong Kong, China, May 31 – June 7, 2014, PP. 3989-3994.
- Somasundaram, G., Sivalingam, R., Morellas, V., and Papanikolopoulos, N.P., "Classification and Counting of Composite Objects in Traffic Scenes Using Global and Local Image Analysis", IEEE Trans. on Intelligent Transportation Systems, Volume 14, No. 1, March 2013, PP. 69-81.
- Masoud, O., and Papanikolopoulos, N.P., "A Novel Method for Tracking and Counting Pedestrians in Real-time Using a Single Camera," IEEE Trans. on Vehicular Technology, Volume 50, No. 5, September 2001, PP. 1267-1278.

- Singh, S., and Papanikolopoulos, N. P., “Monitoring Driver Fatigue Using Facial Analysis Techniques,” Proceedings of the 1999 IEEE/IEEJ/JSAI International Conference on Intelligent Transportation Systems, PP. 314- 318, Tokyo, Japan, October 5-8, 1999.

16. My UAV research focused on solar-powered drones capable of flying for multiple days continuously and transformable multi-section UAV designs. My work includes developing the world's smallest solar-powered UAV with applications in precision agriculture for maximizing crop yield, and detecting harmful algae growth in aquatic ecosystems. I have developed the Multi-Section-Transformable (MIST) UAV, a shape-shifting Vertical Take-Off and Landing platform that can transform in-air between multi-rotor, tail-sitter, and fixed-wing configurations. We have applied UAV technology to robot-based precision agriculture, specifically developing high-altitude aerial image analysis systems for weed detection and classification. My research combines robotics, computer vision, and machine learning to create practical UAV solutions for agriculture, environmental monitoring, and transportation systems.

17. My work in vehicle detection and tracking has focused on using image and video processing techniques, including object detection, tracking, and recognition, to accurately track vehicles in real-time. These algorithms have been applied to different scenarios, such as urban traffic monitoring and surveillance.

Moreover, machine learning techniques have helped in the improvement of these methodologies.

18. My paper “Detection and Classification of Vehicles,” published in the IEEE Transactions on Intelligent Transportation Systems in March 2002, is one of the most cited papers in the history of this journal (more than one-thousand citations). The paper, among other contributions, shows how to segment the main object from videos and images in low-light conditions. I also hold nine patents in pertinent areas. One of them is the “Crowd Counting and Monitoring” with P. Kilambi and O. Masoud. It discloses a system and method for accurately estimating the number of people in a crowded area and monitoring their behavior. The invention utilizes computer vision techniques and machine learning algorithms to analyze video feeds from cameras overlooking the target area. It employs techniques such as background subtraction, main object detection, and tracking to identify individual people within the crowd.

19. My research work (individually and with my collaborators) has been funded by several government funding agencies. For example, we have received funding from the Department of Homeland Security to monitor threats at Mass Transit Sites like the 30th Street Station in Philadelphia, PA, and the Light Rail Station in the Minneapolis-Saint Paul International Airport. Tracking humans was

an essential task for which we developed a variety of image processing algorithms and tools.

20. I have received numerous honors and awards for my research and contributions. I have been a Distinguished McKnight University Professor at the University of Minnesota since 2007 and have been a McKnight Presidential Endowed Professor in Computer Science since 2016. Also in 2007, I was nominated and became an IEEE Fellow. In 2016, I received the IEEE RAS George Saridis Leadership Award in Robotics and Automation as well as the Center for Transportation Studies Research Partnership Award. I have also received the IEEE VTS 2001 Best Land Transportation Paper Award for the paper “A Novel Method for Tracking and Counting Pedestrians in Real-Time Using a Single Camera” (with Osama Masoud). Most recently (2025), I was elected to become a Fellow of the National Academy of Inventors.

21. As a result of my work and research, I am familiar with the design, operation, and functionality of unmanned aerial vehicles (UAVs), also known as drones, such as those described in the '199 patent.

III. COMPENSATION

22. I am being compensated as an expert witness in this case at my standard hourly rate in addition to out-of-pocket expenses. I have received no additional compensation for my work on this matter and my compensation does

not depend, and has not ever depended in any way, on my opinion as expressed in this declaration and in any testimony that I may give, or on the outcome of this matter. I have no financial stake in Airspace Systems, Inc., its subsidiaries, parent organizations, or affiliates, the '199 patent, or the outcome of this IPR or any other matter involving the '199 patent.

IV. MATERIALS CONSIDERED

23. In formulating my opinions, I have relied upon my training, knowledge, and experience that are relevant to the '199 patent. I have also considered the '199 patent, patent applications identified in the priority claim of the '199 patent, and its file history. In addition, I have reviewed the Petition ("Pet.") and attached exhibits, including the declaration by Dr. Chowdhary and the prior art cited by Petitioners. Moreover, I have considered the Board's Institution Decision, and the substitute claims proposed by Patent Owner. For the sake of convenience and quick reference, I have reproduced above Patent Owner's Exhibit List, listing some of the materials that I considered.

V. LEGAL PRINCIPLES

24. I am not an attorney. I have been asked to provide opinions on patentability of the claims challenged by Petitioners and substitute claims proposed by Patent Owner. To this end, I relied on certain legal principles that were provided to me by counsel and that are summarized below.

A. Claim Construction

25. I am informed by counsel and understand that “claim construction” is the interpretation of the meaning of patent claims. I understand that words of a claim are generally given their ordinary and customary meaning, which is the meaning the term or phrase would have to a person of ordinary skill in the art (POSITA) at the time of the invention. I understand that both intrinsic and extrinsic evidence can be used to assist in understanding the meaning of a claim. Intrinsic evidence includes the claim language, language in other claims of the patent, the specification, and the prosecution history.

26. I further understand that, unless required by the claim language or specification, claims should generally not be limited to embodiments in the specification, including preferred embodiments. I understand that extrinsic evidence, which consists of all evidence external to the patent and prosecution history including expert and inventor testimony, dictionaries, and learned treatises, may also be relevant to claim construction.

B. Invalidity Based on Prior Art

27. I am informed and understand that each claim of an issued patent is presumed to be valid. In an IPR proceeding, a party challenging the validity of a patent claim, whether an issued claim or a proposed substitute claim, must present a preponderance of the evidence to demonstrate invalidity of that claim.

1. Prior Art

28. I am informed by counsel and understand that in an IPR proceeding, a Petitioner can only rely upon a patent or other publication as prior art. I also understand that a particular patent may claim priority to one or more earlier filed patent applications, and that subject to meeting certain conditions, the effective filing date of that particular patent can be the actual filing date of the earliest patent application in the priority claim of that particular patent. I am also informed and understand that the earliest priority date of a patent is the effective filing date of that patent.¹

29. I understand further that with respect to a challenged patent, a U.S. or foreign patent may qualify as prior art if the date of issuance of the patent is prior to the effective filing date of the challenged patent. A particular U.S. patent that issued after the effective filing date of a challenged patent may qualify as prior art to the challenged patent if the effective filing date of that particular patent is earlier than the effective filing date of the challenged patent.

30. I also understand that a printed publication, such as an article published in a magazine, academic journal, conference proceedings, or trade

¹ I am informed that in certain cases, if the effective filing date is earlier than March 16, 2013, the earliest priority date of that patent may be the date of invention of the claimed invention of that patent.

publication, or U.S. or foreign published patent application qualifies as prior art to a challenged patent if the date of publication of that printed publication is prior to the effective filing date of the challenged patent. Additionally, I am informed and understand that to qualify as prior art, a reference, whether a patent, published patent application, or another printed publication, must contain an enabling disclosure that allows one of ordinary skill to practice the claims without undue experimentation.

2. Anticipation

31. I understand that, once a claim of a challenged patent have been properly construed, the next step in determining whether that claim is anticipated by a prior art reference under 35 U.S.C. § 102 requires a comparison of the properly construed claim language to the prior art reference on a limitation-by-limitation basis.

32. I understand that a prior art reference “anticipates” a challenged claim, and therefore renders the claim invalid, if all elements of the claim are disclosed in that prior art reference, either expressly or inherently (i.e., necessarily present), arranged in the same way as in the claim. I understand that, for inherent anticipation, it is required that the missing descriptive material is necessarily present in the prior art reference, and not merely probable.

33. I also understand that to anticipate a challenged claim, an allegedly anticipatory prior art reference must provide a disclosure that enables the challenged claim. I understand an enabling disclosure describes the invention of the challenged claim in sufficient detail that would allow a POSITA to make and use that invention without undue experimentation.

34. I understand that for the purposes of an IPR proceeding, a patent claim is anticipated if there is proof that, more than one year before the priority date of that claim, the claimed invention was: patented anywhere in the world or described in a printed publication anywhere in the world. This I am informed is called a statutory bar.

35. I have written this declaration with the understanding that, in an IPR, anticipation must be shown by a preponderance of the evidence. I understand that a preponderance of the evidence means that it is more likely than not that the prior art reference discloses all of the elements of a challenged claim.

3. Obviousness

36. I informed by counsel and understand that even if a challenged claim is not anticipated, it may still be invalid pursuant to 35 U.S.C. § 103 as obvious, if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a POSITA.

37. I understand that a POSITA provides a reference point from which the prior art and claimed invention should be viewed. This reference point prevents one from using his or her own insight or hindsight in deciding whether a claim is obvious. I also understand that an obviousness determination includes the consideration of various factors such as (1) the scope and content of the prior art, (2) the differences between the prior art and the challenged claim, (3) the level of ordinary skill in the pertinent art, and (4) the existence of secondary considerations (also called objective indicia of non-obviousness).

38. I am further informed by counsel and understand that a claim is not proved obvious merely by demonstrating that each of the elements was independently known in the prior art. I understand that many inventions rely on known building blocks, and that claimed inventions, often of necessity, can be combinations of what was already known. I understand that it is therefore important to identify whether a reason existed at the time of the invention that would have prompted a POSITA to combine such known elements in the way the claimed invention does. Such reasons are typically described as the motivation to combine two or more prior art references.

39. I understand that an obviousness evaluation can be based on a combination of several prior art references. I understand that the prior art references themselves may sometimes provide a suggestion, motivation, or reason

to combine, but at other times the nexus linking two or more prior art references can be based on the ordinary understandings available to a POSITA. I further understand that obviousness analysis recognizes that market demand, rather than scientific literature, often drives innovation, and that a motivation to combine references may be supplied by the direction of the marketplace.

40. I am also informed by counsel and understand that the use of hindsight must be avoided when considering whether the alleged invention would have been obvious to a POSITA. In assessing obviousness, I have been instructed to consider the distortion caused by hindsight bias, guard against slipping into the use of hindsight, to be cautious of arguments that rely upon after-the-fact reasoning, and to avoid the temptation to read into the prior art the teachings of the invention in issue.

41. I further understand that secondary considerations of non-obviousness (also known as objective indicia of non-obviousness) may include: (1) a long felt but unsolved need; (2) commercial success; (3) unexpected results; (4) industry praise; (5) licensing; and (6) copying by others. I also understand that there must be a relationship or nexus between any such secondary considerations and the claimed invention. Where the offered secondary consideration results from something other than what is both claimed and novel in a challenged claim, there is no nexus to the merits of the claimed invention.

42. I understand that a nexus is presumed where the secondary considerations are tied to a particular product which: (i) embodies the claimed invention and (ii) is coextensive with the claimed invention. In analyzing whether a product is coextensive with the claimed invention, I understand that there is no requirement for a perfect correspondence between the claims and the product, and that the presumption of a nexus can still apply when unclaimed features present in the product amount to nothing more than additional insignificant features.

43. I further understand that Patent Owner bears the burden of demonstrating that the relevant secondary indicia are attributable to the claimed invention, as opposed to other economic and commercial factors unrelated to the technical quality of the patented subject matter. I also understand that contemporaneous and independent invention by others is a secondary consideration supporting an obviousness determination. Additionally, I understand that, as a safeguard against hindsight bias, all secondary considerations of non-obviousness must be considered prior to reaching an obviousness conclusion.

44. It is further my understanding, as informed by counsel, that a proper obviousness analysis focuses on what was known or obvious to a POSITA, not just Patent Owner. Accordingly, I understand that any need or problem known in the field of endeavor at the time of invention and addressed by the challenged patent can provide a reason for combining the elements in the manner claimed.

45. I understand that whether a prior art reference “teaches away” from the claimed invention is a fact to be considered in determining obviousness. I understand that it is improper to combine references where the references teach away from their combination. I understand, however, that the nature of the teaching is highly relevant and must be weighed in substance; a challenged claim may be obvious over a combination of prior art teachings even if one of those teachings has been described as somewhat inferior to some other teachings. Furthermore, I understand that the prior art’s mere disclosure of more than one alternative does not constitute a teaching away from a particular alternatives when such disclosure does not criticize, discredit, or otherwise discourage the use of that alternative.

46. I understand that, in an IPR proceeding, obviousness must be proven by a preponderance of the evidence such that a POSITA at the time of the alleged invention would have had a reason (or reasons) for combining the teachings of those prior art references to achieve the claimed invention, and that the POSITA would have had a reasonable expectation of success of achieving the claimed invention by combining those teachings.

4. Proposed Substitute Claims

47. I am informed by counsel and understand that in a motion to amend, Patent Owner may cancel any challenged claim or propose a reasonable number of

proposed substitute claims for each challenged claim. 35 U.S.C. § 316(d)(1). I am also informed by counsel and understand that there is a rebuttable presumption that a reasonable number of proposed substitute claims per challenged claim is one. 37 C.F.R. § 42.121(a)(3).

48. I am also informed by counsel and understand that per the applicable rules, a motion to amend may be denied if it does not respond to a ground of unpatentability involved in the trial. 37 C.F.R. § 42.121(a)(3). I am further informed and understand that the “rule does not require ... that every word added to or removed from a claim in a motion to amend be solely for the purpose of overcoming an instituted ground,” and that additional modifications may be included. *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 (Information and Guidance on Motions to Amend) at 5-6.

49. Additionally, I am informed by counsel and understand that no proposed substitute claim may enlarge the scope of the claims of the challenged patent. 35 U.S.C. § 316(d)(3); 37 C.F.R. § 42.121(a)(2)(ii). Finally, I am informed by counsel and understand that no proposed substitute claim may introduce new subject matter. 35 U.S.C. § 316(d)(3); 37 C.F.R. § 42.121(a)(2)(ii).

VI. LEVEL OF ORDINARY SKILL IN THE ART

50. My opinions herein are based from my standpoint of a POSITA at the time of invention of the ‘199 patent.

51. The '199 patent claims priority to U.S. Provisional Pat. App. No. 62/309,838 (filed on March 17, 2016) (the "'838 Prov."). I understand that U.S. Patent Appl. No. 15/598,303 (the "'303 App.") (from which the '199 patent issued), was not filed prior to the expiration of the '838 Prov. I also understand, however, that the U.S. Patent Office restored the priority. *See infra* § VIII.B. In my opinion, all of the proposed substitute claims are entitled to claim priority to the filing date of the '838 Prov. My opinions herein would not change even if one or more proposed substitute claims is determined not to be entitled to that priority date.

52. I understand that Petitioners and their expert Dr. Chowdhary have stated that a POSITA would have had "either (1) at least a Bachelor of Science in Mechanical Engineering, Electrical Engineering, Aerospace engineering, Aviation Technologies, Avionics, or an equivalent field, as well as at least 2 years of academic or industry experience in the aerospace, avionics, telecommunications, or electronic device manufacturing industry fields, or (2) at least four years of experience in any of the above industries." Pet. at 10; EX. 1003 ¶ 62. I agree that the qualifications stated above would indicate the level of ordinary skill in the art with respect to the '199 patent.

53. I understand that the Board, for the purpose of deciding whether or not to institute IPR, adopted Petitioners' definition of a POSITA. *See* Paper 10 at

5-6. Under the above-stated definition of the level of ordinary skill in the art, at the relevant time frame, I was a person of more than ordinary skill in the art. I also worked with and managed many people who fit the characteristics of a POSITA, and I am familiar with their level of skill.

VII. SUMMARY OF MY OPINIONS

54. Petitioners have challenged claims 1-9 of the '199 patent on 6 Grounds. I explain below that proposed substitute claims 10-18 are fully supported by the specification of the '199 patent and the '838 Prov., and as such, no new matter is introduced. Proposed independent substitute claim 10 narrows the scope of the corresponding challenged claim 1, by adding further limitations. These further limitations distinguish proposed substitute claim 10 from the cited prior art, individually or in combination with other cited prior art. Proposed dependent substitute claims 11-18 depend from proposed substitute claim 10. As such, all of the proposed substitute claims are responsive to the Grounds asserted in the Petition, and are patentable.

55. In particular, to allow only the authorized UAVs to operate within a restricted airspace, it is determined whether UAV identifier is a permitted identifier. A rogue UAV can transmit a fake identifier, however, masquerading as an authorized one, and gain access to the restricted airspace. To avoid or at least mitigate this problem, the '199 patent describes the use of a secondary identifier,

also called a second factor identifier. The authenticity of the UAV identifier is determined using the secondary / second factor identifier. Should the verification fail, the UAV is determined as unauthorized, and the disruption system is enabled for interdiction.

56. Proposed independent substitute claim recites “verify[ing] an authenticity of the aerial system identifier ... using the second factor identifier.” None of the prior art teaches or suggests using a second factor identifier to authenticate the UAV identifier. Therefore, in my opinion, proposed substitute claims are patentable.

VIII. THE '199 PATENT

A. Administrative Overview

57. The '199 patent issued from U.S. Patent Application No. 15/598,303 (the '303 App."), that was filed on May 17, 2017. EX1001, face page. The '303 App. claims priority to U.S. Provisional Patent Application No. 62/309,838 (the '838 Prov."), filed on March 17, 2016. *See* EX1001, 1:7-9.

B. Prosecution History

58. The '303 App. was filed more than 12 months after the filing date of the '838 Prov., but within two months after the expiration of the '838 Prov., which expired on March 17, 2017. During the prosecution of the '303 App., Applicant

filed a Petition to restore priority. EX1002 at 157-158. The Office granted the Petition. *Id.* at 146-149.

59. In the first Non-Final Office Action mailed on September 17, 2019, claim 1-11 were rejected under 35 U.S.C. 112(b) as being indefinite, for lacking antecedent basis for a particular term of claim 1. *Id.* at 119. In addition to certain objections to the claims and the specification, claims 1-11 were also rejected under 35 U.S.C. § 102 over one prior art reference, and under 35 U.S.C. § 103 over several prior art references. *Id.* at 120-126.

60. In a response filed on December 3, 2018, Applicant amended various claims, including claim 1. *See id.* at 106-112. Thereafter, the Notice of Allowance was mailed on January 2, 2019. *Id.* at 83-92. In the Reasons for Allowance, the Examiner stated that the prior art of the record failed to teach or suggest allowable features recited in various claim elements of claim 1. *See id.* at 89-90.

C. Subject Matter

61. The '199 patent discloses and claims a “discrimination system” that can “discriminate between authorized and unauthorized aerial systems,” and can “treat authorized aerial systems differently from unauthorized” ones, e.g. “leave alone vs. interdict, respectively.” EX1001, 2:42-47. The '199 patent describes that with “the increased popularity of commercial unmanned aerial vehicles (UAVs)” systems for monitoring the airspace for unauthorized UAVs, and preventing

“unauthorized UAVs from entering restricted airspace, and/or selectively remov[ing] unauthorized UAVs from” restricted airspace were needed. *See id.*, 1:19-25.

62. The '199 patent further noted that the goal stated above is difficult to achieve “when authorized UAVs are concurrently within the airspace” along with unauthorized ones, and that a discrimination system was needed. *See id.*, 1:26-36.

To accomplish the goal of effective discrimination, the '199 patent describes a discrimination system 110 that, along with a disruption system 105, also includes an identification system 111 and a permissions module 103. *See id.*, 2:5-10, FIG.

1. As a starting point, the '199 patent discloses that a “wireless communication system” of the identification system 111 “receives an aerial system identifier signal 300 broadcast from an aerial system 300, and the permissions module 105 determines whether the identifier is authorized.” *See id.* 2:10-15.

63. The '199 patent recognizes that a rogue, unauthorized UAV can present a fake identifier to gain access to a restricted airspace. In particular, the '199 patent states. To combat this problem, the '199 patent states: “[d]etermining an aerial system identifier 310 can optionally include **verifying the authenticity** of the aerial system identifier 310. This functions to identify aerial systems 100 with fake identifier transmission systems, wherein such systems can be treated as

unauthorized or otherwise treated.” *Id.*, 16:6-10, FIG. 3. The ’199 patent describes at least two different techniques for verifying the authenticity.

64. According to one technique, “authentication is accomplished by recording a series of broadcast aerial system identifier signals 300 and verifying the authenticity based on the identifier series. For example, the identifier series can be compared to an expected identifier series, wherein the aerial system 100 is deemed fake when the actual series differs from the expected series.” *Id.*, 16:10-17; *see id.* 2:51-57 (disclosing that “the aerial system identifier 300 can be refreshed at a predetermined frequency” which “can function to prevent identifier tampering and/or reproduction”).

65. According to another technique:

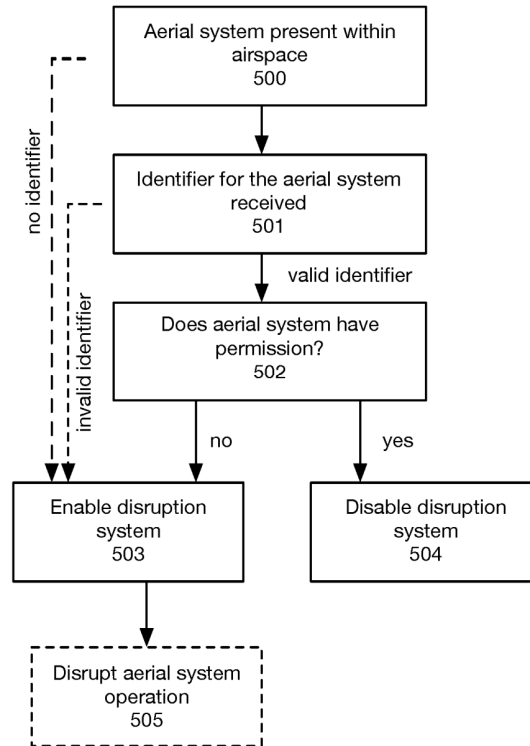
[A]uthentication is accomplished by using a **secondary identifier**. For example, the authenticity of the identifier transmission system 101 can be verified when a first aerial system identifier signal 300 received from a WiFi transmitter (e.g., removably couplable to the aerial system) is associated with a **second aerial system identifier 310** extracted from a pattern of pulsed light (e.g., wherein the light source is integrated into the aerial system 100). In a third variation, authentication is accomplished by using a communications network interface identifier (e.g., **MAC address**). However, the aerial system identifier 310 can be otherwise verified.

Id., 16:17-28; see *id.* 2:57-67 (disclosing that “the aerial system 100 can include a first and second identifier,” “wherein the second identifier can function as” “a **second factor identifier** for the aerial system 100 (e.g., as a **secondary authenticator** for the aerial system, to prevent tampering and /or identifier reproduction”).

66. The '199 patent also distinguishes between an interdiction module actually performing an interdiction action, such launching a net towards a UAV determined to be unauthorized and enabling / unlocking the interdiction module. In particular, the '199 patent states:

[C]ertain scenarios may require the disruption system 105 to be ready to engage on short notice. As depicted in **FIG. 5**, the disruption system 105 may thus be **preemptively enabled** if certain conditions are met (e.g. aerial system detected w/o an identifier 500, identifier is received but is invalid 501, identifier is valid but is not permissioned 502, etc.). Such a configuration would minimize any delays associated with powering on the disruption system 105 and thus allow the system to respond to fast moving aerial systems 100.

67. *Id.*, 19:15-24, FIG. 5.



Id., FIG. 5.

68. Thus, if the identifier is determined to be authorized, the “disruption system 105 can be automatically disabled (e.g., locked)” as no action may be necessary. On the other hand, if the identifier is determined to be unauthorized, the disruption system is “automatically activated (e.g., unlocked).” In this state, a “launcher 303 can launch [an] interdiction module 304 toward the UAV” so as to immobilize and thus remove the unauthorized UAV from the airspace. *See id.* 2:15-26.

69. The ’199 patent describes that the preemptive enabling may accomplished using a control system. *See id.*, 12:54-56 (“The discrimination system 110 can additionally include a control system 104 that functions to

selectively activate or deactivate disruption system operation.”). The ’199 patent further states:

The control system 104 is preferably connected to the disruption system 105, more preferably to the launching mechanism 303 but alternatively the interdiction module 304, but can additionally or alternatively be connected to any other suitable component. The control system 104 is preferably operable between a **locked and unlocked mode**, but can alternatively be operable between any other suitable modes. The control system 104 preferably **locks or otherwise disables** disruption system 105 operation in the locked mode, and **unlocks or otherwise enables** disruption system 105 operation in the unlocked mode.

Id. 12:59-13:3, FIGURE 1.

IX. CLAIM CONSTRUCTION

70. I am informed by counsel and understand that in an *inter-partes* review proceeding, as in a Federal Court, the claims are interpreted according to the *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*) standard. In other words, I am informed and understand, that the claim terms are interpreted according to their “ordinary and customary meaning” also referred to as the plain and ordinary meaning. I have adopted this standard in my analysis of both the issued claims and the proposed substitute claims.

X. PROPOSED SUBSTITUTE CLAIMS COMPLY WITH LAWS AND REGULATIONS PERTAINING TO A MOTION TO AMEND

A. Patent Owner Has Proposed a Reasonable Number of Proposed substitute claims

71. In the motion to amend, for each of the challenged claims 1-9, Patent Owner has proposed only a single corresponding proposed substitute claim. I believe this is a reasonable number of proposed substitute claims.

B. Each Proposed substitute claim Responds to a Ground of Unpatentability

72. Each proposed substitute claim retains all of the limitations of the corresponding challenged claim. Proposed independent substitute claim 10 adds further limitations. As I explain below, none of the prior art cited under any of Petitioners' 6 Grounds teaches or suggests, individually or in combination with other cited prior art, one or more of these **further limitations**. *See infra* § XI. All of the proposed dependent substitute claims depend from proposed substitute independent claim 10. Therefore, in my opinion, the proposed substitute claims respond to one or more Grounds of unpatentability.

C. No Proposed Substitute Claim Enlarges the Scope of the Claims of the '199 Patent

73. As stated above, each proposed substitute claim retains all of the limitations of the corresponding challenged claim. Proposed independent substitute claim 10 is amended to recite further limitations. In proposed substitute

claims 11-18 only the dependencies are amended. As such, in my opinion, no proposed substitute claim enlarges the scope of the claims of the '199 patent.

D. No Proposed substitute claim Introduces New Subject Matter and Is Fully Supported by the Original Disclosure of the '199 Patent

74. I discuss below that the feature(s) recited in each claim element are fully disclosed in the patent application as filed, i.e., the '303 App. In addition, these features are also disclosed in the '838 Prov. to which the '199 patent claims priority. This disclosure includes a written description (and drawings), that would enable a POSITA to make and use a UAV discrimination system as claimed. *See* 35 U.S.C. § 112.

75. In the discussion below, for each claim element I point out the portions of the specification that support the corresponding feature(s) of that claim element. I cite the relevant portions from both the '303 App. and the '838 Prov. Because all of the claim elements of the proposed substitute claims are fully disclosed in the application as filed and in the corresponding priority application, in my opinion, the proposed substitute claims do not introduce new subject matter and also meet the written description and enablement requirements.

1. Proposed substitute claim 10 (Substitute for Claim 1)

a [10.pre] “A discrimination system comprising:”

76. Support for the preamble is found in the '303 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[[1]]10[.pre] A discrimination system comprising:	EX2002 at 1, Title (System and Method for Aerial System Discrimination and Action), at 1:8-10 (“a new and useful aviation discrimination and action system ”), at 2:5 (“FIGURE 1 is a schematic representation of the aerial system discrimination system ”), at 2:18-23 (“[a]s shown in FIGURE 1, the aerial system discrimination system [] includes an aerial system disruption system 105, an aerial system identification system 111, and a permissions module 103. The discrimination system [] can additionally include or use an identifier transmission system 101 configured to mount to, or be embedded in, an aerial system 100. The discrimination system 110 functions to determine whether an aerial system 100 is authorized or unauthorized to be in the airspace”), FIGURE 1; EX2003, Title, ¶¶ 1, 5, 12, FIGURE 1; EX1001, Title, 1:13-15, 1:40-41, 1:60-2:1, FIGURE 1.

77. Thus, the '303 App. and the '838 Prov. both teach a discrimination system for determining whether an aerial system is authorized to be in an airspace. As such, each of the '303 App. and the '838 Prov. teaches the preamble of claim 1.

b [10.a] “an identifier transmission system coupled to an aerial system, wherein the identifier transmission system is configured to broadcast an aerial system identifier signal comprising an aerial system identifier unique to the aerial system”

78. Support for this claim element is found in the '303 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
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[10.a] an identifier transmission system coupled to an aerial system, wherein the identifier transmission system is configured to broadcast an aerial system identifier signal <u>comprising an aerial system identifier</u> unique to the aerial system;	EX2002 at 2:18-22 (“[a]s shown in FIGURE 1, the aerial system discrimination system [] includes an aerial system disruption system 105, an aerial system identification system 111, and a permissions module 103. The discrimination system [] can additionally include or use an identifier transmission system 101 configured to mount to, or be embedded in, an aerial system 100”), FIGURE 1; EX2003, ¶ 12, FIGURE 1; EX1001, 1:60-65, FIGURE 1. EX2002 at 4:8-11 (“in some variations, the identifier transmission system 101 includes a wireless communication chipset 605 (e.g., WiFi, BLE, or LTE chipset), which broadcasts the aerial system identifier 300 over a long geographic distance”), at 6:12-14 (“[t]he aerial system identifier signal 300 can be globally unique, locally unique (e.g., to a geographic location, to an aerial system manufacturer or type, etc.), or generic”), at 3:8-10 (“[t]he aerial system identifier 300 is checked against the permissions module 103, which determines whether the aerial system identifier 300 is associated with an authorized or unauthorized UAV”), EX2003, ¶¶ 14, 17, 13; EX1001, 2:47-51, 3:50-53, 2:12-15. EX2002 at 14:13-16 (“[t]he identifier transmission system 101 preferably periodically or constantly broadcasts the aerial system identifier signal 300, but can alternatively display the aerial system identifier 310, send the aerial system identifier signal 300 in response to receipt of a request for the aerial system identifier 310, or otherwise transmit the aerial system identifier 310. The aerial system identifier 310 preferably identifies an aerial system 100, and is preferably globally unique, but can alternatively be unique for a geographic region, unique for a period of time, generic, or otherwise related to other aerial system identifiers”); EX2003, ¶¶ 44-45; EX1001, 7:51-62.
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	EX2002 at 3:3-8 (“[i]n a specific example, the discrimination system 110 includes: a disruption system 105 including a launcher 303 and an interdiction module 304; an identification system 111 including a wireless communication system; and a permissions module 103 connected to the wireless communication system. In operation, the wireless communication system receives an aerial system identifier signal 300 broadcast from a aerial system 100”), at 8:21-9:1 (“the identification receiver 102 is a wireless communication module including an antenna array 607 and chipset 608 The antenna array 607 of the identification receiver 102 functions to receive broadcast signals from an aerial system 100”), FIGURES 1, 3, 6; EX2003, ¶ 13 (referring to the wireless communication system as a radio and the aerial system as a UAV), ¶ 31, FIGURES 1, 3, 6; EX1001, 2:5-12, 4:64-5:2, FIGURES 1, 3, 6.
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79. Thus, the '303 App. and the '838 Prov. both disclose an identifier transmission system mounted to or embedded in, i.e., coupled to, an aerial system. The identifier transmission system broadcasts the aerial transmitter signal. The signal is globally or locally unique, and is used to determine whether the UAV, i.e., the aerial vehicle, is authorized, and is thus unique to the aerial system. The discrimination system includes an identification system for receiving signals, including the aerial system identifier signal, broadcast from an aerial system. Accordingly, each of the '303 App. and the '838 Prov teaches claim element [10.a].

c [10.b] “an identification system comprising an identification receiver”

80. Support for this claim element is found in the '452 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[10.b] <u>an identification system comprising an identification receiver</u> ;	EX2002 at 2:18-20 (“[a]s shown in FIGURE 1, the aerial system discrimination system [] includes an aerial system disruption system 105, an aerial system identification system 111, and a permissions module 103”), at 3:3-6 (“[i]n a specific example, the discrimination system 110 includes: a disruption system 105 including a launcher 303 and an interdiction module 304; an identification system 111 including a wireless communication system”), at 8:7-8 (“[t]he identification system 111 of the discrimination system 110 functions to receive the aerial system identifier signal 300 from the aerial system 100”), FIGURE 1; EX2003, ¶¶ 12, 13, 29, FIGURE 1; EX1001, 1:60-63, 2:5-10, 4:44-46, FIGURE 1. EX2002 at 8:16-9:1 (“[t]he identification system 111 can include an identification receiver 102, which functions to receive the aerial system identifier signal 300. The identification receiver 102 can be passive (e.g., receive information broadcast by the aerial system 100) In a first variation, as shown in FIGURE 6, the identification receiver 102 is a wireless communication module including an antenna array 607 and chipset 608 The antenna array 607 of the identification receiver 102 functions to receive broadcast signals from an aerial system 100), FIGURE 6; EX2003, ¶¶ 30-32, FIGURE 6; EX1001, 4:57-5:2, FIGURE 6. EX2002 at 9:13-17 (“The chipset 608 of the identification receiver 102 functions to interpret the received aerial system identifier signal 300. The

	chipset 608 preferably interprets the signal 300 into the aerial system identifier 310 (e.g., decrypts the signal, etc.)”), at 28, ll. 8-9 (“[t]he aerial system identifier 310 is preferably determined by the identification receiver 102”); EX2003, ¶¶ 32, 59; EX1001, 5:20-27, 14:60-64. EX2002 at 30:17-18 (“[d]etermining an aerial system identifier 310 can optionally include verifying the authenticity of the aerial system identifier 310”), at 30:24-31:1 (“[i]n a second variation, authentication is accomplished by using a secondary identifier”), at 4:15-20 (“in some variations, the aerial system 100 can include a first and second identifier, transmitted by a first and second identifier transmission system, respectively, wherein the second identifier can function as ... a second factor identifier for the aerial system 100 (e.g., as a secondary authenticator for the aerial system to prevent tampering and/or identifier reproduction)”); EX2003, ¶¶ 14, 66; EX1001, 2:57-64, 16:6-8, 16:17-18.
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81. Thus, the '303 App. and the '838 Prov. both state that the identification receiver receives the identifier signal. The '303 App. and the '838 Prov. each also teaches that the identification receiver receives “information broadcast by the aerial system” and “broadcast signals from an aerial system,” which include the second factor identifier that is included in, and is thus associated with, the aerial system. Both the '303 App. and the '838 Prov. also teach that the identification receiver interprets the identifier signal to determine the aerial system identifier from the identifier signal. Moreover, according to the '199 patent, determining the identifier includes “verifying the authenticity” of the aerial system

identifier, which is accomplished using the second factor identifier. Accordingly, each of the '303 App. and the '838 Prov teaches claim element [10.b].

d [10.c] “a permission module”

82. Support for this claim element is found in the '452 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[10.c1] a permission module,	EX2002 at 2:18-20 (“[a]s shown in FIGURE 1, the aerial system discrimination system [] includes an aerial system disruption system 105, an aerial system identification system 111, and a permissions module 103”), FIGURE 1; EX2003, ¶ 12, FIGURE 1; EX1001, 1:60-63, FIGURE 1. EX2002 at 3:3-6 (“[i]n a specific example, the discrimination system 110 includes: a disruption system 105 including a launcher 303 and an interdiction module 304; an identification system 111 including a wireless communication system; and a permissions module 103 connected to the wireless communication system. In operation, the wireless communication system receives an aerial system identifier signal 300 broadcast from a aerial system 100. The aerial system identifier 300 is checked against the permissions module 103, which determines whether the aerial system identifier 300 is associated with an authorized or unauthorized UAV”), FIGURE 1; EX2003, ¶ 13, FIGURE 1; EX1001, 2:5-15, FIGURE 1. EX2002 at 18:8-13 (“[a]s shown in FIGURE 3, the permissions module 103 of the discrimination system 110 functions to store permissions for the physical volume and/or individual aerial systems. The permissions module 103 can additionally function to determine whether the aerial system

	100 has permission for a physical volume (e.g., restricted airspace 301ab), and/or generate operation permissions for the disruption mechanism 105 based on whether the aerial system identifier 310 is permitted”), FIGURE 3; EX2003, ¶ 40, FIGURE 3; EX1001, 9:53-61, FIGURE 3.
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83. Thus, the '303 App. and the '838 Prov. each discloses a permission module that stores permissions for the physical volume of an airspace and an aerial system, and determines whether a particular aerial system has the permission to enter a particular airspace. Accordingly, each of the '303 App. and the '838 Prov teaches claim element [10.c].

e [10.d] “wherein the identification receiver is configured to receive the aerial system identifier signal and a second factor identifier associated with the aerial system”

84. Support for this claim element is found in the '303 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[10.d] wherein the identification receiver is configured to receive the aerial system identifier signal <u>and a second factor identifier associated with the aerial system; [[and]]</u>	<i>See supra</i> element [10.b] (disclosing the identification receiver receives from the identifier transmission system broadcast signals that include the aerial system identifier signal and the secondary / second factor). EX2002 at 9:13-17 (“The chipset 608 of the identification receiver 102 functions to interpret the received aerial system identifier signal 300. The chipset 608 preferably interprets the signal 300 into the aerial system identifier 310 (e.g., decrypts the signal, etc.)”), at 28, ll. 8-9 (“[t]he aerial system identifier 310 is preferably determined by the

	identification receiver 102”); EX2003, ¶¶ 32, 59; EX1001, 5:20-27, 14:60-64. EX2002 at 8:16-9:1 (“[t]he identification system 111 can include an identification receiver 102, which functions to receive the aerial system identifier signal 300. The identification receiver 102 can be passive (e.g., receive information broadcast by the aerial system 100) In a first variation, as shown in FIGURE 6, the identification receiver 102 is a wireless communication module including an antenna array 607 and chipset 608 but can alternatively include any other suitable component. The antenna array 607 of the identification receiver 102 functions to receive broadcast signals from an aerial system 100), FIGURE 6; EX2003, ¶¶ 30-31, FIGURE 6; EX1001, 4:57-5:2, FIGURE 6.
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85. Thus, the '303 App. and the '838 Prov. both disclose that the identification receiver receives the identifier signal. The '303 App. and the '838 Prov. each also teaches that the identification receiver receives “information broadcast by the aerial system” and “broadcast signals from an aerial system,” which include the secondary / second factor identifier that is included in, and is thus associated with, the aerial system.

86. Both the '303 App. and the '838 Prov. also teach that the identification receiver interprets the identifier signal to determine the aerial system identifier from the identifier signal. Moreover, according to the '199 patent, determining the identifier includes “verifying the authenticity” of the aerial system

identifier, which is accomplished using the second factor identifier. Accordingly, each of the '303 App. and the '838 Prov teaches claim element [10.d].

f [10.e1] “wherein the identification system is configured to determine and verify an authenticity of the aerial system identifier of the aerial system identifier signal using the second factor identifier; and to provide an authenticated aerial system identifier of the aerial system identifier signal when the authenticity has been determined and verified, and”

87. Support for this claim element is found in the '303 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
<u>[10.e1] wherein the identification system is configured to determine and verify an authenticity of the aerial system identifier of the aerial system identifier signal using the second factor identifier, and to provide an authenticated aerial system identifier of the aerial system identifier signal when the authenticity has been determined and verified, and</u>	EX2002 at 30:17-18 (“ [d]etermining an aerial system identifier 310 can optionally include verifying the authenticity of the aerial system identifier 310 ”), at 30:24-31:1 (“ [i]n a second variation, authentication is accomplished by using a secondary identifier ”), at 4:15-20 (“in some variations, the aerial system 100 can include a first and second identifier , transmitted by a first and second identifier transmission system, respectively, wherein the second identifier can function as ... a second factor identifier for the aerial system 100 (e.g., as a secondary authenticator for the aerial system to prevent tampering and/or identifier reproduction)”), EX2003, ¶¶ 14, 66; EX1001, 2:57-64, 16:6-8, 16:17-18.

88. Accordingly, each of the '303 App. and the '838 Prov teaches claim element [10.e1].

g [10.e2] “to provide the authenticated aerial system identifier of the aerial system identifier signal to the permission module, and”

89. Support for this claim element is found in the ’452 App. and the ’838

Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[10.e2] to provide <u>the authenticated aerial system identifier of the aerial system identifier signal to the permission module, and</u>	<i>See supra</i> element [1.b] (describing that the identification module determines the aerial system identifier from the aerial system identifier signal, and that the determination includes verifying the authenticity of the aerial system identifier). EX2002 at 3:3-6 (“the discrimination system 110 includes: ... an identification system 111 including a wireless communication system; and a permissions module 103 connected to the wireless communication system”), FIGURE 1; EX2003, ¶ 13, FIGURE 1; EX1001, 2:5-10, FIGURE 1. EX2002 at 9:13-17 (“The chipset 608 of the identification receiver 102 functions to interpret the received aerial system identifier signal 300. The chipset 608 preferably interprets the signal 300 into the aerial system identifier 310 (e.g., decrypts the signal, etc.)”), at 30:17-18 (“[d]etermining an aerial system identifier 310 can optionally include verifying the authenticity of the aerial system identifier 310”); EX2003, ¶¶ 32, 66; EX1001, 5:20-27. EX2002 at 9:20-22 (“[t]he chipset 608 can be connected to the permissions module 103, wherein the chipset 608 sends the raw or processed signal to the permissions module 103 for permissions determination”), at 18:13-16 (“[t]he permissions module 103 is preferably connected to, and receives information from, the identification receiver

	102 ”), FIGURES 3, 6; EX2003, ¶¶ 32, 40, FIGURES 3, 6; EX1001, 5:31-34, 9:61-64, FIGURES 3, 6.
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90. Thus, both the '303 App. and the '838 Prov. disclose that the identification receiver is configured to provide the determined and verified aerial system identifier that was determined from an aerial system identifier signal to the permission module for permissions determination. Accordingly, each of the '303 App. and the '838 Prov teaches claim element [10.e2].

h [10.f] “wherein the permission module is configured to determine that the aerial system associated with the authenticated aerial system identifier of the aerial system identifier signal is not permitted to be in an airspace; and”

91. Support for this claim element is found in the '452 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[10.f] wherein the permission module is configured to determine that the aerial system associated with <u>the authenticated aerial system identifier</u> of the aerial system identifier signal is not permitted to be in an airspace; and	EX2002 at 3:6-10 (“[t]he aerial system identifier 300 is checked against the permissions module 103 , which determines whether the aerial system identifier 300 is associated with an authorized or unauthorized UAV ”), at 18:8-13 (“[t]he permissions module 103 can additionally function to determine whether the aerial system 100 has permission for a physical volume (e.g., restricted airspace 301ab) , and/or generate operation permissions for the disruption mechanism 105 based on whether the aerial system identifier 310 is permitted”), FIGURES 1, 3; EX2003, ¶¶ 13, 40, FIGURES 1, 3; EX1001, 2:12-15, 9:55-61, FIGURES 1, 3. EX2002 at 32:20-22 (“[d]etermining a set of permissions associated with the restricted airspace

	functions to identify metrics by which to determine whether the aerial system 100 is permitted within the airspace”), at 35:3-10 (“[d]etermining whether the aerial system parameters are permitted based on the set of permissions functions to determine: whether the aerial system is permitted within the airspace The aerial system parameters can be: permitted, prohibited, partially permitted”), at 35:17-20 (“the aerial system is deemed not permitted when the aerial system lacks an identifier, the identifier is not on the list of permitted aerial system identifiers for the airspace, or the identifier is on a list of prohibited aerial system identifiers for the airspace”); EX2003, ¶¶ 69, 74, 75; EX1001, 17:13-16, 18:21-31, 18:42-47.
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92. Thus, both the '303 App. and the '838 Prov. teach that the permission module can determine that the aerial system associated with the aerial system identifier determined from an aerial system identifier signal is not permitted to be in an airspace. Accordingly, each of the '303 App. and the '838 Prov teaches claim element [10.f].

- i [10.g] “a disruption system configured to disrupt an operation of the aerial system (i) when it is determined by the permission module that the aerial system associated with the authenticated aerial system identifier of the aerial system identifier signal is not permitted to be in an airspace, or (ii) when the authenticity of the aerial system identifier of the aerial system identifier signal is not verified, wherein the disruption system is preemptively enabled based on the received aerial system identifier signal”*

93. Support for this claim element is found in the '452 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[10.g] a disruption system configured to disrupt an operation of the aerial system <u>(i) when it is determined by the permission module that the aerial system associated with the authenticated aerial system identifier of the aerial system identifier signal is not permitted to be in an airspace, or (ii) when the authenticity of the aerial system identifier of the aerial system identifier signal is not verified</u>, wherein the disruption system is preemptively enabled based <u>on</u> the received aerial system identifier signal.	EX2002 at 2:18-20 (“[a]s shown in FIGURE 1, the aerial system discrimination system [] includes an aerial system disruption system 105”), at 3, ll. 3-6 (“the discrimination system 110 includes: a disruption system 105 including a launcher 303 and an interdiction module 304”), at 20:9-14 (“[i]n one variation, shown in FIGURE 3, the disruption system 105 can include a launching system 303 and an interdiction module 304, which cooperatively function to intercept, then interdict, the aerial system 100”), FIGURES 1, 3; EX2003, ¶¶ 12, 13, 21, FIGURES 1, 3; EX1001, 1:60-63, 2:5-10, 10:56-59, FIGURES 1, 3. EX2002 at 3:10-17 (“[t]he disruption system 105 can be automatically disabled (e.g., locked) in response to determination that the UAV is authorized, and/or automatically activated (e.g., unlocked) in response to determination that the UAV is unauthorized (e.g., reporting an unauthorized identifier, not reporting an identifier, etc.). When the disruption system 105 is in an unlocked state, the launcher 303 can launch the interdiction module 304 toward the UAV, wherein the interdiction module 304 can immobilize the motive mechanism of the aerial system 100 (e.g., by disabling the power system, entangling the motive mechanism, etc.)”); EX2003, ¶ 13; EX1001, 2:15-26. EX2002 at 30:17-20 (“[d]etermining an aerial system identifier 310 can optionally include verifying the authenticity of the aerial system identifier 310. This functions to identify aerial systems 100 with fake identifier transmission systems, wherein such systems can be treated as unauthorized or otherwise treated”), at 2:22-3:2 (“[t]he discrimination system 110 functions to determine whether an aerial system 100 is authorized or unauthorized to be in the airspace. The discrimination system no can additionally function

to **prevent**, disrupt, **remove**, or otherwise interact with an **unauthorized aerial system** within the airspace”); EX2002 ¶¶ 12, 66; EX1001, 1:66-2:4, 16:6-10.

EX2002 at 36:20-37:2 (“certain scenarios may require the disruption system 105 to be **ready to engage on short notice**. As depicted in **FIGURE 5**, the disruption system 105 may thus be **preemptively enabled** if certain conditions are met (e.g. aerial system detected w/o an identifier 500, **identifier is received but is invalid 501**”), at 24:4-5 (“[t]he discrimination system 110 can additionally include a control system 104 that functions to selectively activate or deactivate disruption system operation”), at 24:10-15 (“[t]he control system 104 is preferably operable between a **locked and unlocked mode** The control system 104 preferably locks or otherwise disables disruption system 105 operation in the locked mode, and **unlocks or otherwise enables disruption system 105 operation in the unlocked mode**”), **FIGURE 5** (depicting that the disruption system is enabled for disrupting an aerial system upon determining that the aerial system does not have permission); EX2003, ¶ 42, **FIGURE 5**; EX1001, 12:54-56, 12:63-13:3, 19:15-21, **FIGURE 5**.

EX2002 at 26:9-15 (“[a]s shown in **FIGURE 2**, the method for aerial system discrimination and action includes: determining that an aerial system has entered restricted airspace 200, determining an aerial system identifier 300 for the aerial system 201, determining a set of permissions associated with the restricted airspace 202, and determining whether the aerial system parameters are permitted based on the set of permissions 203. Further, if the **aerial system is not permitted, enabling a disruption system 204**, and disrupting the operation of the aerial system 205”), **FIGURE 2**; EX2003, ¶ 54, **FIGURE 2**; EX1001, 13:62-14:4, **FIGURE 2**.

	EX2002 at 36:4-6 (“[t]he method can optionally include controlling disruption system operation based on the aerial system permission determination, which functions to selectively enable or disable the disruption system”), at 36:8-14 (“[c]ontrolling disruption system operation can include: selecting a disruption system operation mode based on the determined aerial system permission and controlling the disruption system operation to meet the selected mode. Selecting a disruption system operation mode based on the determined aerial system permission preferably includes: selecting an enabled operation mode in response to aerial system classification as not permitted (e.g., prohibited) and selecting a disabled operation mode in response to aerial system classification as permitted”); EX2003, ¶ 76; EX1001, 18:57-60, 18:63-19:6.
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94. Thus, the '303 App. and the '838 Prov. each discloses a disruption system 105 that can be preemptively enabled, i.e., enabled for disrupting an aerial system upon determining that the aerial system does not have permission, or is unauthorized, e.g., because its identifier was not authenticated, where such determination is made e.g., when the aerial system identifier determined from the received aerial system identifier signal is found to be invalid. Accordingly, each of the '303 App. and the '838 Prov teaches claim element [10.g].

95. Thus, the '303 App. and the '838 Prov. individually disclose all of the limitations recited in proposed substitute claim 10.

2. Proposed Substitute Claim 11 (Substitute for Claim 2)

96. Proposed substitute claim 11 recites: “[t]he system of claim 10, wherein the identifier transmission system and the identification receiver communicate using a radio chipset that is compatible with a communication protocol selected from the following: WiFi, LTE, or Bluetooth”

97. Support for proposed substitute claim 11 is found in the ’303 App. and the ’838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[[2]11. The system of claim 10, wherein the identifier transmission system and the identification receiver communicate using a radio chipset that is compatible with a communication protocol selected from the following: WiFi, LTE, or Bluetooth.	EX2002 at 4:8-11 (“in some variations, the identifier transmission system 101 includes a wireless communication chipset 605 (e.g., WiFi, BLE, or LTE chipset), which broadcasts the aerial system identifier 300 over a long geographic distance”), at 8:21-23 (“as shown in FIGURE 6, the identification receiver 102 is a wireless communication module including an antenna array 607 and chipset 608”), FIGURES 1, 3, 6; EX2003, ¶¶ 14, 31, FIGURES 1, 3, 6; EX1001, 2:48-51, 4:64-67, FIGURES 1,3, 6. <i>See also</i>, EX2002 at 30, ll. 17-18 (“[d]etermining an aerial system identifier 310 can optionally include verifying the authenticity of the aerial system identifier 310”), at 31:1-7 (“the authenticity of the identifier transmission system 101 can be verified when a first aerial system identifier signal 300 received from a WiFi transmitter (e.g., removably couplable to the aerial system) is associated with a second aerial system identifier” or with “a communications network interface identifier (e.g., MAC address)”), at 40 (claim 2); EX2003, ¶ 66;; EX1001, 16:6-8, 16:18-27.

98. Thus, the '303 App. and the '838 Prov. disclose an identifier transmission system having a WiFi, BLE (i.e., Bluetooth Low Energy), or LTE chipset, and an identification receiver that is a wireless communication module that includes a chipset 608 and that receive a aerial system identifier signal broadcast by the identifier transmission system. As such, the identifier transmission system and the identification receiver can communicate using radio chipsets that are compatible with WiFi, LTE, or Bluetooth. As such, the '303 App. and '838 Prov. each teaches the limitations recited in proposed substitute claim 11.

3. Proposed Substitute Claim 12 (Substitute for Claim 3)

99. Proposed substitute claim 12 recites: “[t]he system of claim 10, wherein the identification receiver is a mobile device.”

100. Support for proposed substitute claim 12 is found in the '303 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[[3]]12. The system of claim 10, wherein the identification receiver is a mobile device.	EX2002 at 11:15-18 (“the identification reader 102 is mounted to a mobile mounting point (e.g., the disruption system, second aerial system, etc.)”), at 8:14-17 (“the identification system 111 can be part of a secondary system, such as a user device 405 (e.g., a smartphone, tablet , etc.). The identification system 111 can include an identification receiver 102”), 40 (claim 4); EX2003, ¶ 36; EX1001, 6:25-30.

101. Thus, both the '303 App. and the '838 Prov. disclose that the identification reader / receiver 102 can be mounted to a mobile mounting point, or

may be included in a smartphone or tablet. As such, the '303 App. and the '838 Prov. both teach an identification receiver that is a mobile device. As such, the '303 App. and '838 Prov. each teaches the limitations recited in proposed substitute claim 12.

4. Proposed Substitute Claim 13 (Substitute for Claim 4)

102. Proposed substitute claim 13 recites: “[t]he system of claim 10, wherein the identifier transmission system is configured to be reassigned from a first aerial system to a second aerial system.”

103. Support for proposed substitute claim 13 is found in the '303 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[[4]]13. The system of claim 10, wherein the identifier transmission system is configured to be reassigned from a first aerial system to a second aerial system.	EX2002 at 14:17-23 (“ [d]ynamic aerial system identifiers can be generated, re-assigned, ... in response to the occurrence of a trigger event (e.g., upon user reassignment of the identifier transmission system 101 to a different aerial system)”), at 16:23-17:3 (“[t]he coupling mechanism of the identifier transmission system 101 functions to couple the identification transmitter to the aerial system 100. The coupling mechanism ... can ... be removable (e.g., transient), such that the identifier transmission system 101 can be moved between different aerial systems 100”); EX2003, ¶¶ 45, 50; EX1001, 7:63-8:5, 9:6-12. EX2002 at 37:21-38:4 (“[a]s shown in FIGURE 4 the method can optionally include reassigning identifier transmission systems 101 to different aerial systems Reassigning the identifier transmission system 101 can include: detecting a reassignment event 401

	... detecting an assignment event for a second aerial system 402”), at 38, ll. 5-8 (“reassignment event can include: physical identifier transmission system 101 removal from the first aerial system 401 ”), at 38, ll. 16-21 (“[t]he assignment event can be: physical identifier transmission system 101 coupling to a second aerial system 402 ”); EX2003, ¶ 78; EX1001, 19:51-67, 20:11-19.
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104. Thus, the '303 App. and the '838 Prov. both disclose reassigning an identifier transmission system by removing it from one aerial system and coupling and assigning it to another aerial system. As such, the '303 App. and '838 Prov. each teaches the limitations recited in proposed substitute claim 13.

5. Proposed Substitute Claim 14 (Substitute for Claim 5)

105. Proposed substitute claim 14 recites: “The system of claim 10, wherein when the disruption system is enabled the aerial system is caused to be removed from the airspace.”

106. Support for proposed substitute claim 14 is found in the '303 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[[5]]14. The system of claim 10, wherein when the disruption system is enabled the aerial system is caused to be removed from the airspace.	EX2002 at 43 (Abstract) (“[t]he discrimination system can additionally function to prevent, disrupt, remove , or otherwise interact with an unauthorized aerial system within the airspace ”), at 2, l. 23 to 3, l. 3 (stating the same), at 41 (claim 7); EX2003, ¶ 12, EX1001, Abstract. EX2002 at 3:10-17 (“[t]he disruption system 105 can be ... automatically activated (e.g., unlocked) in

response to determination that the UAV is unauthorized (e.g., reporting an unauthorized identifier, not reporting an identifier, etc.). When the disruption system 105 is in an **unlocked state, the launcher 303 can launch the interdiction module 304** toward the UAV, wherein the interdiction module 304 can immobilize the motive mechanism of the aerial system 100 (e.g., by disabling the power system, entangling the motive mechanism, etc.)”); EX2003, ¶ 13; EX1001, 2:15-26.

EX2002 at 20:9-14 (as “shown in FIGURE 3, the disruption system 105 can include a launching system 303 and an **interdiction module 304**, which cooperatively function to intercept, then **interdict, the aerial system 100**. However, the disruption system 105 can include a jamming system, an electromagnetic disruption system, a buckshot system ..., an ablation system, a projectile net system, or any other suitable mechanism capable of interfering with aerial system operation”), at 21:12-19 (“[t]he interdiction module 304 of the disruption system 105 functions to **interfere with aerial system 100 traversal through airspace**. The interdiction mechanism 304 preferably interferes with aerial system 100 **motive mechanism operation**, but can additionally or alternatively interfere with the aerial system electronics and controls, disrupt the electrical connections between the control system and the motive mechanism ... to **disrupt aerial system traversal through airspace**”), FIGURE 3; EX2003, ¶ 21, 23, FIGURE 3; EX1001, 10:56-64, 11:28-39, FIGURE 3.

EX2002 at 21:20-21 (“the interdiction module 304 includes a **net that entangles the aerial system motive mechanism**”), at 22:9-11 (“the interdiction module 304 includes a **set of masses (e.g., bullets)** that physically **intercept the aerial system motive mechanism and/or electronics**”), at 22:18-20 (“the interdiction module 304 includes collated light (e.g.,

	a laser) that physically intercepts and burns the aerial system motive mechanism and/or electronics”); EX2003, ¶¶ 24-26; EX1001, 11:40-41, 11:58-60, 12:4-7.
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107. Thus, both the '303 App. and the '838 Prov. disclose that the disruption system can remove “an unauthorized aerial system within the airspace.” To this end, the '303 App. and the '838 Prov. both disclose that the disruption system is automatically unlocked and enabled upon determining the presence of an unauthorized aerial vehicle in the airspace. The '303 App. and the '838 Prov. each also describes that the disruption system can interfere with the motive, electronics, and/or controls of the unauthorized aerial system. Instruments such as a net, bullets, and a laser can be used for causing the interference. Interference with the motive, electronics and/or controls would cause the unauthorized aerial vehicle to be removed from the airspace. As such, the '303 App. and '838 Prov. each teaches the limitations recited in proposed substitute claim 14.

6. Proposed Substitute Claim 15 (Substitute for Claim 6)

108. Proposed substitute claim 15 recites: “[t]he system of claim 10, wherein the disruption system comprises of a projectile launcher and an interdiction module”

109. Support for proposed substitute claim 15 is found in the '303 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[[6]]15. The system of claim 10, wherein the disruption system comprises of a projectile launcher and an interdiction module.	EX2002 at 20:9-14 (as “shown in FIGURE 3, the disruption system 105 can include a launching system 303 and an interdiction module 304, which cooperatively function to intercept, then interdict, the aerial system 100. However, the disruption system 105 can include a jamming system, an electromagnetic disruption system, a buckshot system (e.g., a system that fires buckshot), an ablation system, a projectile net system ”), at 21:20-21 (“the interdiction module 304 includes a net that entangles the aerial system motive mechanism”), 22, ll. 4-8 (“the net can be part of a two-stage system, wherein the net is encapsulated within an airframe. The airframe is launched from the launching mechanism 303, and the net is subsequently launched from the airframe while the airframe is in flight. However, the net can be otherwise propelled toward the target ”), at 41 (claim 8), FIGURE 3; EX2003, ¶¶ 21, 24, FIGURE 3; EX1001, 10:56-64, 11:40-41, 11:52-57, FIGURE 3.

110. Thus, the '303 App. and the '838 Prov. disclose a “projectile net” that can be launched from an airframe, i.e., a projectile launcher. The airframe itself can be launched from a launcher included in the interdiction module. As such, the '303 App. and '838 Prov. each teaches the limitations recited in proposed substitute claim 15.

7. Proposed Substitute Claim 16 (Substitute for Claim 7)

111. Proposed substitute claim 16 recites: “[t]he system of claim 10, wherein the disruption system comprises of an interceptor drone coupled with an interdiction module”

112. Support for proposed substitute claim 16 is found in the '303 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[[7]]16. The system of claim 10, wherein the disruption system comprises of an interceptor drone coupled with an interdiction module.	EX2002 at 20:9-14 (as “shown in FIGURE 3, the disruption system 105 can include a launching system 303 and an interdiction module 304, which cooperatively function to intercept, then interdict, the aerial system 100”), at 23:16-18 (“the interdiction module 304 is propelled from a second aerial system (e.g. an interceptor drone) towards a target aerial system 100 when the target aerial system 100 is in ra[n]ge of the second aerial system”), FIGURE 3; EX2003, ¶ 21, FIGURE 3; EX1001, 10:56-59, 12:37-40, FIGURE 3.

113. As such, the '303 App. and '838 Prov. each teaches the limitations recited in proposed substitute claim 16.

8. Proposed Substitute Claim 17 (Substitute for Claim 8)

114. Proposed substitute claim 17 recites: “[t]he system of claim 10, further comprising a control system for controlling the disruption system”

115. Support for proposed substitute claim 17 is found in the '303 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[[8]]17. The system of claim 10, further comprising a control system for controlling the disruption system.	EX2002 at 24:4-5 (“[t]he discrimination system 110 can additionally include a control system 104 that functions to selectively activate or deactivate disruption system operation”), at 24:12-15 (“[t]he control system 104 preferably locks or otherwise disables disruption system 105 operation in the

	locked mode, and unlocks or otherwise enables disruption system 105 operation in the unlocked mode”), at 41 (claim 10), FIGURE 1; EX2003, ¶ 42, FIGURE 1; EX1001, 12:54-56, 12:66-13:3, FIGURE 1. <i>See also</i> supra element [10.d] (describing the control, including enabling and disabling of the disruption system by the control system).
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116. The '303 App. and the '838 Prov. each discloses that by activating / deactivating and/or enabling / disabling the disruption system, the control system controls the disruption system. As such, the '303 App. and '838 Prov. each teaches the limitations recited in proposed substitute claim 17.

9. Proposed Substitute Claim 18 (Substitute for Claim 9)

117. Proposed substitute claim 18 recites: “[t]he system of claim 10, further comprising a logging system that is configured to record activity of at least one of the identification receiver, the permission module, or the control system”

118. Support for proposed substitute claim 18 is found in the '303 App. and the '838 Prov. at least at the portions cited below.

Claim Element	Support in the Specification
[[9]]18. The system of claim [[8]]10, further comprising a logging system that is configured to record activity of at least one of the identification receiver, the	EX2002 at 25:13-21 (“[t]he discrimination system 110 can additionally include a logging system 106 that functions to store and/or provide histories for aerial system identifiers 310 (e.g., generated by the identifier transmission system 101, static identifier for the aerial system 100, etc.), airspace volume, an entity associated with a set of airspaces, an entity associated with a set of aerial systems, or any other

permission module, or the control system.	suitable history. The history can include: operation history (e.g., SOC, flight velocity, etc.), parameters for aerial system collocation within a given volume of airspace (e.g., airspace identifier, timestamps, concurrent weather proximal the airspace, etc.), or any other suitable historic parameter”), FIGURE 1; EX2003, ¶ 43, FIGURE 1; EX1001, 13:34-45, FIGURE 1. EX2002, at 25:21-26:7 (“[t]he history is preferably generated (automatically, etc.) in response to aerial system identification within the airspace (e.g., wherein the logging system can be coupled to the identification receiver), in response to determination of unauthorized aerial system presence within the airspace (e.g., wherein the logging system can be coupled to the permissions module) The history can be used to predict aerial system action given a set of current operation parameters (e.g., using machine learning algorithms), to verify that the aerial system was within restricted airspace, to identify or verify the aerial system (e.g., wherein the discrimination system can query the aerial system for historic information, and verifies the aerial system upon receipt of the correct historic information)”), at 41 (claim 11), FIGURE 1; EX2003, ¶ 43, FIGURE 1; EX1001, 13:45-60, FIGURE 1.
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119. Thus, the '303 App. and the '838 Prov. each discloses a discrimination system that includes a logging system that is coupled to the identification receiver and/or the permission module, for recording histories, i.e., activity of these modules. At the permission module, “in response to determination of unauthorized aerial system presence within the airspace,” the activity of the control system, e.g., in disabling / activating the disruption system is recorded. As

such, the '303 App. and '838 Prov. each teaches the limitations recited in proposed substitute claim 18.

120. In light of the foregoing, it is my opinion that each of the proposed substitute claims 10-18 is fully supported by the original disclosure of the '199 patent and the '838 App., and that none of the proposed substitute claims adds new subject matter.

XI. PROPOSED SUBSTITUTE CLAIMS ARE PATENTABLE

121. I am informed by counsel and understand that Petitioners “bear[] the burden of persuasion to show, by a preponderance of the evidence, that any proposed substitute claims are unpatentable.” 37 C.F.R. § 42.121(d)(2). Nevertheless, I discuss below that each of the proposed substitute claims is patentable over the prior art cited in the Grounds asserted this IPR proceeding. I have not been provided with any particular combinations of the cited prior art as allegedly rendering proposed independent substitute claim 10 obvious. Therefore, at this time I do not present any opinion about the motivation to combine, or lack thereof, the references that I discuss below.

122. In this IPR, the sole challenged independent claim is claim 1. In Ground 1, Petitioners contend that claim 1 is unpatentable over Whitmarsh. *See* Pet. at 15-35. In Ground 3, Petitioners contend that claim 1 is unpatentable over the combination of Whitmarsh and Goodrich. *See id.* at 40-51. In Ground 5,

Petitioners contend that claim 1 is unpatentable over the combination of Viggiano and Goodrich. *See id.* at 51-69. In Grounds 2, 4 and 6 alleging unpatentability of dependent claim 4, Petitioners cite Falk. *See id.* at 35-40, 51, 69. These references in the context of the limitations of the proposed substitute claims are discussed below.

123. Proposed independent substitute claim 10 is patentable at least because it recites “an identification receiver ... configured to receive the aerial system identifier signal and a second factor identifier”; and an “identification system [] configured to determine and verify an authenticity of the aerial system identifier ... using the second factor identifier, and to provide an authenticated aerial system identifier ..., and to provide the authenticated aerial system identifier ... to the permission module.”

124. Among the IPR Prior Art, Whitmarsh appears to describe “a drone defense system (DDS) ... to effect one or more countermeasures against unwanted or unauthorized drone incursions into defined air space.” EX1006 ¶ 3. Whitmarsh states that the “drone defense system may also involve a remote transmission security system (RTSS) which may be used to take control of or commandeer an unauthorized, undesired, or rogue drone.” *Id.* ¶ 6. Whitmarsh also states that “[a]ll drones have a unique identifier, such as a media access control (MAC) address,

that can be determined or read by the DDS and used to identify the drone.” *Id.* ¶ 13.

125. Whitmarsh further states that “[a]ll drones with definable MAC addresses are tagged by the DDS. All non-MAC address drones activate the countermeasures system.” *Id.* ¶ 16. Whitmarsh’s “DDS Tags all drones and does a MAC address check at the local and national registry. If no MAC address is detected, or if it is not registered, the DDS activates the countermeasures system.” *Id.* ¶ 17. Whitmarsh also states that “RTSS is the first defensive system that can ID a drone's signature.” *Id.* ¶ 7.

126. Regarding signatures that may be used to identify a done, Whitmarsh states:

RTSS determines threat level and identifies (IDs) the drones. In one embodiment, the **RTSS identifies**, classifies, and categorizes the unauthorized or hostile drones by their **signatures. Each movement is computed and observed.** Each tracking signature may be processed in conjunction with one or more information databases, including, for example a local database or a national database (the national registry database structure is currently being defined) to record the signature of each non-recognized signature and each event. The RTSS will record them and once the national database is online, it will attempt to match the signature of the drone or device with its owner. The **behavior of the unauthorized or hostile drone is recorded with its signature identification.**

Id. ¶ 10. Thus, the “signature” that Whitmarsh describes is not an identifier of the drone, but an attribute of the drone – its movement pattern that may be used to identify (or “ID” as Whitmarsh states) the drone. Whitmarsh’s signature is **computed and observed**. It is not received as an identifier by the DDS.

127. Whitmarsh further states:

DDS will enable creation of a National Registry for a Cloud based highly secure DDS Database that interacts with the DMV for classification, registration, and recording the signature ID of a Drone and its MAC address (MAC addresses are like the VIN Numbers on vehicles). The DDS would **cross-check** Drones being tracked for authentication and verification **via the DMV and DDS Database** that transmits to DDS “RTSS” to activate an action.

Id. at 23 (Section “Regulation”).

128. To the extent Whitmarsh discloses the MAC address of a drone as the claimed “identifier signal unique to the aerial system,” Whitmarsh does not teach or suggest any other identifier that is received by the DDS, RTSS, or any other system. Whitmarsh discloses a “signature ID”, but as shown above, it is an attribute of a drone – a drone’s movement pattern – that is **computed and observed**. As such, Whitmarsh does not teach or suggest a “received” “second factor identifier,” as claimed in proposed substitute claim 10. To the extent Whitmarsh describes “authentication and verification” of a drone, Whitmarsh does not teach or suggest verifying the authenticity of the MAC address using any additional identifier that is

received as an identifier, i.e., using a received second factor identifier.

Accordingly, in my opinion, Whitmarsh does not teach or suggest any of the above-stated limitations of proposed substitute claim 10.

129. Viggiano appears to describe a system and method that “requires ADS-B systems to respond to authentication challenges, verifying the identity of the ADS-B systems using an authentication challenge-response format.” EX1007 ¶ 6. In particular, Viggiano teaches that an “Authenticator’s system generates a unique identifier and transmits an authentication challenge 12, which includes the unique identifier, to the ADS-B transmitter 20.” *Id.* ¶¶ 12, 13. The ADS-B transmitter on the aircraft uses “the unique identifier, the ADS-B transmitter’s ID 22 and specific data 24” to “generate its authentication challenge response.” *Id.* ¶ 13. The challenge response received from the aircraft by the ground station, whether unencrypted or encrypted, is not a second factor identifier.

130. Falk appears to describe a “beacon ... attached to an unmanned aerial vehicle” where the “beacon includes first indicia identifying an owner or responsible party, and second indicia identifying a particular unmanned aerial vehicle.” EX1011, 3:42-44. “At least a portion of the first and second indicia together form a unique identifier associating the owner or responsible party with the unmanned aerial vehicle.” *Id.*, 3:44-47. Falk also discloses:

[A] beacon 100 may include first indicia 121 that encodes in an optical form the information required by regulation, and second indicia 122 that encodes in a computer-readable form the information required by regulatory requirements. In other embodiments, the beacon 100 may include first and second indicia 121, 122 that have different information. For example, the first indicia 121 may only include the information required by regulation, and the second indicia 122 may only include additional information such as the intended flight plan for the UAV or the intended purposes of the UAV.

Id. 6:36-46, FIG. 1.

131. Falk does not disclose authenticating the first indicia of a beacon using a second indicia thereof, or vice versa. As such, neither of the two indicia is “a second factor identifier associated with the aerial system” used “to determine and verify an authenticity of the aerial system identifier of the aerial system identifier signal,” as proposed substitute claim 10 recites.

132. Regarding authentication, Falk describes “a UAV 10 [] deployed with a particular sensory package for surveillance,” that collects and stored information for “later retrieval and analysis.” *Id.* 7:48-54. Falk states that “information retrieved from the indicia 120 may be encoded into the information” collected by the sensory package, “so that the information retrieved from the indicia 120 helps provide assurances regarding the authenticity of the data collected by the UAV 10.” *Id.* 7:54-65.

133. To the extent the beacon and/or the indicia 120 therein constitute an “aerial system identifier,” the “data collected by the UAV” is not an identifier associated with the UAV. As such, the “data collected by the UAV” is not a “second factor identifier associated with the aerial system” recited in proposed substitute claim 10. For the same reason, the “data collected by the UAV” is also not the “aerial system identifier of an aerial system identifier signal” that is “unique to the aerial system,” as proposed substitute claim 10 recites. Therefore, it is my opinion that Falk does not teach or suggest any of the above-stated limitations of proposed substitute claim 10.

134. For its part, Goodrich appears to disclose “an interceptor UAV that is launched toward a detected target UAV. The target UAV is detected, for example, by a ground-based detector,” and the “interceptor UAV then flies autonomously to intercept the target UAV.” EX1008 ¶ 11. Goodrich is silent on any identifiers associated with a UAV, and as such, does not teach or suggest any of the above-stated limitations of proposed substitute claim 10.

135. It is my opinion that none of the IPR Prior Art teaches or suggests at least the above-stated limitations of proposed substitute claim 10. Therefore, in my opinion proposed substitute claim 10 is patentable. Proposed substitute claims 11-18 depend from proposed substitute claim 10, and are therefore patentable at least for that reason.

XII. CONCLUSION

136. For the foregoing reasons, it is my opinion that proposed substitute claims 10-18 are patentable.

137. I currently hold the opinions that I have expressed in this declaration. My analysis may continue, however, as I may acquire or receive additional information or insights that may result in revised or supplemental observations or opinions.

138. I understand this declaration may be used as evidence in the instant IPR proceeding the PTAB.

139. I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 or Title 18 of the United State Code, and that such willful false statements may jeopardize the validity of the '199 patent.

140. I declare under penalty of perjury that the foregoing is true and correct.

Dated: December 19, 2025

Respectfully submitted,



Dr. Nikolaos Papanikolopoulos