

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLIED CONCEPTS INC.

Petitioner,

v.

KUSTOM SIGNALS INC.,

Patent Owner

U.S. Patent No. 11,194,039

DECLARATION OF DR. CHRIS G. BARTONE. P.E.

1. I am Dr. Chris Bartone and I work in Athens, Ohio.
2. I have been retained as an independent expert consultant in this IPR2024-00829 proceeding before the United States Patent and Trademark Office (“USPTO”), involving Applied Concepts Inc. (“ACI”, “Petitioner”) and Kustom Signals Inc. (“Kustom”, “Patent Owner”), regarding U.S. Patent No. 11,194,039 (“the ’039 patent”) (Ex. 1001). The ’039 patent is assigned on its face to Kustom. I have been retained on behalf of Kustom. . As President of GNSS Solutions® Ltd, I

am being compensated at my nominal hourly rate for the time I spend on this matter, and no part of my compensation is dependent on the outcome of this proceeding, and I have no other interest in the outcome of this case, the '039 patent, or any proceeding involving ACI. or Kustom.

3. I have reviewed the information provided to me by Kustom's council and other open-source information. I will cite previously identified exhibit numbers. I base my opinions stated in this declaration on the materials I have reviewed in this matter and the significant experience I have.

4. I have been asked to evaluate the '039 patent, along with its prosecution history, if the inventions claimed in the '039 patent would have been obvious to a person of ordinary skill in the art (POSITA), at the time of the priority claim of the '039 patent, as the Petitioner has alleged.

My Background, Education, Training, and Experience

5. I summarize my educational and professional background, publications, and other relevant qualifications. I have over 40 years of professional experience in communication, navigation, and surveillance (CNS) systems. I have over 30 years of experience with GPS and GPS-based systems and applications. I received my Ph.D. in electrical engineering (EE) from Ohio University in 1998,

where I specialized in electronic navigation systems. I received a MSEE from the Naval Postgraduate School in 1987, where I specialized in Communications Engineering. I received a BSEE from The Pennsylvania State University in 1983, where I had an emphasis in communications and antenna systems. I am a licensed professional engineer in the state of Ohio since 2002.

6. I am a Fellow of the Institute of Navigation (ION) and recipient of the ION Captain P.V.H. Weems Award for my sustained contributions in research, applications and teaching in the areas of electronic navigation, GNSS, and antenna technologies. I also received the RTCA William E. Jackson Award for my outstanding contributions to aviation as reflected in my Ph.D. dissertation entitled Ranging Airport Pseudolite for Local Area Augmentation Using the Global Positioning Systems. I am also a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE) professional association.

7. My research concentrates on all aspects of CNS systems, with emphasis on GPS and GPS-based applications. For over 40 years, I have supported various organizations including the United States Department of Defense (Navy, Air Force, Coast Guard, Florida Air National Guard), the Department of Transportation (DOT) (Volpe Research Center, Federal Aviation Administration, Federal Railroad

Administration), and commercial contractors (Northrup Grumman, Spectral Systems Incorporated/Sierra Nevada Corporation, Spectracom). I also have experience with automotive radar systems used in automatic cruise control applications.

8. I have authored over 100 professional publications including refereed journal papers, refereed conference/magazine publications, conference papers, patent applications (4 awarded), technical reports, and textbooks on GNSS. I am the co-author of the textbook, Global Navigation Satellite Systems, Inertial Navigation, and Integration (John Wiley & Sons). (Global Navigation Satellite Systems is a more general term that includes GPS and other countries' satellite navigation systems.)

9. As a Professor at Ohio University within our School of Electrical Engineering and Computer Science, I have developed and teach several graduate classes including:

- a. EE6053 Satellite-based Navigation Systems
- b. EE6023 High Accuracy Satellite Navigation
Systems
- c. EE4403/5403 Antenna and Microwave Device
Theory

- d. EE6023 Radar Systems
- e. EE6903 Satellite Communication Systems
- f. EE6013 Electromagnetic Wave Propagation in
Electronic Navigation Systems
- g. EE3214/EE3223 Electromagnetics and Materials I
& II (undergraduate classes)

10. For over the past 20 years, I have continuously taught GPS classes at the graduate level, GPS seminars prior to the Institute of Navigation (ION) GPS/Global Navigation Satellite Systems (GNSS) Conference, as well as internationally.

11. In addition to my work as a professor, I also have significant experience as a consultant dealing with CNS and GPS-based systems. As president of GNSS Solutions® Ltd, I have provided technical consulting and services, specializing in technical seminars, technical expert legal support, and engineering services in the CNS areas. As a technical expert, I have consulted on over 20 patent litigation and contract dispute cases, many of which involved CNS systems, including GPS-based positioning and radar-based devices (e.g., commercial police radar detectors). I have

tested many radar-based detection devices and performed test using roadside speed detection radar devices.

12. Prior to joining Ohio University, I worked for the Naval Air Warfare Center performing research, development, and testing on various CNS and electronic warfare systems, including airborne radar-based (i.e., secondary radar) systems.

13. My curriculum vitae (CV) is attached as Exhibit 2003; it provides additional details on my background, education, training, and experience as a technical expert, including the CNS, GNSS, telematics, and radar aspects related to this case.

GPS Background Information

14. GNSS is an acronym for Global Navigation Satellite System. GNSS generically refers to various satellite-based navigation systems including the Global Positioning System (GPS). While GNSS is a generic system, I may interchangeably refer to GPS and GNSS in discussions in this declaration. The GPS is a space-based radionavigation system designed to provide all-weather 24/7 position, navigation and timing (PNT) service across the globe. Early experimentation on GPS began back in the 1960s, saw the first GPS NAVSTAR satellite (Block I) launched in 1978

by the United States Department of Defense (DOD). While GPS was funded by the DOD for military purposes, it did have open-source signal components.

15. The GPS operates on multiple frequency in the L-band (1-2 GHz) with various PNT signal structures to support military and civil users for a wide variety of user applications. The GPS system provides two levels of service for two general classes of users, the GPS Standard Positioning Service (SPS) for civil users and the Precise Positioning Service (PPS) for authorized Government users. The GPS uses multiple frequencies and codes for the navigation signals transmitted from the GPS satellites. The Legacy GPS signals operated at the GPS L1 (1575.42MHz) with course acquisition (C/A) code and/or encrypted Precise (P(Y)) code. Civil and non-authorized users typically utilize the GPS L1 C/A code to calculate their position, velocity and time (PVT) solution.

16. The GPS is comprised of three main segments, the Space Segment, the Control Segment, and the User Segment:

- a. The GPS Space Segment (i.e., the GPS constellation) consists of the GPS satellites in a Medium Earth Orbit (MEO) and have an orbital period of 11hours, 58minutes, and 02 seconds. The

satellites move constantly across the sky with respect to a user on or near the surface of the Earth. The power level of the GPS signals received near the surface of the Earth is very low (i.e., -160 dBW or about 1×10^{-16} Watts).

- b. The GPS Ground Control Segment (GCS) consists of the various ground reference receivers located throughout the globe that receive the GPS signals, and the GPS timing information that is received from the U.S. Naval Observatory. The U.S. Air Force 2nd Space Operations Squadron (2 SOPS) plays a key role in the GPS Control Segment by operating and maintaining the GPS satellite constellation. Using high-quality GPS receiver located throughout the Globe, at known locations, the GPS GCS determines the GPS satellite locations and transmitter clock offsets, and

encodes these data into the data message format
that is transmitted by the GPS satellites.

- c. The GPS User Segment consists of the various
military and civil users of the systems for a wide
variety of applications. A GPS user will use a GPS
antenna with GPS receiver to receive and process
the GPS signals that are transmitted by the GPS
satellites to produce an estimate of the range to
each GPS satellite (i.e., pseudorange), which may
be used to calculate a position, velocity, and time
(PVT) user solution.

17. Using precise time and known position data from these specialized satellites, a ground-based GPS receiver can be used to locate the position of the ground-based receiver with respect to satellites and thus its absolute position on the face of the Earth using triangulation calculations based on the time and space data. The initial goal for the GPS system was to employ a network—or constellation—of at least 24 satellites in orbit so that a GPS receiver could “see” at least four satellites from any point on Earth, thereby allowing the GPS receiver to accurately triangulate

its position based on the time and positioning data embedded in the satellite data. Although the initiative launched in 1978, it wasn't until 1993 before 24 GPS satellites were in orbit.

18. While initially used by the U.S. military, an unfortunate event in 1983 opened the door for civilian use of GPS. Korean Air Flight 007 from New York to Seoul, South Korea via Anchorage, Alaska, which was shot down by Soviet forces when the airline's crew made a navigational error and accidentally drifted over Soviet-restricted airspace. Soviet forces incorrectly believed the airline was executing military operations, which led to its downing of the aircraft. As a result of this catastrophe, President Reagan issued an order authorizing civilian use of the GPS system in an effort to avoid such disasters in the future.

19. As the GPS was developed, various "Blocks" of GPS Space Vehicles (SVs), i.e., satellites, have been deployed to replenish and enhance the space constellation. The early Block I SVs were considered developmental, where the performance of the GPS was tested. The last GPS Block I SV, (11 of 12) was launched in 1985. Initial developmental testing of GPS revealed the GPS Standard Positioning Service (SPS) performance for civil applications was much better than predicted, which posed a problem for the DOD. The follow-on GPS Block II SVs

were design to implement a technique known as Selective Availability (SA), which as discussed below, purposefully degraded the accuracy of the civil SPS. In 1989 DOD launched the first GPS Block II SV with SA enabled mid-year, which began the performance degradation of GPS SPS for civil applications. When all of the GPS Block II SVs were deployed the DOD enabled the SA technique in the GPS constellation on July 4, 1991, where SPS users achieved position accuracies on the order of 100m. The DOD declared an initial Operating Capability (IOC) of GPS on December 8, 1993, where the GPS constellation was made up of 24 operational SVs, with SA enabled. As GPS constellation continued to develop, the DOD declared a Final Operational Capability (FOC) of the GPS on April 27, 1995.

20. To counter the performance degradation due to SA and to improve the PVT accuracy of the GPS, researchers began developing prototype differential GPS concepts and techniques using one or more dedicated reference stations. These DGPS techniques involved forming measurements, calculations, and corrections at one or more reference stations and then communicating these corrections to the user. For these DGPS techniques to be useful to the user, the DGPS reference stations should be sufficiently close to the user (so that common error terms do not spatially decorrelate over distance) and provide the corrections to the user in a timely manner

(so that common error terms do not temporally decorrelate over time) for the intended application. In the 1990s, initial DGPS research concentrated on DGPS for maritime users and later development concentrated on DGPS for airborne users.

GPS User Solution and Error Considerations

21. A GPS receiver will receive the GPS signals transmitted by the GPS satellites and process the signals to produce a user position, velocity, and/or time solution (i.e., “user solution”). The received GPS signals will provide the user GPS receiver with knowledge of the GPS satellite locations (with the inherent errors encoded by the GPS GCS), and GPS satellite transmitter clock offsets (with the inherent errors encoded by the GPS GCS).

22. GPS, and other GNSSs, are essentially one-way ranging systems, so knowledge of the satellite constellation data including the satellite locations and transmitter clocks are important to minimize user solution error. Using the received GPS signal information from the constellation of satellites, the GPS receiver would make code-phase and carrier-phase measurements. While the code-phase measurements are related to the true range between a given GPS satellite antenna and the user antenna, they are referred to as “pseudorange measurements” because

they have error on them. A POSITA would be well aware of the various errors on these GNSS measurements include¹:

- a. Satellite position errors (even after using the encoded data),
- b. Satellite transmitter clock errors (even after using the encoded data),
- c. Atmospheric errors:
- d. induced by the ionosphere as the signals pass through it,
- e. induced by the troposphere as the signals pass through it.
- f. Signal multipath, as the received signal is a combination of the direct signal received and reflected signals received.
- g. Receiver processing noise.

23. A POSITA would recognize Macneille presents various error terms and the challenge in obtaining accurate GPS position, velocity, and time (PVT)

¹ Exhibit 2006, Chapter 7, pg 250-254, 263-270, 285-289.

calculations for vehicle applications. (Ex. 2001 1:7-2:10, 3:17-58). Macneille demonstrates that a POSITA recognizes the errors above that I have discussed and would need to take those errors into consideration when deciding the suitability or acceptability of potentially adopting GPS solutions in a given context.

24. To calculate a user solution, the GPS receiver would need to calculate 4 unknown variables: the user 3D location (i.e., location in Earth Centered to Earth Fixed Coordinate System, (x, y, z) location, and the receiver clock error offset.

25. The user solution may be accomplished using various methods, (e.g., ordinary-least squares, Kalman Filter) to produce the user solution. These non-linear user solutions use a concept of “tri-lateration” to iteratively solve for the user solution. The trilateration technique is similar to a triangular technique but performed in 3D, where the user equipment clock error (i.e., clock bias) is also calculated.

26. In addition to error on the measurements, the accuracy of the user PVT solution is also affected by the number of GPS satellites used in the solution and the dispersion of the satellite in space. These factors may be characterized in terms of the “dilution of precision (DOP)” parameters, which relates the measurement error in the “range or measurement domain” to the errors in the solutions domain (e.g.,

position domain). The DOP parameters can be further characterized in terms of PDOP (Position DOP), HDOP (Horizontal DOP), VDOP (Vertical DOP), and TDOP (Time DOP). For example, if the error on each of the measurements is the same value of 20 meters, and the HDOP is 3, the expected error in the horizontal direction of the position solution would be the multiplication of these two terms, or 60 meters.

27. Because of the number, nature, and variability of errors that are introduced into GPS user solution calculations, due to the error sources on the measurements, GPS position error is not constant. Rather, they vary statistically. In other words, a GPS receiver in a fixed position will report a position that wanders or drifts over time as a result of the inconsistent, but ever-present conditions affecting the system. Consequently, different accuracy measurements are often reported with a given GPS receiver or system so that the user of such system understands its constraints and appropriately accounts for them. A POSITA would understand that they may consider the availability, accuracy, continuity, and/or integrity of a systems or sensor for a given application.

28. How often the user PVT solution is calculated is user, equipment, and application specific. The user PVT solutions may calculate the user GPS

antenna/receiver location in an Earth Centered Earth Fixed (ECEF) coordinate system, which may be translated into a Latitude Longitude Height (LLH) coordinate system.

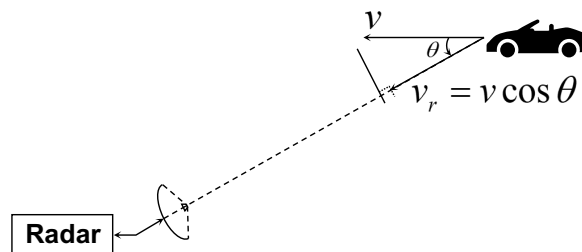
Radar Background Information

29. Radar is an acronym for radio detection and ranging, is a non-cooperative technique to determine the position and/or velocity of a target, relative to the radar device. Radar systems typically uses a highly-directional antenna to transmit a signal, that travels outward from the radar device. This signal reflects off of moving and stationary objects, and these reflected signals are subsequently received by the radar device. For a single-antenna mono-static type of radar architecture, the same highly directional antenna is used for the transmission and reception of the radar signals. Depending upon the radar design, target detection may be determined by the received signal amplitude, frequency and/or phase.

30. In the context of traffic radar systems used by patrol vehicles, these types of radars operate in various frequency bands (e.g., X, K, Ka, and Ku) and are typically based on continuous wave (CW) formats. CW-based radars are known to be low cost.

31. CW-based radars that implement a simple sinusoidal can effectively process a returned signal when one target is within the field of view of the highly-directional antenna. When multiple targets are within the field of view of the directional antenna, multiple target returns are present, depending upon the power levels of the signals received, can produce intermodulation products, and make the detection of the desired target processing more difficult.

32. For these types of traffic radar systems, the signal is transmitted at one frequency, and then the received signal is received at a different frequency, that included a potential Doppler shift induced by the relative line-of-sight motion between the radar and the target. The received signal is processed to measure the Doppler frequency induced on the received signals by targets within the radar antenna field of view. The Doppler frequency can be related to the relative line-of-sight velocity of a given target. The figure below I made illustrates this.



33. The Doppler frequency is related to the radial speed (i.e., line-of-sight velocity) and the transmitted signal characteristics as:

$$f_d = \frac{2 v_r}{\lambda_t} = \frac{2 f_t v_r}{c}$$

where:

f_t = radar transmitter frequency, [Hz]

λ_t = radar transmitter wavelength, [m]

c = speed of light = 3.0×10^8 m/s

and,

v_r = radial velocity between the radar and the target, [m/s]

v_r = " + " when the relative range (i.e., distance) is Decreasing between the radar and the target

v_r = " - " when the relative range (i.e., distance) is Increasing between the radar and the target

34. With knowledge of the Doppler frequency induced on the received signal, the relative speed of the target can be determined.

35. In order to determine the absolute (line-of-sight) speed of a target the speed of the radar needs to be determined. Initially, a determination (either manual or automatic) needs to be made if the radar is stationary or moving. If the radar is stationary, the relative line-of-sight speed of the target can be used directly as the absolute line-of-sight speed of the target. If the patrol vehicle radar is determined to

be stationary, the radar may be faced with processing one or more target vehicles within the radar antenna field of view.

36. Robust automatic determination of static or mobile is desirable as it would reduce the workload of the radar operator (i.e., patrol officer) in the patrol vehicle. However, the complexity and effectiveness of an automatic static or mobile determination of the radar system is sensor dependent and how the sensor information is presented to the radar system.

37. If the radar is determined to be moving, then the radar must determine the speed of the radar, and then use this speed to determine the absolute line-of-sight speed of the target.

38. If the patrol vehicle radar is determined to be moving, the radar may be faced with not only processing one or more target vehicles, as well as, signals with significant and varying Doppler frequencies being received from stationary objects, such as the road/roadside objects. Determining the accurate speed of the patrol vehicles from the Doppler shifted signals received from road/roadside objects has been a challenge over the decades, as the Doppler frequency received from the road/roadside objects varies, as function of the line-of-sight velocity; see my figure above, and this phenomenon may be referred to the “cosine effect”. It is well known

that accurately determining the speed of the patrol vehicle is critical in producing an accurate absolute estimate of the target vehicle speed so that a valid overspeed citation could be issued by law enforcement officers. The goal to accurately determine the speed of the patrol vehicle, and provide robust target speed determination is at the heart of this technology.

Prosecution History of U.S. Patent No. 11,194,039

39. In my review of the prosecution history there are several significant items to note. (Ex. 1002 at 69-79) It is evident that the USPTO examiner closely reviewed the claims of the '039 patent and the prior art. In the early prosecution of the '039 patent, the examiner rejected all claim of the Application 16/137,860 as being either indefinite, anticipated, or obvious over two Aker Applications and one Okamura Application. The Aker US 2005/0062642 Application ("Aker1") titled "System and Method for Determining Patrol Speed" disclosed a simultaneous dual configuration (i.e., front and rear antenna) that may be used to determine the patrol speed or speedometer data. The Aker US 2006/0181449 Application ("Aker2") titled "Vehicle Traffic Surveillance Doppler Radar Systems" disclosed a dual configuration (i.e., front and rear antenna) that used Frequency Modulation techniques to determine the range and speed of target vehicles. In Aker2 the patrol

vehicle speed may be determined from the radar returns or by a vehicle speedometer.

[Aker2, [0051]] The Okamura US 2018/0225961 Application titled “Speed Limit Violation Control System and Speed Limit Violation Control Method” discloses a system that uses video images, taken at different times, to determine the target vehicle speed. Okamura has a GNSS unit to detect position information. These prior art references (Aker1, Aker2, and Okamura) are very similar and contain some of the same features the Petitioner relies upon in their obvious arguments.

40. To traverse the anticipation rejection of the then claim 1 (and dependent claims), the application pointed out the distinctive features of the ‘039 patent whereby “the processing element receives a plurality of digital data samples derived from one of either the first or second electronic signal”, and its effect on the signal processing of the digital data samples. (Ex. 1002 57-66) The applicant presented differences on the signal processing performed on both the front and back data in Aker1 and only one antenna (front or rear) in the application. The applicant highlighted the differences from the prior art with a “newly added step of converting the speed of the patrol vehicle (from the speed determining element) to a frequency bin number, that marks the center of the a window outside of which the spikes of other vehicles are determined.” (Ex. 1002 at 59) In response to the applicant’s

arguments filed on 29 June 2021, the examiner stated the applicants have overcome the art of record, however, claim 1 was still rejected based on indefiniteness. To traverse the indefinite rejection of claim 1, the application added clarity to claim 1, and in particular, the part of claim 1 that reads “a speed determining element configured to determine and output a speed of the patrol vehicle and not **receive signals or data from** the patrol vehicle; and”. (‘039 patent, claim 1, bold emphasis added); the bold emphasis added is the additional clarification the applicant added. In the USPTO prosecution history, the examiner provided allowance over several Aker, Okamura, applications.

41. A POSITA would recognize, as did the USPTO examiner, that a very unique and innovative aspect of claim 1 in the ‘039 patent that the speed determining element DOES NOT receive signals or data from the patrol vehicle. A POSITA would understand that no interface is needed to the host patrol vehicle as these interfaces are varied and complex. This is described in the ‘039 patent. (Ex. 1001, 1:39-48).

Overview of U.S. Patent No. 11,194,039

42. I have reviewed the specification and claims of U.S. Patent No. 11,194,039 (Ex. 1001), which was filed in the United States on September 21, 2018,

and the prosecution history of the '039 patent (Ex. 1002). I understand that the '039 patent is based on provisional U.S. applications filed October 9, 2017 (62/569,667; and 62/569,923) and October 10, 2017 (62/570,446). I understand that each of these provisional applications is incorporated into and made a part of the '039 patent. (Ex. 1001, 1:6-19). I therefore understand that prior art constitutes publications and patent materials that were published before the earliest filed provisional application on October 9, 2017.

43. The '039 patent describes a traffic radar system with patrol vehicle speed detection. (Ex. 1001, Title; 1:24-26). The '039 patent relates to devices employed for instance by law enforcement officers in the targeting of speeders and issuance of speeding tickets to speeders. A POSITA, as further discussed below, would understand that the legal ramifications of the issuance of a speeding ticket and legal sustainability thereof before a court of law mandates defensible, instantaneous, and accurate speed determination of the patrol vehicle and target vehicle.

44. The '039 patent explains, in the context of traffic radar systems used for patrol vehicle speed detection that:

Prior art traffic radar systems have accessed the patrol vehicle speed from the patrol vehicle itself. But connecting to traffic radar system to the patrol vehicle's speed detection electronics may be difficult and time consuming.

Furthermore, each patrol vehicle make and/or model may be a different protocol to output the patrol vehicle's speed, thereby requiring multiple software or firmware interfaces for the traffic radar system to properly receive the patrol vehicle speed from different vehicles.
(Ex. 1001, 1:39-48)

45. The '039 patent then describes:

Embodiments of the current invention solve the above-mentioned problems and provide a distinct advance in the art of traffic radar systems. An exemplary traffic radar system includes a patrol vehicle speed detector that is independent from the patrol vehicle and thus requires no connection to the patrol vehicle and no specific vehicle software or firmware interfaces.
(Ex. 1001, 1:52-58)

46. The '039 patent explains that in the context of traffic enforcement, knowing the speed of a patrol vehicle is important to be able to accurately calculate the speed of a target vehicle. Prior solutions for determining the speed of a patrol vehicle tapped signals originating from the patrol vehicle itself, i.e., signals associated with the speedometer of the patrol vehicle. (Ex. 1001, 1:37-43). But, as explained by the '039 patent, tapping a patrol vehicle's speedometer took time and was difficult for a number of reasons, including the fact that different makes and models of patrol vehicles selected by law enforcement agencies employ different protocols, data rates, etc. to represent speed data that would all need to be decoded and interpreted by speed enforcement devices to properly understand a patrol

vehicle's speed to be used in calculating a target vehicle's speed and, ultimately, issuing a ticket. (Ex. 1001, 1:30-49)

47. Thus, the '039 patent describes embodiments of the invention in which the radar device is independent from the patrol vehicle and requires no connection to the patrol vehicle and no specific vehicle software or firmware interface. (Ex. 1001, 1:51-58).

48. To accomplish this, embodiments of the claimed invention employ a speed determining element that "is configured to receive and process radio frequency signals from a global navigation satellite system to determine and output a speed of the patrol vehicle" that is then used as part of the calculation of the targeted vehicle speed calculation process. (Ex. 1001, 2:26-30).

49. The '039 patent describes:

The speed determining element 22 generally determines a speed of the main unit 34 and by extension, the patrol vehicle 30. The speed determining element 22 may receive and process radio frequency (RF) signals from a multi-constellation global navigation satellite system (GNSS) such as the global positioning system (GPS), the GLONASS system, the Galileo system, the quasi-zenith satellite system (QZSS), and so forth. The speed determining element 22 may also may [sic] receive and process RF signals from telecommunications networks that provide or utilize Assisted GPS (A-GPS).

(Ex. 1001, 5:50-5:60).

50. U.S. Provision application serial number 62/569,923, incorporated by reference into the '039 patent, explains that “data from a GPS receiver or other constellation module [is used] to steer or assist the DSP signal processing search of the Doppler return information for the patrol vehicle’s radar return signal to improve accuracies.” (Ex. 2005, at 21, [0002]). The “system determines the patrol vehicle speed through a combination of constellation data and radar return.” (*Id.*, at 23, [0011]; *see also id.*, [0013] (“using the independent GPS sensor data for determining a search window to guide or steer the DSP processing of the radar measured speed of the patrol vehicle.”)).

51. The '039 patent discloses generally how calculation of the target vehicle speed is accomplished depending on whether the patrol vehicle is stationary or moving. “If the patrol vehicle 30 is in stationary mode, then the target vehicle speed, that was just converted, is an absolute, or actual, target vehicle speed. If the patrol vehicle 30 is in moving mode, then the target vehicle speed is a speed relative to the speed of the patrol vehicle 30.” (Ex. 1001, 9:19-23). Thus, it is important for the radar device to know whether the patrol vehicle is moving or stationary.

52. To accomplish the automatic distinction of modes between stationary and moving, the '039 teaches additional steps to be performed to provide an accurate speed determination. These steps ensure an accuracy speed determination is produce for the patrol vehicle speed, due to the noisy nature of GPS/GNSS measurements, and the determination of the position and speed of the patrol vehicle. As explained earlier in the GPS Background Information section of this declaration, a POSITA would understand the '039 patent characterizes these noisy characteristics as to what the '039 calls "GPS jitter" or "GPS drift." GPS jitter is phenomena in which a GPS's reported location, i.e., its latitude and longitude, changes over time when the GPS receiver is in fact stationary. A number of common reasons for GPS jitter, sometimes called "drifting," include:

- a. SA technique where each of the satellite transmitter clock are "dithered" to produce a non-common clock error, which degrades the user solution, and changes over time.
- b. changes in atmospheric conditions from the ionosphere that attenuate, delay, and distort the with GPS signals;

- c. changes in atmospheric conditions from the troposphere that attenuate, delay and distort with GPS signals;
- d. multipath interference
- e. multipath signal interference in which physical obstacles like trees, bridges, road signs, buildings, and other topographical obstructions deflect GPS signals;
- f. signal interference present in the environment that may be intentionally or un-intentionally be produce in the GPS/GNSS frequency bands.
- g. Receiver noise within the GNSS receiver.

53. To overcome this GPS jitter problem, the '039 patent, and particularly provisional application serial number 62/569,923, identifies a technique that “improves rejection of jitter in the stationary GPS positioning data.” (Ex. 2005, at 30, [0032]). The improved jitter rejection method employs thresholds to make the automatic mode determination. The '923 application notes “Auto-Mode switching

is improved by setting tolerances and time requirements on the switching.” (Ex. 2003, at 30, [0032]). Thus, the ’039 patent explains:

Based on the value of the patrol vehicle speed, the processing element 26 sets a mode of speed detection to either “stationary”, if the patrol vehicle speed is less than a first threshold speed for at least four consecutive satellite data messages, or “moving”, if the patrol vehicle speed is greater than a second threshold speed for at least four consecutive satellite data messages. An exemplary first threshold speed is 1.1 mph. An exemplary second threshold speed is 3.1 mph.

(Ex. 1001, 7:49-57; *see also* 11:27–33).

54. By adopting this dual-threshold, non-zero, with different positive values, thresholding methodology rather than simple reliance on the binary zero/non-zero, single-threshold choice, the ’039 patent overcomes the GPS jitter problems present in the art to automatically determine the appropriate methodology for calculating a target vehicle’s speed based on the speed of the patrol vehicle.

55. The ’039 patent describes using a patrol vehicle speed based upon a speed determining element’s processing of GPS data in the form of an RMC-format satellite data message:

An example of the RMC-format satellite data message that is output from the speed determining element 22 is shown in FIG. 5. An explanation of the contents of the satellite data message is shown in the table of FIG. 6. The table includes three columns: a first column that lists a plurality of fields that

are included in each message, a second column that lists an example of each field, and a third column that lists a description of each field or optional values that could be included in each field. One of the fields in the satellite data message is “Speed Over Ground”, which is the speed of the patrol vehicle 30 around the time that the satellite data message is generated.

(Ex. 1001, 7:27-38).

56. The '039 patent describes a method of initializing the speed determining element by sending command messages to the speed determining element to program the format of the data output by the speed determining element. In this manner, the performance of the speed determining element is improved. (Ex. 1001, 6:64-7:3).

The processing element 26 communicates a first command to the speed determining element 22 that sets a format of its satellite data message to an RMC message, or Recommended Minimum Specific GNSS data. This reduces the amount of data included in each satellite data message from the speed determining element 22. The processing element 26 communicates a second command to the speed determining element 22 that decreases the time period between position fixes, which is when the speed determining element 22 determines its position, speed, and other data that is included in the satellite data message. The second command has the effect of increasing the number of satellite data messages that the speed determining element 22 can produce per second. An example of the second command sets the time period to 200 milliseconds, thereby setting the satellite data message rate to 5 times per second. The processing element 26 communicates a third command to the

speed determining element 22 that increases the bit communication rate output by the speed determining element 22. Thus, each time the speed determining element 22 outputs the satellite data message, it generates the message more quickly. Other command messages may be sent to the speed determining element 22 to further customize the data output.

(Ex. 1001, 7:3-26). This “improvement to the GPS communications is to limit the constellation message to a certain type, increase the output update rate to higher than once per second, and to increase the baud rate.” (Ex. 2005, at 27, [0029]). “At the default output rate of once per second there can be a lot of change in the ‘Speed Over Ground’ value if the patrol vehicle is accelerating or deaccelerating.” (*Id.*) Thus, the ‘039 patent describes clearly that the “processing element 26 may complete the target vehicle speed determination process multiple times per second.” (Ex. 1001, 10:4–17).

57. Thus, a POSITA would recognize the ‘039 teaches that the GNSS receiver must be configured to, and provide the needed GNSS position data at a rapid rate so that the speed determining element 22 can accurately determine the speed of the patrol vehicle. A POSITA would also recognize that the ‘039 teaches this update rate to be faster than a nominal GPS measurement rate (i.e., 1 Hz), where the ‘039

teaches this update rate to be 5 times per second (i.e., 5 Hz), where update interval would be 200msec.

58. The claims of the '039 patent include the following exemplary independent claims. (Ex. 1001, Claims 1 and 9):

Claim 1	Claim 9
A traffic radar system comprising: a first radar transceiver configured to transmit and receive radar beams from a front zone corresponding to an area in front of a patrol vehicle and to generate a first electronic signal corresponding to the received radar beam; a second radar transceiver configured to transmit and receive radar beams from a rear zone corresponding to an area behind the patrol vehicle and to generate a second electronic signal corresponding to the received radar beam; a speed determining element configured to determine and output a speed of the patrol vehicle and not receive signals or data from the patrol vehicle; and a processing element configured to	A traffic radar system comprising: a first radar transceiver configured to transmit and receive radar beams from a front zone corresponding to an area in front of a patrol vehicle and to generate a first electronic signal corresponding to the received radar beam; a second radar transceiver configured to transmit and receive radar beams from a rear zone corresponding to an area behind the patrol vehicle and to generate a second electronic signal corresponding to the received radar beam; a speed determining element configured to receive and process radio frequency signals from a global navigation satellite system to determine and output a speed of the patrol vehicle; and

receive a plurality of digital data samples derived from one of either the first or second electronic signals, receive the speed of the patrol vehicle from the speed determining element, perform a time domain to frequency domain conversion on the digital data samples creating a plurality of frequency bins, each frequency bin associated with a frequency bin number, having a relative magnitude value, and corresponding to a speed of a vehicle, convert the speed of the patrol vehicle to a frequency bin number, form a patrol vehicle speed window that includes a range of frequency bin numbers having the frequency bin number of the converted patrol vehicle speed as a center of the range, determine at least one group of successive frequency bin numbers outside of the patrol vehicle speed window whose relative magnitude is greater than a spike threshold value, convert one frequency bin number in each group to the relative speed of one target vehicle, and	a processing element configured to receive a plurality of digital data samples derived from one of either the first or second electronic signals, receive the speed of the patrol vehicle from the speed determining element, perform a time domain to frequency domain conversion on the digital data samples creating a plurality of frequency bins, each frequency bin associated with a frequency bin number, having a relative magnitude value, and corresponding to a speed of a vehicle, convert the speed of the patrol vehicle to a frequency bin number, form a patrol vehicle speed window that includes a range of frequency bin numbers having the frequency bin number of the converted patrol vehicle speed as a center of the range, determine at least one group of successive frequency bin numbers outside of the patrol vehicle speed window whose relative magnitude is greater than a spike threshold value, convert one frequency bin number in each group to the relative speed of one target vehicle, and
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convert the relative speed of the target vehicle to an absolute speed using the speed of the patrol vehicle.	convert the relative speed of the target vehicle to an absolute speed using the speed of the patrol vehicle.
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59. Dependent claims separately recite the threshold-based automatic switching between stationary and moving modes of the claimed traffic radar system using two thresholds. For instance, dependent claims 5 and 12 recite:

Claim 5	Claim 12
The traffic radar system of claim 1, wherein the speed determining element outputs the patrol vehicle speed in a stream of messages and the processing element is further configured to determine that the patrol vehicle is stationary when the patrol vehicle speed is less than a second threshold value for a predetermined number of successive messages.	The traffic radar system of claim 9, wherein the speed determining element outputs the patrol vehicle speed in a stream of messages and the processing element is further configured to determine that the patrol vehicle is moving when the patrol vehicle speed is greater than a first threshold value for a predetermined number of successive messages, and determine that the patrol vehicle is stationary when the patrol vehicle speed is less than a second threshold value for a predetermined number of successive messages.

Legal Principles

60. The opinions I express in this declaration involve the application of my technical knowledge and experience to evaluating certain prior art with respect to the '039 patent. In preparing this declaration, certain patent law concepts have been explained to me by legal counsel, including the legal standard for interpreting claims, as well as those for assessing written descriptions, enablement, and obviousness.

61. I understand that patentability must be analyzed from the perspective of a Person of Ordinary Skill In The Art (“POSITA”) in the same field as the challenged patent as of the “effective filing date” of the claims. I understand that a POSITA is a hypothetical individual presumed to know the relevant art as of the effective filing date of the claims and has the same level of skill as the ordinary practitioner of the art at issue.

62. I understand that patent claims should be interpreted in accordance with their ordinary meaning as understood by a POSITA at the time of the effective filing date of the patent in light of the claim language, patent specification, and prosecution history, unless the patentee unambiguously defines or otherwise modifies the meaning of a claim term.

63. I understand that a patent claim is unpatentable if the subject matter of the claim is anticipated or would have been obvious to a POSITA as of the effective priority date.

64. I understand from my review of the relevant materials in this matter that no claims of the '039 patent have been alleged to be anticipated by the petitioner ACI.

65. I understand that a claim is obvious if one or more prior art disclosures would have rendered the claimed invention as a whole obvious to a POSITA. I understand that when evaluating obviousness, I should consider (a) the scope and content of the prior art, (b) the differences between the prior art and the claimed invention, (c) the level of ordinary skill in the art, and (d) any “secondary considerations” or “objective indications” of non-obviousness. I am informed that if present, these objective indications concern real-world evidence of non-obviousness of the claimed invention, and that the evidence must be related to the allegedly novel features of the claimed invention.

66. I further understand that a claim may be obvious based on itself, based on multiple references combined with one another, or pursuant to the knowledge and skill of a POSITA. I also understand there must have been a reason that would have

prompted a POSITA to combine the features of the prior art to arrive at the claimed subject matter, and that this is sometimes referred to as a “motivation to combine.”

67. I also understand that a POSITA must have reasonably expected that the combination would work, which is sometimes referred to as a “reasonable expectation of success.”

The Level of Ordinary Skill In the Art

68. I understand the level of ordinary skill in the art is pertinent to analyzing a patent’s validity in view of prior art, particularly with respect to whether a patent claim is obvious. I understand that this hypothetical person of ordinary skill in the art is understood to have normal skills and knowledge of a person in a certain technical field at the time of the invention at issue. I further understand that factors that may be considered to decide the level of ordinary skill in the art include: (1) the educational level of the inventor, (2) the types of problems encountered in the art, (3) the prior art solutions to those problems, (4) rapidity with which innovations are made in the field, (5) the sophistication of the technology, and (6) the educational level of active workers in the field. Moreover, I understand a person of ordinary skill in the art is presumed to be knowledgeable of the universe of available prior art.

69. I have also reviewed the POSITA that is included in the Petition, and the POSITA basis that Dr. Anthony used in forming his opinions. (Paper 1 at pg. 4, Ex. 1003 at 10) Based upon my education, training, and experience discussed above, I believe as of October 9, 2017, a person of ordinary skill in the art with respect to the '039 patent would have the following qualifications. A person of ordinary skill in the art relating to, and at the time of, the invention of the '039 Patent ("POSITA") would have been a person with a working knowledge of Doppler radar systems. The person would have had a Bachelor of Science degree in an academic discipline emphasizing electrical, mechanical, instrumentation engineering or other disciplines related measurement science, in combination with specific training or at least two years of related work experience with Doppler radar systems. ACI-1003, [16]-[18]. Alternatively, the person could have also had a Master of Science degree in electrical engineering with at least one year of related work experience in the same disciplines. The above POSITA is similar to what the Petitioner has used with updates to the minimum of years of experience.

70. I reach this conclusion based upon the following considerations and the aforementioned factors regarding a person of ordinary skill in the art:

a. Types of problems encountered in the art: radar- and GNSS-based signals filtering and analysis in “noisy” environments encountering a plethora of signals over many different bands with unknown origin and purpose, all of which must be performed near instantaneously to ensure law enforcement agencies that use the radar and GNSS devices described and claimed in the '039 patent withstand legal scrutiny to those wishing to challenge the propriety of any tickets issued.

b. Prior art solutions to those problems: the use of GNSS systems for location identification was known. Also known was the error, sometimes substantial, present with GNSS systems. Thus, a POSITA would understand that although location acquisition with a GNSS was known, speed of such acquisition and resulting accuracy of the location information were factors that must be considered to understand whether a solution employing GPS for location acquisition was suitable.

c. Rapidity of innovation in the field: GNSS systems were known for location identification. But the expense associated with maintaining GNSS systems in orbit, and development of other less-expensive solutions means

advancement in GNSS-based speed determination solutions was slow. For instance, ordinary inventors lacked the resources to launch additional SV.

d. Sophistication of the technology: GNSS-based enhancements to speed determination in the field of traffic enforcement is sophisticated and requires legal defensibility. Thus, the technology is relatively sophisticated given the amount, nature, and real-time requirements of signals processing. This is particularly true given the known frailties of using GNSS in accuracy- and speed-demanding contexts.

e. Educational and experience level of workers in the field: commonly a bachelor's degree in electrical engineering, or a related engineering field.

71. Based on my experience and education, I consider myself (both now and as of October 9, 2017) to at least be a person of ordinary skill in the art with respect to the field of technology implicated by the '039 patent.

72. I have been asked to evaluate the '039 patent's claims and prior art references through the eyes of a hypothetical person of ordinary skill in the art at the time of the claimed invention of the '039 patent (i.e., prior to its earliest identified October 9, 2017 priority date).

Claim Interpretation

73. I have been informed that in *inter partes* review proceedings, claim terms “shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. I have followed these principles in my analysis.

74. Claim 1 (and dependent claims 2 through 8) of the ‘039 require in claim element [1.3] “a speed determining element configured to determine and output a speed of the patrol vehicle and **not receive signals or data from the patrol vehicle;** and”. (‘039 patent, claim 1, bold emphasis added). Indeed, this claim element was very closely reviewed by the examiner in the prosecution of the ‘039 patent where the examiner provided allowance over a previously rejected indefiniteness position. As disclosed in the ‘039, and the prosecution history it is very clear that the ‘039 patent initially obtains the speed of the patrol vehicle from the speed determining element, and NOT from signals or data received from the patrol vehicle. Quite simply a POSITA would understand the ‘039 patent teaches not to obtain the speed of the patrol vehicle from any device that receives signals or data, such as a

speedometer from the patrol vehicle. In my opinion, and applying the plain and ordinary meaning of claim element [1.3] a POSITA would recognize the significance that the '039 patent teaches that the traffic radar system with patrol vehicle speed detection does not receive signals or data from the patrol vehicle (e.g., the patrol vehicle speedometer) in order to determine the speed of the patrol vehicle.

75. Claim 6, (including independent claim 1), and Claim 9 (and dependent claims 10 through 15) of the '039 patent, as recited in claim 6 and claim element [9.3] require a **speed determining element to be configured to receive and process radio frequency signals from a global navigation satellite system to determine and output the speed of the patrol vehicle.** ('039 patent, claim 6, claim element [9.3], bold emphasis added). A POSITA would understand that the claims require the GNSS to determine and output the speed of the patrol vehicle.

76. Based upon ACI's application of certain prior art in its petition, I believe the following terms require careful interpretation: "**predetermined number of successive messages,**" "**first threshold**" and "**second threshold.**" These terms are recited in, for instance, dependent claims 4, 5, 12 of the '039 patent, which relate to the automatic mode switch capability claimed in the '039 patent.

77. As explained above, the '039 patent describes a technique by which the claimed radar system automatically determines whether the patrol vehicle is stationary or moving and, based upon that determination, switches modes to ensure the appropriate calculation is employed to determine the target vehicle's speed based, in part, on the patrol vehicle's speed. The specification of the '039 patent explains:

Referring to step 101, a satellite data message is received from the speed determining element 22. ...

Referring to step 102, the satellite data message is processed to determine a speed of the patrol vehicle 30. The satellite data message is parsed to find a Speed Over Ground field, and the value of the field is retrieved. ...

Referring to step 103, a mode of speed detection is set according to the patrol vehicle speed. Based on the value of the patrol vehicle speed, the mode of speed detection is set to either "stationary", if the patrol vehicle speed is less than 1.1 mph for at least four consecutive satellite data messages, or "moving", if the patrol vehicle speed is greater than 3.1 mph for at least four consecutive satellite data messages.

(Ex. 1001, 11:14–33; *see also* 7:39–57).

78. Thus, the disclosure of the '039 patent explains that multiple satellite data messages are processed for determining patrol vehicle speed, which are used in the system's logic to determine whether, based on the identified thresholds, the patrol vehicle is stationary or moving. Importantly, and as I addressed above, the separate thresholds identified in the specification (e.g., 1.1 mph for the first

threshold, and 3.1 mph for the second threshold) are important for addressing what the provisional '923 application dubbed GPS jitter problem in which a GPS's reported location, i.e. its latitude and longitude, changes over time when the GPS receiver is in fact stationary as a result of various errors that GPS systems and receivers frequently encounter. Because of GPS jitter, these errors that are continually present in each successive GPS message – the '039 patent describes receiving 5 such messages in a second separated by 200 milliseconds (Ex. 1001, 7:14-19) – will resolve to indicate erroneously that the GPS receiver is moving. If a threshold for whether the vehicle is moving is set at zero, this error will result in the incorrect determination that a patrol vehicle is moving when it is not. That is why the system of the '039 patent claims multiple successive readings are required in making the mode determination. The successive messages (plural, i.e., more than one) in relation to separate recited thresholds (first and second) compensate for the GPS jitter problem to make accurate moving/stationary determinations. Notably, if only a single threshold were used, it would make little sense to therefore describe and later claim a second threshold. Indeed, because of GPS jitter, a POSITA would recognize that there will always be some measure of indicated location change

between separate GPS messages (even if small) that would erroneously indicate movement when in fact none has occurred.

79. A POSITA would understand that the '039 patent teaches the use of GNSS for the speed determining element 22, where the GNSS measurements, are obtained from satellites where the power received is very low (i.e., -160 dBW or 1×10^{-16} Watts) and are susceptible to various error sources such as satellite orbit and clock errors, multipath, atmospheric distortion from the ionosphere, atmospheric distortion from the troposphere, receiver noise, and RF interference. A POSITA would understand that the random nature of the GNSS measurements, and hence the speed calculation, the processing element would use two positive threshold values (i.e., with some hysteresis). (A POSITA would understand that speed is the absolute value (i.e., magnitude) of velocity.). Furthermore, a POSITA would understand that a single threshold, such as zero would not be effective, because, when the patrol vehicle would be stationary where the true speed is zero, the random nature of the GNSS measurements would produce positive non-zero speeds that would determine the patrol vehicle is “moving”. Thus, a POSITA would recognize the '039 teaches that the first threshold is a positive value of speed and when the speed of the patrol

vehicle, from the speed determining element was less than this first threshold value, then the speed of the patrol vehicle would be determined to be “stationary”.

80. Similarly, due the random nature of the GNSS measurements, a POSITA would recognize the ‘039 teaches a second threshold, that is used when the speed of the patrol vehicle, from the speed determining element is greater than this second threshold, to determine if the patrol vehicle is “moving”.

81. Likewise, due the random nature of the GNSS measurements, A POSITA would also recognize that the second threshold value would be greater than the first threshold value to provide some level of “hysteresis” in the “static” or “moving” determination.

82. A POSITA would understand the ‘039 patent claims a first and second threshold that is not zero and they are different. The ‘039 patent teaches each of these thresholds not to be zero because of the GPS jitter (i.e., noisy random nature of the GNSS measurements, position, and speed solution that is used to determine patrol vehicle speed). This is due to the error characteristics of GNSS measurements, the GNSS position solution that is calculated, and hence, the noisy nature of the patrol vehicle speed. Furthermore, A POSITA would understand that when decisions are made from a noisy process (i.e., use of noisy speed measurement to determine if the

patrol vehicle is “stationary” or “moving”), a certain amount of hysteresis would be put into the decision. The ‘039 patent teaches this by using two thresholds that are different. This thresholding methodology can be applied for non-GNSS sensors. For example, consider a light sensor in your car that automatically dims your console lights when the sun goes down. Typically, these types of sensor and control systems, have a certain amount of hysteresis in the decision logic so the dashboard lights can effectively be bright in daylight hours, and dim in dark nighttime hours. The use of two different thresholds would provide more predictable light control so the dashboard lights would not constantly be changing between bright and dim lights at a rapid and annoying rate, as the light conditions change slightly in your vehicle. Thus, I conclude that the “first threshold” and “second threshold” claimed in the ‘039 patent must be different and that they are positive values of speed.

83. Dependent claims 4, 5, and 12 recite, respectively:

<u>Claim 4</u>	<u>Claim 5</u>	<u>Claim 12</u>
4. The traffic radar system of claim 1, wherein the speed determining element outputs the patrol vehicle speed in a <u>stream of messages</u> and the processing element is	5. The traffic radar system of claim 1, wherein the speed determining element outputs the patrol vehicle speed in a <u>stream of messages</u> and the processing element is	12. The traffic radar system of claim 9, wherein the speed determining element outputs the patrol vehicle speed in a <u>stream of messages</u> and the

further configured to determine that the patrol vehicle is moving when the patrol vehicle speed is greater than a <u>first threshold</u> value for a <u>predetermined number of successive messages</u> .	further configured to determine that the patrol vehicle is stationary when the patrol vehicle speed is less than a <u>second threshold</u> value for a <u>predetermined number of successive messages</u> .	processing element is further configured to determine that the patrol vehicle is moving when the patrol vehicle speed is greater than a <u>first threshold</u> value for a <u>predetermined number of successive messages</u> , and determine that the patrol vehicle is stationary when the patrol vehicle speed is less than a <u>second threshold</u> value for a <u>predetermined number of successive messages</u> .
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Based on the '039 patent disclosure, prosecution history, and recited claims, I believe a POSITA would understand the “**predetermined number of successive messages**” limitation to mean a preselected set of at least two following messages.

84. Based on the '039 patent disclosure, prosecution history, and recited claims, A POSITA would understand that the processing element determines of the patrol vehicle is “static”, when the speed calculation, performed by the processing element, with consecutive speed information (e.g., 4 consecutive satellite data messages) from the speed determining element is less than a “first threshold”. (Ex.

1001, 7: 49-57) Similarly, A POSITA would understand that the processing element determines the patrol vehicle is “moving”, when the speed calculation, performed by the processing element, with consecutive speed information (e.g., 4 consecutive satellite data messages) from the speed determining element is greater than a “second threshold”. (Ex. 1001, 7: 49-57)

The Scope and Content of the Prior Art

85. I have reviewed the Petition, Patent Owner’s Preliminary Response, Petitioner’s Preliminary Reply, and Patent Owner’s Preliminary Sur-Reply and the Board’s Institution Decision in this matter. I understand ACI’s petition relies on combinations of various prior art to argue that claims 1-15 of the ’039 patent are invalid. The following table taken from ACI’s petition summarizes the invalidity positions based on obviousness that ACI has asserted:

Ground	Challenged Claims	Basis for Rejection
1A	1-3, 6-11, 14, 15	Obviousness (§103) over Aker, Aker ’724, and Thomas
1B	3-5, 11-13	Obviousness (§103) over Aker, Aker ’724, Thomas, and Carmichael
2A	1-3, 6-11, 14, 15	Obviousness (§103) over Shelton, Henderson, and Thomas
2B	3-5, 11-13	Obviousness (§103) over Shelton, Henderson, Thomas, and Carmichael

(Paper 1, at 2). I understand the foregoing combinations of prior art are the only combinations asserted in this matter. I therefore confine my analysis to the assessment of the foregoing identified combinations of prior art. I understand from counsel that in this proceeding ACI must establish invalidity of the challenged claims of the '039 patent by a preponderance of the evidence. As set forth below, I conclude that ACI's evidence, including the opinions of its witness Dr. Anthony, fail to establish obviousness of the challenged claims by a preponderance of the evidence.

U.S. Patent Application Publication No. 2004/0257268 (Ex. 1004 or "Aker") and U.S. Patent No. 5,691,724 (Ex. 1007 or "Aker '724") Prior Art

86. I understand from reading the petition that ACI treats both of the Aker references together. In fact, both Aker references appear to be owned by ACI. (Ex. 1004, at 1; Ex. 1007, at 1:41–43). ACI states "Aker '724 provides additional detail on aspects of the processing of samples of the received radar energy using fast Fourier transforms by the digital signal processor (DSP)." (Paper 1, at 7). ACI states that combining Aker with Aker '724 is appropriate because "the traffic radar system of Aker is further detailed in the Aker '724 patent, which Aker incorporates by reference." (Paper 1, at 7–8). Aker discloses that its invention "is useful in the field

of traffic surveillance radars.” (Ex. 1004, [0001]). To accurately determine the speed of a target vehicle (for example, the vehicle whose speed a patrol vehicle is trying to determine for traffic enforcement purposes), a radar unit must also have access to the patrol vehicle’s speed. Aker discloses two ways to determine a patrol vehicle’s speed: Aker either “acquir[es] and track[s] the patrol car speed from returns from stationary objects as is well known [t]he prior art” or “by means of a link to the speedometer.” (Ex. 1004, [0064]). Aker explains:

In species within the genus of the invention wherein patrol car speed is determined from the car’s speedometer (as opposed to processing returns from stationary objects such as the ground), an optional speedometer link transducer 59 provides a signal or data to the DSP from which the indicated speed on the speedometer can be determined for use in moving mode target speed calculations.

(Ex. 1004, [0051]).

87. Aker states that when “a ‘hardwired’ link to the speedometer via transducer 59 [is used], the processing blocks 212 and 214 and the blocks described below pertaining to patrol speed processing of stationary target returns are replaced with a process to read the transducer and calculate the patrol speed from data acquired from it.” (Ex. 1004, [0099]). Aker Figure 1 shows the signal paths and DSP:

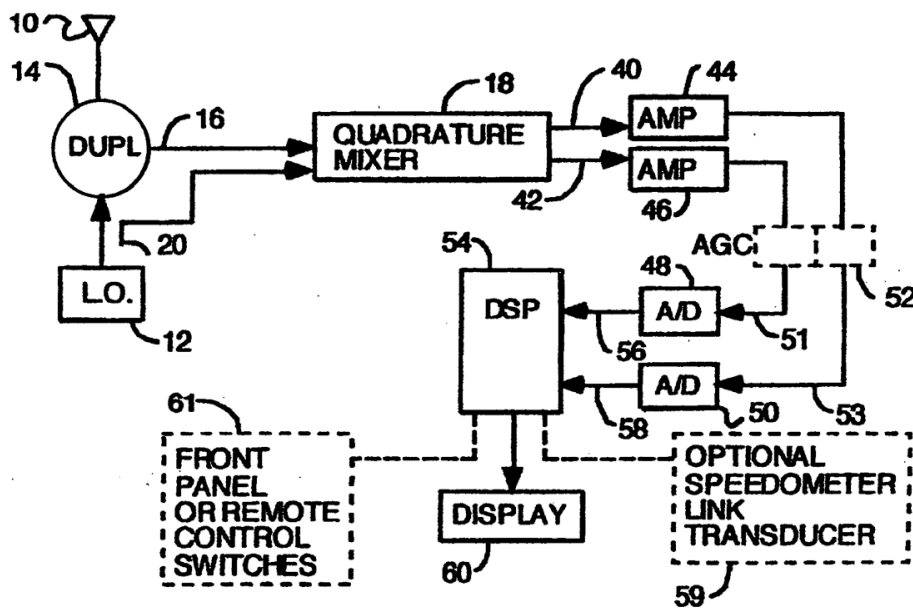


FIG. 1

88. Aker describes “a process for a multimode digital FFT, direction sensing, doppler radar where the operator can select between” modes in which the patrol vehicle is either stationary or moving.” (Ex. 1004, [0008]–[0025]). Importantly for purposes of this proceeding, Aker’s teaching specifically discloses that the operator manually selects whether the patrol vehicle is moving or stationary. (Ex. 1004, [0049]–[0050]).

89. Aker '724 describes “a control program is detailed in the flow charts described later herein and the actual executable binary code in [sic] included herewith as Appendix A. The code of Appendix A is ported for a Motorola 56001

digital signal processor (hereafter DSP).” (Ex. 1007, 18:31–35; *id.*, at 75–102). Aker

’724 Figure 18 shows that DSP and “speedometer interface 424”

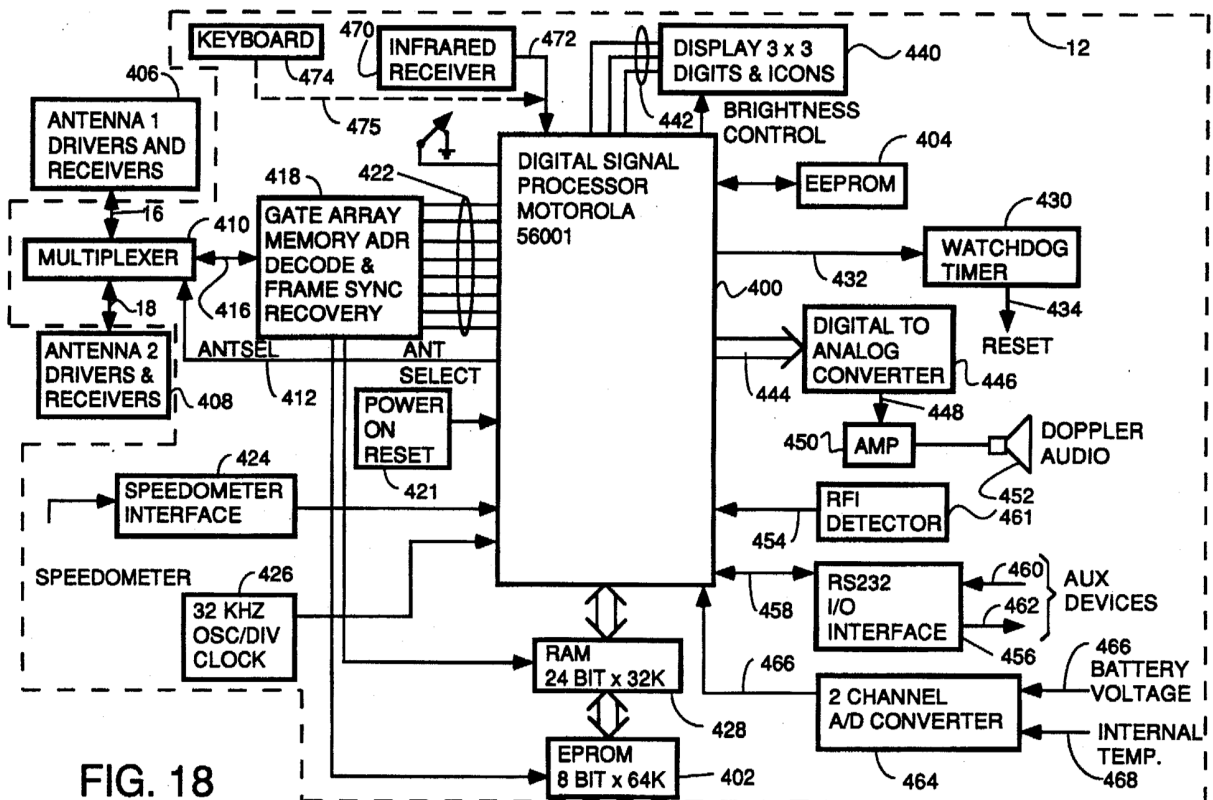


FIG. 18

(Ex. 1007, 27:60-61; Fig. 18).

90. Aker ’724 states that the “DSP also has an optional speedometer interface 424 in some embodiments through which the DSP can read the actual patrol car speed for purposes of comparing this speed to the ‘patrol speed’ derived from the radar returns of stationary objects.” (Ex. 1007, 20:34–38). But Aker ’724 warns that “[t]he software of Appendix A does not use the actual speedometer speed as the

patrol speed because this is not accurate enough. Instead, the patrol speed is derived from the Doppler shifted radar returns from the ground.” (Ex. 1007, 20:38–40). Aker ’724 explains:

This is done by using the strongest radar return over time and assuming this is the return from the ground. Basically, the ground return is usually the strongest radar return although when targets get close, their returns become stronger for a short time than the ground return but then the target return goes away altogether. The software therefore assumes that the strongest return over an interval which is longest enough [sic] to distinguish over transitory target returns, is the return from which the patrol speed is derived. The software also includes the ability to compare the calculated patrol speed from the return selected in the above described manner to the speed read from the speedometer, and, if the difference is greater than 3 MPH, to discard the calculated patrol speed and recalculate it from a different radar return.

(Ex. 1007, 20:42–55).

91. When examined together as ACI proposes, the Aker references teach that a patrol vehicle’s in-car speedometer may be tapped to supply a patrol vehicle’s speed to a processor for use in calculating a target vehicle’s speed. But given the underlying art for the Aker references, ACI’s inventors understandably have a strong preference for accurate speed readings because the code programmed for the Motorola 56001 in the Aker ’724 reference “does not use the actual speedometer

speed as the patrol speed because this is not accurate enough.” (Ex. 1007, 20:38–40). Because the patrol vehicle speed that is determined by tapping a patrol vehicle’s in-car speedometer is not accurate enough, the Aker ’724 reference relies on radar returns from ground returns to calculate the patrol vehicle’s speed. (Ex. 1007, 20:42–55). Moreover, Aker ’724 teaches a POSITA that when radar-calculated patrol vehicle speed differs from the tapped speedometer’s reading by more than 3 miles per hour, Aker ’724 teaches “to discard the calculated patrol speed and re-calculate it from a different radar return.” (Ex. 1007, 20:51–55). Plainly Aker ’724 teaches a POSITA a preference for radar-based patrol vehicle speed calculations rather than use of a vehicle’s speedometer when accuracy is required. Given the context of the art, Aker ’724 requires accuracy because that is what was programmed by ACI’s inventors to be employed in its processor for use in the demanding field of speed enforcement.

United Kingdom Patent Application Publication No. 2,334,700 (Ex. 1005 or “Thomas”)

92. I understand from reading the petition that ACI uses Thomas as a secondary reference in its obviousness combinations. ACI alleges Thomas’s

teaching can be used to modify its primary references and render some of the challenged claims obvious. (Paper 1, at 8–11, 33, 42–44, 65–67).

93. Thomas discloses “A Vehicle Speed Controller” that its invention “relates to a controller for a vehicle engine which is designed to restrict the vehicle speed automatically within a zone in which the vehicle is travelling.” (Ex. 1005, at 5, ll. 1–6). Thomas states there is “a widespread need to be able to ensure that vehicles adhere to speed limits especially within urban districts. There has been proposed methods of controlling vehicle speed by interrupting the throttle linkage of the vehicle. Such systems are largely mechanical and tend to be complex and expensive to fit to a vehicle.” (Ex. 1005, at 5, ll. 8–14).

94. Thomas teaches that the “controller 10 of the present invention can be connected to almost any vehicle in the world. The system will connect to either the engine management system of modern cars or the ignition system on older vehicles with carburetors and no engine management.” (Ex. 1005 at 8, ll. 15-19)

95. Thomas teaches that within the controller 10, the current speed (e.g., from receiver 12) is applied to a comparator 14, and the comparator 14, compares the current vehicle speed with the vehicle speed limit (i.e., the speed limit). The output of the comparator is a control signal to either control (i.e., reduce fuel injector

operation) or nominally control (i.e., normal fuel injector operation) that is applied to the regenerator 16 (i.e., fuel injector driver). The engine management systems (i.e., injector output) provides an input to the regenerator 16, which then provides an output to control the fuel injectors. (Ex. 1005 at 9 ll. 15 – 10, ll. 20, Figure 1, Figure 2)

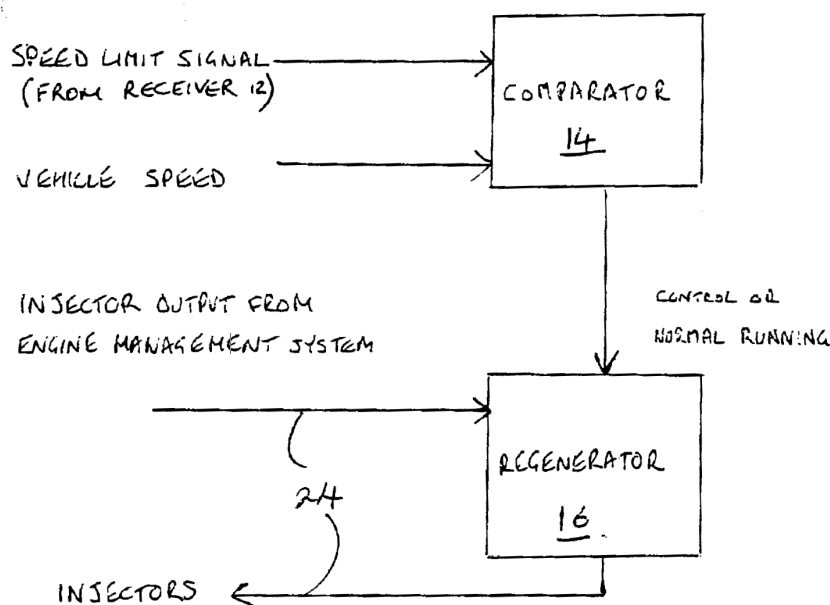


FIGURE 2

96. Thomas provides the detailed circuit diagram of Figure 1, shown below, where the controller 10, receives speed information from either receiver 12 or the ABS Sensors 22, and then outputs control signals to the engine management information on lines 24 connected to the fuel injectors 20. Figure 1 also shows a

manual speed limit input (Ex. 10059 ll. 15 – 10, ll. 20, Figure 1, Figure 2) and a speed being controlled Activation light”.

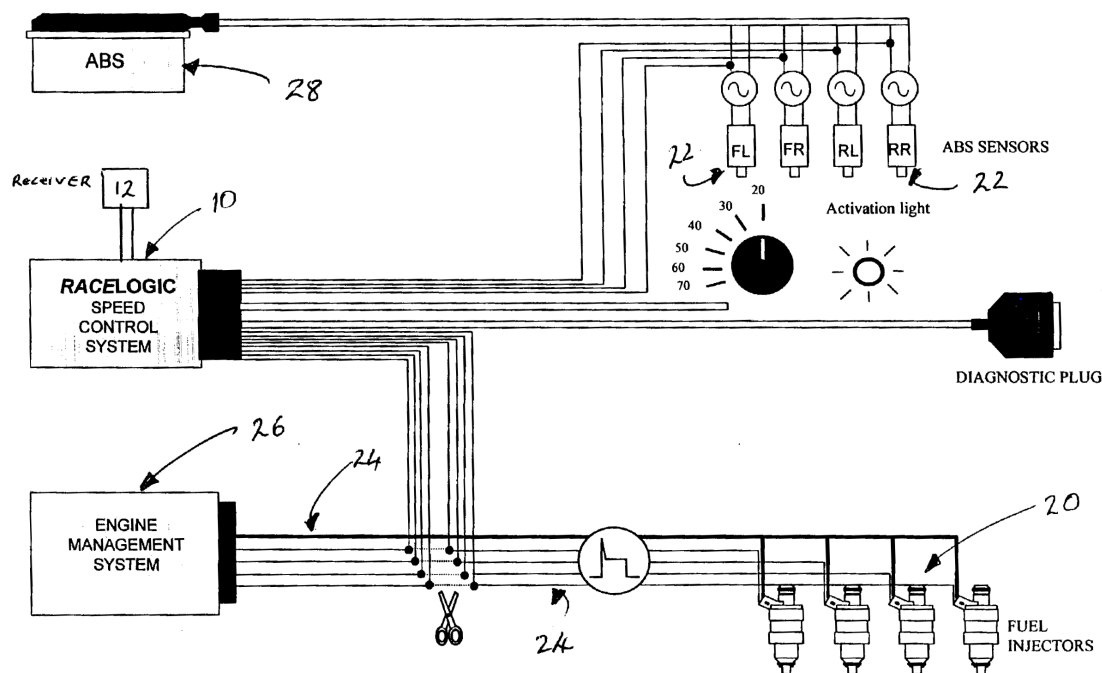


FIGURE 1

(Ex. 1005 at 2)

97. Thomas teaches that a vehicle's speed can be determined as follows:

The controller 10 also includes means to receive a signal indicative of the vehicle current speed. The speed will normally be measured by one of the following three ways:

1. using an ABS sensors 22 already fitted to the vehicle (as shown in the illustrated embodiment);
2. using a road speed sensor already fitted to the vehicle; and
3. using a calculated speed computed from the global positioning system (GPS).

(Ex. 1005 at 9, ll. 5-13)

98. Similarly, Thomas also states:

The absolute speed of the vehicle is normally measured using one of three methods. The first method is to take a signal from wheel speed sensors attached to the hubs of the vehicle, as used in ABS systems. The second is to use a signal taken from the speedometer of the vehicle. The third is to use the information from the GPS system to determine speed.

(Ex. 1005 at 16 ||24-30)

99. Thomas consistently describes the three methods, with one exception. At one point, Thomas describes “The second method is to use a Global Positioning system receiver ...” (Ex. 1005 at 18 ll. 8-16). I believe, and I believe a POSITA would read this as an error, where Thomas is describing “The ~~second~~ [third] method is to use a Global Positioning system receiver ...” to determine speed.

100. It is also important to note that Thomas uses the word “speedometer” only twice and never refers to the speed derived from the GPS receiver as “GPS speedometer”, (Ex. 1005 8||19-21, 16||24-30), as ACI has mischaracterized in their Petition. (Paper 1 at 9, 10, 40, 42)

101. Thomas states that “a number of standard receivers [are] used to interpret the GPS signals from the collection of satellites used for global positioning.

These receivers allow determination of the a *[sic]* vehicle position to within about 50–100 meters. To increase the accuracy of the positioning, a differential radio receiver unit may be connected to the GPS receiver, and this will improve the accuracy to about 10 meters.” (Ex. 1005, at 11, ll. 15–21).

102. Thomas explains “[t]he information available from the GPS system can be used to calculate speed, therefore obviating the need for a separate speed sensor 22 input.” (Ex. 1005, at 11, ll. 32 – 33, ||. 1). The “current-vehicle-speed-limit signal is generated from GPS data in conjunction with an in-board database” that can be used to determine the speed limit to which the vehicle’s speed must conform. (Ex. 1005, at 6, ll. 15–17; *see also* at 11, ll. 28–31). Thomas states that the “controller preferably reduces the vehicle speed in a predetermined manner and thus avoids potentially dangerous rapid deceleration. The predetermined manner is preferably a progressive manner.” (Ex. 1005, at 6, ll. 25–29; *see also* at 10, ll. 1–2).

103. Thomas’s only disclosure for calculating speed using GPS uses distance traveled over time: “the absolute Latitude and Longitude of the vehicle is known at a precise time. Two such readings can be subtracted to give distance travelled over time. This can then be used to work out vehicle speed.” (Ex. 1005, at 17, ll. 11–15).

104. Thomas does not disclose the update rate at which GPS measurements are to be obtained and does not disclose the update rate at which the speed is calculated.

105. Thomas does not disclose any consistency check on GPS measurement as a precursor to the using the GPS derived speed to control the vehicle's fuel injectors. Thomas's controller 10 does not output GPS position or speed.

106. Thomas's controller 10 outputs control signals to control the fuel injectors.

U.S. Patent Application Publication No. 2005/0146458 (Ex. 1006 or "Carmichael")

107. I understand from reading the petition that ACI uses Carmichael as a secondary reference in its obviousness combinations challenging certain dependent claims of the '039 patent.

108. Carmichael titled Vehicular Electronic Interface Module and Related Methods, discloses a "module for interfacing on-board electronics in a vehicle with a radar device and/or camera." (Ex. 1006, Abstract). Carmichael describes the difficulties in interfacing with various on-board electronics to obtain the speed of the vehicle due to varying standards and various vehicle manufactures. (Ex. 1006,

[0008]). Carmichael disclosed that the speed of the patrol vehicle can be obtained from the speedometer, however, the disadvantage of this method requires interface to the various manufactures' speedometers, and this would likely require lengthy specific calibrations to account for the speedometer transducer. (Ex. 1006, at 15 [0004]).

109. As shown in Figure 1 below, Carmichael interfaces to the host vehicle electronics via the On-Board Diagnostic (OBD) connector to provide vehicle information to the video surveillance camera and radar device.

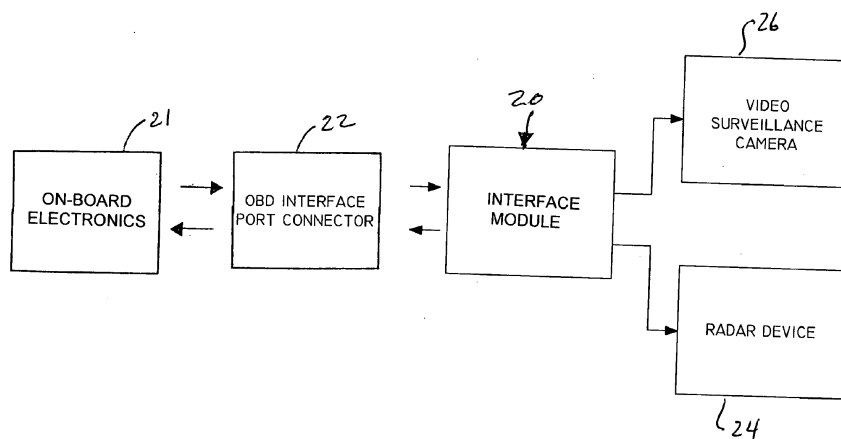


FIG. 1

(Ex. 1006 at 2)

110. Carmichael “is directed to apparatus for interfacing with the On-Board Diagnostic (OBD) computer (also referred to herein as the on-board electronics) in a vehicle with a radar device and/or video surveillance system.” (Ex. 1006, at 16,

[0022]). Numerous data busses are disclosed between the vehicle's electronics and the radar device that have "different signaling protocols, such as variable pulse width (VPW), pulse width modulation (PWM) and IOS 9141 that are used by the various forms of on-board electronics. (Ex. 1006, at 16, [0022]). Carmichael discusses distinguishing which of the various protocols are employed by a vehicle's system, decodes speed information from data provided by the decoded vehicle data, and then the "radar device will use the vehicle speed information when a patrol vehicle is in motion to calculate the speed of a target vehicle in a known manner." (Ex. 1006, at 16, [0022], at 19, [0055]).

111. Carmichael describes a capability for automatically or manually switching between stationary and moving modes of operation of a radar:

For ease of operation, it is desirable to have the radar device automatically switch over to stationary mode if the patrol vehicle is stopped. Likewise, it is also desirable to have the radar device to switch back to moving mode once the patrol vehicle is moving again. It is also important from the operator's point of view that the mode switchover be selectable from either automatic or manual settings. The radar device preferably contains a software menu that the operator can use to select between manual and automatic mode switchover. VIP_CHOICE at block 231 is the variable used to hold the state of the manual/automatic switchover and its status is saved in non-volatile memory on power down and recalled on power up. First, the VIP_CHOICE variable is checked to determine if the radar is in automatic or manual mode switchover. The routine exits if VIP_CHOICE is equal to a 1 meaning that the radar is in manual mode. In manual

switchover mode, the radar will display a zero in the patrol window when the radar device has come to a stop and will not display any target speeds nor will the device switch over automatically to stationary mode.

(Ex. 1006, at 20–21, [0062])

112. Carmichael also recites in claim 9 the following:

9. The apparatus for interfacing between on-board electronics in a vehicle and a radar device as claimed in accordance with claim 2 wherein said radar device has a moving mode and a stationary mode, said radar device automatically switching to the stationary mode if the vehicle speed information indicates that the speed of the vehicle is zero and automatically switching to the moving mode if the vehicle speed information is not zero.

(Ex. 1006, at 22).

113. Thus, Carmichael discloses comparing a single speed reading with a single threshold—zero—to determine whether the device is in stationary mode or moving mode.

114. A POSITA would recognize that Carmichael receives the vehicle speed information from the vehicle OBD interface port, directly from the vehicle itself. A POSITA would recognize that, regardless of the accuracy of the speed value, Carmichael receives the vehicle speed information through direct wire connections and the noise characteristics of the speed (i.e., variation) would be low. A POSITA would recognize that Carmichael teaches to use a single threshold-zero value for the

automatic determination of static or moving for the patrol vehicle. A POSITA would understand that using a single threshold with this low variance speed signal (via direction connection in Carmichael), would be very different than using a dual threshold methodology with a noisy speed signal obtained from a GNSS signals.

U.S. Patent No. 6,023,236 (Ex. 1008 or “Shelton”)

115. I understand from reading the petition that ACI uses Shelton as a primary reference to argue the challenged claims are obvious in their Grounds 2.

116. Shelton is titled a “Speedometer Assisted Patrol Speed Search for DSP Traffic Radar.” (Ex. 1008, Title). Shelton describes “a method and apparatus for processing Doppler return information by analyzing a limited area of the frequency spectrum corresponding to the speedometer output of the patrol vehicle.” (Ex. 1008, at 7, 1:9–13). Shelton discloses:

The signal processing system of the radar unit converts the pulses from the speedometer and calculates the speedometer speed. Using this speed as the center of a search window, the system searches for the patrol vehicle radar return signal that falls within the search window. Once the patrol speed is found, other targets can be found and their speed accurately determined

(Ex. 1008, at 7, 1:53–59).

117. Shelton explains that an “electronic speedometer 20 outputs a certain number of pulses for each mile the patrol vehicle travels. A common value of the speedometer pulses is 8,000 pulses per mile.” (Ex. 1008, at 7, 2:44–46). Shelton teaches that analyzing vehicle radar returns more accurately involves creating a narrow search window to reduce false returns by counting pulses from the speedometer. (Ex. 1008, at 7, 1:53–59; at 8, 4:42–46; Fig. 4). The search window Shelton identifies is ± 5 mph. (Ex. 1008, at 5, Fig. 4, #82; at 8, 4:16–19).

118. A POSITA would recognize that Shelton is a single front-only traffic radar systems that interfaces to the patrol vehicle’s speedometer. A POSITA would recognize that Shelton discloses an electronic speedometer that interfaces to the patrol vehicle to estimate the speed of the patrol vehicle. The speed of the patrol vehicle from the electronic speedometer is used to center a search window around the radar Doppler derived signal returns. A POSITA would also recognize that Shelton does not use GPS, any other GNSS, or signal processing associated with GPS/GNSS for any purpose.

U.S. Patent No. 5,528,246 (Ex. 1009 or “Henderson”)

119. I understand from reading the petition that ACI uses Henderson as a secondary reference in some of its obviousness combinations. ACI alleges

Henderson's teaching can be used to modify its primary references and render some of the challenged claims obvious.

120. Henderson describes a "Traffic Radar with Digital Signal Processing" that processes the Doppler return information by analysis of the received frequency spectrum in order to improve target identification and minimize interference and unwanted harmonics. ... The speed of the patrol car is determined by recognizing a signature that exhibits an asymmetry due to the cosine effect." (Ex. 1009, at 1, Abstract). Henderson discloses "systems work in tandem to process control options and radar Doppler return signals, screen and search for interference patterns, then determine a combination of target and/or patrol vehicle speeds and indicate those speeds to the operator." (Ex. 1009, at 35, 2:63–67).

121. Henderson states that "[t]he radar relies on ground reflection Doppler signals to determine the patrol vehicle speed." (Ex. 1009, at 38, 8:14–15). Henderson explains that "[o]ne of the unique features of the DSP based traffic radar is its ability to analyze the frequency information returns of the reflected microwave carrier. Because of the cosine effect phenomenon, the patrol vehicle Doppler return has a unique signature when compared to target vehicle Doppler return signals." (Ex. 1009, at 38, 8:1–7). Henderson states "[t]ests indicate that the patrol speed can be

accurately found by this pattern search approximately 60% to 70% of the time, with strongest return still used as a fallback.” (Ex. 1009, at 39, 9:5–7). Henderson calculates vehicle speed by matching radar return signatures or selecting the strongest return. (Ex. 1009, at 38, 8:2–16, at 39: 9:5–7, 9:13–22).

122. A POSITA would recognize that Henderson is a front or rear single-receiver traffic radar systems that used DSP in an attempt to more accurately identify and calculate the patrol vehicle speed from the asymmetric radar returns from road/roadside objects caused by the cosine effect. A POSITA would also recognize that Henderson does not use GPS, any other GNSS, or signal processing associated with GPS/GNSS for any purpose.

Summary of Opinions

123. My evaluation of the '039 patent, along with its prosecution history and related prior art discussed in this declaration, leads me to conclude that the invention claimed in the '039 patent would not have been obvious to a person of ordinary skill in the art at the time of the invention.

1. Under all grounds, Petitioner has failed to establish obviousness under any grounds asserted because before the invention of the '039 patent, there was no motivation to combine the identified prior art and no reasonable expectation of success in making the combination. A POSITA would not be motivated to combine Thomas to any combination as the Petitioner has proposed because **Thomas's GPS receiver did not have the accuracy** to reliably center a window over the patrol vehicle radar returns to effectively determine the relative target speed and effectively determine the absolute target speed using the patrol vehicle speed.
2. Under all grounds, Petitioner has failed to establish obviousness under any grounds asserted because before the invention of the '039 patent, there was no motivation to combine the identified prior art

and no reasonable expectation of success in making the combination. A POSITA would not be motivated to look towards a **simple fuel injector controller for a much more complicated GNSS-based traffic radar system.**

3. Under all grounds, even if a POSITA would have made the combination Petitioner proposes, they would recognize that Petitioner's proposed combination would not meet the limitations of the claims because **Thomas's controller outputs a control signal, not a speed signal.**
4. Under all grounds, claims 1-8, require that "a speed determining element configured to determine and output a speed of the patrol vehicle and **not receive signals or data from the patrol vehicle**", yet the Petitioner proposes combinations that do receive signals or data from the patrol vehicle, and therefore do not render claims 1-8 obvious.
5. Under grounds 1B and 2B for claims 4, 5, and 12, Petitioner has failed to establish Carmichael uses the recited "**successive messages**" or **first and second thresholds.**

Insufficient Evidence on Motivation to Combine Prior Art of Petitioner

124. The Petition cited to excerpts from Thomas regarding the percentage of cars (i.e., 99%) and time it takes (i.e., around 3 hours) to incorporate what the Petitioner calls “Thomas’ GPS Speedometer”. (Paper 1 at 10, 42-43) I disagree that Thomas discloses a speed determining element that could easily be retro-fitted to a patrol vehicle to meet the claim limitations of the ‘039. (*Id.*). Firstly, Thomas uses the word “speedometer” only twice and never refers to the speed derived from the GPS receiver as “GPS speedometer”. (Paper 1 at 9, 10, 40, 42) Secondly, a POSITA would recognize that Thomas’s vehicle speed controller, i.e., controller 10 does not output position or speed. A POSITA would understand that Thomas’s controller 10 outputs a control signal going to the vehicle fuel injectors. Thirdly, a POSITA would understand the task of interfacing Thomas’s controller 10 outputs fuel injector control signals on single wires, going to the fuel injectors of a vehicle. A POSITA would understand that interfacing to the vehicles’ fuel injector is a well-known and straight forward technology to decrease the speed of a vehicle. A POSITA would not be motivated to look towards a simple fuel injector controller for a much more complicated GNSS-based traffic radar systems with patrol vehicle speed determination where the GNSS speed is used to verify the patrol vehicle speed and

is used to enhance the performance of the absolute target velocity speed determination.

125. The Petition also cites to the statement by Thomas pointing out that prior art methods of controlling vehicle speed by interrupting the throttle linkage of the vehicle “are largely mechanical and tend to be complex and expensive to fit to a vehicle.” (Ex. 1005, at 5:12-13) But the Petition misrepresents this statement is criticizing speedometer links like that disclosed in Aker and Shelton. This is simply wrong as the criticism relates to the mechanical linkage systems, not speedometer connections, of the prior art. (*Id.*) Therefore, the Petition is incorrect when it states that Thomas provides a motivation to combine its GPS receiver embodiment with Aker/Aker ‘724, Thomas is not suggesting that speedometer links such as used in those references are complex and expensive to fit to a vehicle, Thomas is referring to the mechanical linkage systems to control the throttle. (*Id.*)

126. More fundamentally, a POSITA would not be motivated to combine Thomas with Aker/Aker ‘724, or have a reasonable expectation of success in the combination. A POSITA would understand that Aker ‘724 explains that the speedometer signal must obtain a certain level of accuracy. If the speedometer reading and the radar return reading are more than 3 mph different from each other,

Aker ‘724 rejects the radar-based calculation and tries again. Thus, a POSITA would understand that the speedometer source is expected to be at least within an accuracy band of 3 mph. If it is not, the radar system would enter a loop in which valid ground radar returns are continuously being rejected. Therefore, a POSITA is taught by Aker/Aker ‘724 that the source for patrol car speed must be accurate enough to be within 3 mph of the actual patrol car speed. (Ex. 1007, at 59, 20: 50-55)

127. Given this fundamental requirement of the Aker/Aker ‘724 system and the Thomas disclosure, I disagree with the Petitioner’s conclusory statements that “the Aker-Thomas combination renders the ‘039 obvious.” A POSITA having read the art of the proposed combination would understand that Thomas’s GPS receiver is **not accurate enough**. In my opinion, a POSITA would recognize that Claim 9 is Not Obvious over Aker, Aker ‘724 and Thomas because Thomas’s GPS position and speed determinations are not accurate enough for a Traffic Radar System with Patrol Vehicle Speed Detection. My opinions are supported by the GPS errors disclosed in Thomas.

128. In addition to the 3 mph accuracy limitation taught by Aker/Aker ‘724, the ‘039 patent and the relevant prior art on traffic radar systems for patrol vehicles stress the importance of determining the speed of the patrol vehicle so that it can be

used to convert the relative target vehicle speed to an absolute target speed using the speed of the patrol vehicle. A POSITA would understand that the accuracy of determining the speed of the patrol vehicle is an important element of traffic radar systems used by police. In fact, the speed determining accuracy of police radar devices is a critical factor as specified by the U.S. Department of Transportation (DOT), National Highway Traffic Safety Administration (NHTSA). For police radar type devices, the DOT NHTSA specifies the Speed Accuracy in Field Operation in the determination of the target speed, shall be accurate to (+1, -2 mph) when the radar is in Stationary Mode, and ± 2 mph when the radar is in Moving Mode. (Ex. 2009 at 2-11, A-2) (Ex. 2008 at 2-11, A-1). A POSITA would understand that if the patrol vehicle speed is not accurate, the speed of the target vehicle would not be accurate. **The Petitioner has failed to provide reasoning on why a POSITA would be motivated to form the combinations set forward in their Petition as to how a POSITA would have a reasonable expectation of success in accurately determining the speed of the target vehicle using Thomas.** A POSITA would understand that issuing erroneous speeding citations to vehicle operators would be inappropriate and not enable law enforcement officers to issue valid speeding citations. Thus, a POSITA would understand that the accuracy of the patrol vehicle

speed needs to be performed to enable law enforcement officers to issue valid citations.

129. A POSITA would understand that even if Thomas's controller 10 did produce speed at the output, which it does not and cannot based on the teachings and components within the controller 10, the GPS speed from Thomas's receiver 12 would not be accurate enough for the traffic radar system with patrol vehicle speed detection.

130. A POSITA would understand that the proposed combination would utilize the GNSS converted speed to center a window in which the radar return representing the patrol speed would be found. If the center of the window is off then the window will likely be outside the frequency response of the patrol vehicle radar returns, corresponding to the speed of the patrol vehicle. Thus, the radar returns corresponding to the speed of the patrol vehicle, would not be within the window. This will make the determination of the patrol vehicle speed much more difficult, as is taught in the prior art. Thus, if the window is outside of the actual patrol vehicle radar returns, then the system will not properly function to determine the patrol vehicle speed and a POSITA would know this.

131. Furthermore, this inaccuracy in the GNSS speed and window center, will not exclude the patrol vehicle radar return frequency bins in the determination of the relative target vehicle speed. A POSITA would expect the patrol vehicle radar return frequency bins to interfere with the relative speed determination of the target vehicle radar return frequency bins, as taught in the prior art.

132. Even furthermore, these inaccuracies in the patrol vehicle speed determination, and the inaccuracies in the relative speed of the target vehicle determination, lead to inaccuracies in the absolute speed of the target vehicle determination. Such inaccuracies could lead to the radar system identifying a target return as the patrol vehicle return.

133. A POSITA would understand that the GPS derived position error disclosed by Thomas derives from known error sources (i.e., multipath, atmospheric error in the ionosphere and troposphere, interference, etc.) included within GPS positioning.

134. A POSITA would understand that the GPS derived position error of 10 meters disclosed by Thomas would be associated with a “differential radio receiver unit” connected to the GPS receiver. (Ex. 1005 at 11: 19 – 21). A POSITA would understand that Thomas is referring to differential GPS (DGPS) whereby reference

measurements may be received at one or more supporting DGPS reference stations, forms corrections in real-time, and then transmits those corrections to a mobile user in the local area over a data link, in a timely manner, such that the measurements do not decorrelate with space and time.

135. Thomas states that “In the GPS method, the absolute Latitude and Longitude of the vehicle is known at a precise time. Two such readings can be subtracted to give distance travelled over time.” (Ex. 1005, at 17:12 -15). A POSITA would understand that two factors go into this speed determination: 1) the accuracy of the two position solutions; and 2) the time interval between these two positions. Regarding factor 1), the accuracy of the position solutions, I have also examined the Petition, Patent Owner’s Preliminary Response, Petitioner’s Preliminary Reply, and Patent Owner’s Preliminary Sur-Reply, regarding Thomas’s statements on the accuracy of differential GPS positioning. In my opinion, the position accuracy statements made by Thomas of 10 meters (i.e., ± 10 meters) for differential GPS position is consistent with what a POSITA would understand to be the position accuracy of a prototype differentially corrected GPS at the time. A POSITA would also understand that the 10 meters error disclosed in Thomas is an error of ± 10 meters (not ± 5 meters) as the Petitioner has stated. (Petitioner’s Preliminary

Response at 3). A POSITA would understand a DGPS position error of 10 meters would be the difference between the true position and the calculated DGPS position. A POSITA would understand the position errors associated with a DGPS user solution are statistical in nature and not biased in a constant direction. In other words, the DGPS position solution error may be in any direction from the true position, which would be represented as ± 10 meters.

136. Regarding factor 2), the time interval between two positions to calculate speed, Thomas does not explicitly disclose what the update rate would be used to determine the position, nor disclose, at what interval the speed would be calculated. In my opinion, the fact that Thomas did not address the rate at which speed was calculated, is because Thomas was concerned with controlling the fuel injectors to reduce the vehicle speed if it exceeded the speed limit in a slow and controlled manner. What Thomas does teach is that when the vehicle speed does exceed the posted speed limit, “the output-torque signal is produced to reduce the torque produced by the engine in a preset manner; normally the torque will be gradually reduced to effect gradual slowing down of the vehicle.” (Ex. 1005, at 8:15-28, 9:13-10:2). A POSITA would understand that Thomas’s controller 10 would operate in a

slow and controlled fashion so the controller would gradually reduce torque produced by the engine and gradually slow the vehicle down.

137. As described in the GPS Background Information section of this declaration, the Petition does not at all address how Thomas's controller 10 would obtain these DGPS real-time corrections and effectively apply them to the mobile patrol vehicle in a real-time fashion where the patrol vehicle would be operating over a wide area. Thus, in my opinion, a POSITA would understand that Petition has not detailed how a mobile patrol vehicle would make use of $\pm 10\text{m}$ and make these corrections available to a patrol vehicle to effectively obtain position accuracy to $\pm 10\text{m}$ in operations. Thomas does not disclose any details on how the 10 meter (i.e., ± 10 meter) differentially corrected position would be obtained and supported, nor does the Petitioner.

138. If a POSITA was to do a performance analysis on Thomas's 10 meter accuracy statement (i.e., ± 10 meters), they would be expected to consider the worst case in estimating the speed that would be calculated from subtracting two absolute Latitude and Longitude position estimates from the GPS receiver. (Ex. 1005 at 11, ll. 19-21; at 17, ll. 12-15)

139. In this performance analysis of Thomas, a POSITA would consider the accuracy of the GPS receivers for the updates provided. Since Thomas does not disclose the rate at which data is collected, a POSITA would likely consider using position update rates at a nominal rate of 1 Hz. Even though Thomas does not explicitly disclose the update rate on the position, A POSITA would understand that the accuracy statement in Thomas of 10m (i.e., $\pm 10\text{m}$) to be a nominal 1 Hz rate. A POSITA would understand that in the dynamic application of police radar enforcement, “[a]t the default output rate of once per second there can be a lot of change in the ‘Speed Over Ground’ value if the patrol vehicle is accelerating or decelerating.” (Ex. 2005 at [0029]). Thus, the update rate would be at least once a second.

140. Even if Thomas’s differential technique was available it still would not be accurate enough. Using the worst-case position error estimates (i.e., ± 10 meters) and a nominal 1 Hz update rate, a POSITA could calculate the maximum expected error of the speed estimate produced by Thomas’s GPS receiver to be 44.74 mph. (i.e., $20\text{m} * (1\text{mile}/1609.344\text{m}) * (3600\text{sec}/1\text{hr})$). Similar calculations could be done by a POSITA as shown in the table below for other position accuracy conditions. It would be obvious to a POSITA that the position and hence speed accuracies

disclosed in Thomas would not be sufficiently accurate enough to support the teachings and claims of the '039.

Position Differences, [m] vs Speed Error [mph]		
Update Rate [Hz]:		1
Update Interval [s]:		1
Position Difference [m]		Speed Error, [mph]
200	(i.e., $\pm 100\text{m}$)	447.39
100	(i.e., $\pm 50\text{m}$)	223.69
50	(i.e., $\pm 25\text{m}$)	111.85
20	(i.e., $\pm 10\text{m}$)	44.74
10	(i.e., $\pm 5\text{m}$)	22.37
5	(i.e., $\pm 2.5\text{m}$)	11.18
4.47	(i.e., $\pm 2.23\text{m}$)	10
2.5	(i.e., $\pm 1.25\text{m}$)	5.59

141. A POSITA would understand that if the center of the window is off, formed from the GNSS converted speed of the patrol vehicle, then the window will likely be outside the frequency response of the patrol vehicle radar returns, corresponding to the speed of the patrol vehicle. Thus, the radar returns corresponding to the speed of the patrol vehicle, would not be within the window.

142. Furthermore, a POSITA would understand this inaccuracy in the GNSS speed and window center, would be expected to not exclude the patrol vehicle radar return frequency bins in the determination of the relative target vehicle speed. A POSITA would expect the patrol vehicle radar return frequency bins to interfere with the relative speed determination of the target vehicle radar return frequency bins.

143. Even furthermore, a POSITA would expect these inaccuracies in the patrol vehicle speed determination, and the inaccuracies in the relative speed of the target vehicle determination, would lead to inaccuracies in the absolute speed of the target vehicle determination.

144. A POSITA may also analyze what position accuracy would be needed to support a window size of the ± 5 mph as taught in the '039. (Ex. 1001, at 14, 9:2-13, at 15, 12:13-16). A POSITA would recognize that if the window is off by 10 mph, then the taught ± 5 mph window would be totally outside the patrol vehicle radar return frequency bins. Thus, if the speed error of the speed determining element is 10mph, the radar system would be ineffective in windowing the patrol vehicles radar frequency bins. Using this 10 mph speed error, a POSITA can calculate the position accuracy needed to support the ± 5 mph window as: $10\text{mph} * (1609.344\text{m}/1\text{mile}) * (1\text{hr}/3600\text{sec}))$, which equals 4.47 meters (i.e., $\pm 2.23\text{m}$); as shown in the above table.

145. A POSITA would understand that Thomas's 10m differential GPS position accuracy produces maximum speed errors that would far exceed the necessary speed accuracies taught in the '039. Thus, a POSITA would recognize that Thomas's differential GPS 10m accuracy statements would not provide an

accurate enough window to exclude the police radar return frequency bins in the determinations of the relative target speed and hence the absolute target speed using the speed of the patrol vehicle, as taught in the '039 patent. In view of the deficiencies of a GPS-based speed determination as taught by Thomas, a POSITA would not be motivated to make the combinations the Petitioner has proposed. Furthermore, given these same deficiencies, a POSITA would not have a reasonable expectation that the combination would succeed. Petitioner's combination of Shelton-Henderson and Thomas does not overcome any of the deficiencies explained above. Shelton relies on a speed window of ± 5 mph to distinguish the patrol vehicle speed from target speed. A POSITA would understand that the speedometer source is expected to be at least within an accuracy band of 5 mph. If it is not, Henderson's old methods of strongest signal for determining patrol vehicle speed, would not achieve the advantage of using the claimed invention. The Shelton-Henderson and Thomas combination does not overcome the accuracy deficiencies described above. A POSITA is taught by Shelton-Henderson that the source for patrol car speed must be accurate enough to be within 5 mph of the actual patrol car speed.

146. A POSITA would recognize that if the window is off by 10 mph, then the taught ± 5 mph window would be totally outside the patrol vehicle radar return frequency bins. Thus, if the speed error of the speed determining element is 10mph, the radar system would be ineffective in windowing the patrol vehicles radar frequency bins. Using this 10 mph speed error, a POSITA can calculate the position accuracy needed to support the ± 5 mph window as: $10\text{mph} \times (1609.344\text{m}/1\text{mile}) \times (1\text{hr}/3600\text{sec})$, which equals 4.47 meters (i.e., $\pm 2.23\text{m}$); as shown in the above table.

147. As explained immediately above, a POSITA would understand that Thomas's 10m differential GPS position accuracy produces maximum speed errors that would far exceed the necessary speed accuracies taught in the '039. Consequently, a POSITA would have no motivation to combine Shelton-Henderson and Thomas nor would they have an expectation of success in achieving that proposed combination.

RESPONSE TO PETITION OBVIOUSNESS GROUNDS

148. Here I state my opinions regarding the Petitioner's obviousness arguments. In my response, I will order the Grounds and Claims in the order as the

Petitioner had and will reference back previously presented Exhibits when appropriate.

Ground 1A: Claims 1-3, 6-11, 14, 15 are Not Obvious over Aker, Aker '724 and Thomas

149. Even assuming a POSITA would have a reason to make the proposed combination, and a reasonable expectation of success, I disagree that the combination of Aker, Aker '724 and Thomas render **claims 1-3, 6-11, 14, and 15** obvious.

Ground	Challenged Claims	Basis for Rejection
1A	1-3, 6-11, 14, 15	Obviousness (§103) over Aker, Aker '724, and Thomas
1B	3-5, 11-13	Obviousness (§103) over Aker, Aker '724, Thomas, and Carmichael
2A	1-3, 6-11, 14, 15	Obviousness (§103) over Shelton, Henderson, and Thomas
2B	3-5, 11-13	Obviousness (§103) over Shelton, Henderson, Thomas, and Carmichael

Claim 9

[9.3] a speed determining element configured to receive and process radio frequency signals from a global navigation satellite system to determine and output a speed of the patrol vehicle; and

150. The Petitioner has alleged that the combination of Aker, Aker '724 and Thomas render claim 9 obvious. I disagree. Specifically, the requirement of element 9.3 would not be met. The Petitioner relies on Thomas's speed controller 10 configured to determine and output a speed of the patrol vehicle.

151. The Petition states that "the controller 10 from Thomas (including the GPS receiver 12) provides a "current-vehicle-speed signal" calculated based on the GPS data to the 'speedometer link transducer 59' of the DSP in the counting display unit" (Paper 1 at 16, also see similar at 8, 11, 17). No other description of the proposed combination is made, other than a block diagram reproduced in the Petition at page 8.

152. It is my understanding that Petition is alleging that the Thomas controller 10 satisfies the speed determining element of claim 9.3. (*Id.*) I disagree.

153. Thomas teaches that within the controller 10, the current speed (e.g., from receiver 12) is applied to a comparator 14, and the comparator 14, compares the current vehicle speed with the vehicle speed limit (i.e., the speed limit). The output of the comparator is a control signal to either control (i.e., reduce fuel injector operation) or nominally control (i.e., normal fuel injector operation) that is applied to the regenerator 16 (i.e., fuel injector driver). The engine management systems

(i.e., injector output) provides an input to the regenerator 16, which then provides an output to control the fuel injectors. (Ex. 1005 at 9 ll. 15 – 10, ll. 20, Figure 1, Figure 2)

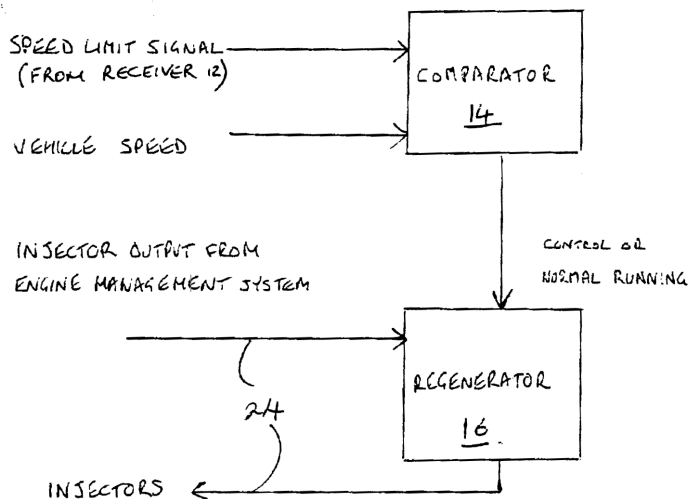


FIGURE 2

154. Thomas provides the detailed circuit diagram of Figure 1, shown below, where the controller 10, receives speed information from either receiver 12 or the ABS Sensors 22, and then outputs control signals to the engine management information on lines 24 connected to the fuel injectors 20. Figure 1 also shows a manual speed limit input (Ex. 1005 at 9 ll. 15 – 10, ll. 20, Figure 1, Figure 2) and a speed being controlled Activation light”.

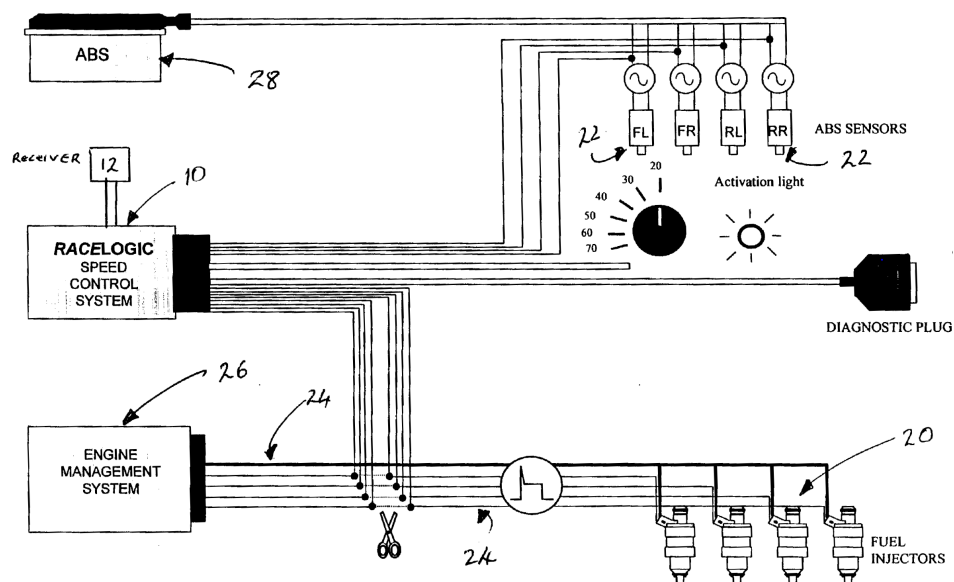


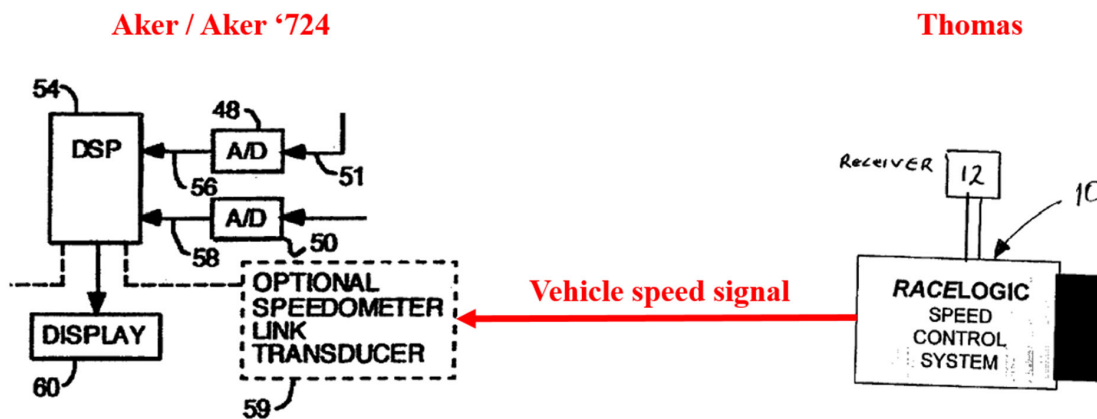
FIGURE 1

155. A POSITA would recognize the output of the controller 10 are signals that travel over wires that go to the fuel injectors to either control (i.e., reduce the vehicle speed that has exceeded the speed limit) or control the fuel injectors in a nominal fashion (i.e., for a vehicle speed less than speed limit). A POSITA would recognize that controller 10 does not output any GPS position or speed information.

156. As stated previously, Thomas's controller 10 does not output position or speed. Internal to Thomas's controller 10, the current-vehicle-speed signal from GPS is applied to a comparator 14, which compares the current vehicle speed with the vehicle speed limit. The output of the comparator is a control signal (not speed) to either control (i.e., reduce fuel injector operation) or nominally control (i.e.,

normal fuel injector operation) that is applied to the regenerator 16 (i.e., fuel injector driver). The engine management systems (i.e., injector output) provides an input to the regenerator 16, which then provides an output to control the fuel injectors. (Ex. 1005 at 9||15-11||20, 9:20-32, Figure 2). This point is further illustrated in Thomas's Figure 1.

157. The Petitioner has substantially modified Thomas's Figure 1, and only shows one line coming out of the substantially modified controller 10 of Thomas.



(Paper 1 at 8)

The Petition fails to explain specifically how Thomas is being modified to pass a speed signal to its output and how the output is being modified. In addition, Aker/Aker '724 are shown as having a speed link transducer receiving the signal from Thomas. The Petition fails to describe the format of the signal from Thoms.

The Petition fails to describe the format signal input of the Aker/Aker '724 transducer and how that format is compatible with the output of Thomas's controller 10. The Petition fails to describe if and how this signal from the speed link transducer of Aker/Aker '724 is capable of transducing that signal into a format suitable for the DSP 54. Petitioner does not even address the issue or explain how this proposed combination would work. The Petition fails to provide technical basis for the conclusory statement "a POSITA would have both found the combination obvious and been motivated perform the combination". It is my understanding that conclusory statements of obviousness do not provide sufficient technical basis for an obviousness position. In my opinion, a POSITA would understand that Petitioner's proposed combination is insufficient because Thomas's controller 10 outputs a control signal, not a speed signal, and the transducer of Aker/Aker '724 is not configured to receive such signals.

[9.4]: "a processing element configured to"

158. The Petition describes DSP in Aker, but fails to describe with any detail how the processing element is **configured** to satisfy the claim limitations stated in the rest of the claim. The '039 teaches sending multiple commands to the GNSS receiver to minimize messages on the port, provide GNSS data at a faster than

nominal rate (e.g., 5 updates per second (i.e., 5 Hz rate)) with update interval of 200 msec, and at a higher than nominal bit rate (i.e., baud rate). While I am not reading any of these specific settings into the claim limitations, clearly the '039 teaches the GNSS receiver is to be configured by the processor, which the Petitioner does not address.

159. The Petition fails to describe how a processing element is **configured** to receive the speed from the patrol vehicle from the speed determining element. (Ex. 1001, 6-64-7:26.) Once again, the Petitioner only provides a conclusory statement “Accordingly, the Aker-Thomas combination renders this limitation obvious.” (Paper 1 at 16-17) The Petition fails to provide technical basis for the conclusory statement. It is my understand that conclusory statements of obviousness do not provide sufficient technical basis for an obviousness position.

[9.6]: “receive the speed of the patrol vehicle from the speed determining element”

160. As describe earlier in claim element [9.3] of this declaration, the Petitioner relies on Thomas’s “controller 10 (the speed determining element) that ‘*calculate[s]*’ a ‘*current-vehicle-speed signal ... from GPS (global positioning*

data)’ and outputs the signal to a separate component in the systems.” (Paper 1 at 17)

161. As describe earlier in claim element [9.3] of this declaration, Thomas’s controller 10 does not output position or speed. Internal to Thomas’s controller 10, the current-vehicle-speed signal from GPS is applied to a comparator 14, which compares the current vehicle speed with the vehicle speed limit. The output of the comparator is a control signal (not speed) to either control (i.e., reduce fuel injector operation) or nominally control (i.e., normal fuel injector operation) that is applied to the regenerator 16 (i.e., fuel injector driver). The engine management systems (i.e., injector output) provides an input to the regenerator 16, which then provides an output to control the fuel injectors. (Ex. 1005 at 9||15-11||20, 9:20-32, Figure 1, Figure 2).

162. Even if Thomas’s controller 10 did produce speed at the output, which it does not and cannot based on the teachings and components with the controller 10, the Petitioner then applies the single line of Thomas’s modified controller 10 to the speedometer transducer interface of Aker. The Petition does not describe how the alleged “Vehicle Speed Signal” out of the modified Thomas controller 10, would interface.

163. The Petitioner does not sufficiently, if at all describe how the Thomas's control will process the speed information through the comparator, and regenerator to somehow magically produce the speed of the patrol vehicle from the speed determining element that is required in claim element [9.6].

164. The Petitioner has failed to provide any detail on how a POSITA would interface Thomas's controller 10 signal outputs on wires going to fuel injectors would drive the Aker's speedometer link transducer. The Petitioner simple states "Accordingly, the Aker-Thomas combination renders this limitation obvious." In my opinion the Petition fails to provide technical basis for the conclusory statement. It is my understand that conclusory statements of obviousness do not provide sufficient technical basis for an obvious position.

[9.8]: "convert the speed of the patrol vehicle to a frequency bin number"

165. With regard to claim element [9.8], the Petition concludes that "Thus, Aker discloses converting the speed of the patrol vehicle from the speedometer to a frequency bin number instead of from the Doppler radar signal." (Paper 1 at 21)

166. It is my understanding that Petitioner alleges that Aker's DSP converts the speed of the patrol vehicle (form the speed determining element, i.e., GNSS) to a frequency bin number. I disagree.

167. Claim element [9.8] required the GNSS derived speed patrol vehicle speed be converted to a frequency bin number. A POSITA would understand that Aker does not use GNSS to determine the speed of the patrol vehicle. A POSITA would also understand that Thomas does not output speed from the controller 10.

168. As describe earlier in claim element [9.3], Thomas's controller 10 does not output position or speed. The Petitioner does not provide any detail on how the controller 10 output signal, on a wire, going to a fuel injector will be interfaced to Aker's speedometer interface.

169. Additionally, Aker's does not explicitly disclose that it converts an optional speedometer vehicle speed to a frequency number. Furthermore, the Petition, nor its expert provide an opinion based on the knowledge of a POSITA.

Claim 10

170. Claim 10 is not obvious as discussed above regarding claim 9.

Claim 11

[11.0]: "The traffic radar system of claim 9, wherein the processing element is further configured to determine whether the patrol vehicle is moving or stationary and convert the relative speed of the target vehicle to the absolute speed using the speed of the patrol vehicle only when the patrol vehicle is moving."

171. Claim 11 is not obvious as discussed above regarding claim 9. Furthermore, the Petition fails to identify the claim element “the processing element is further configured to determine whether the patrol vehicle is moving or stationary . . .” Petitioner points to Aker, which describes that the “operator” selects moving or stationary mode. (Petition at 28). The plain meaning of processor configured to **determine** excludes a system that relies on the operator to determine the mode.

Claim 14

172. Claim 14 is dependent on claim 9, therefor is not obvious. *See* claim 9 *supra*.

Claim 1

Claim element 1.3 is not obvious over Aker, Aker ‘724 and Thomas

[1.3]: “a speed determining element configured to determine and output a speed of the patrol vehicle and not receive signals or data from the patrol vehicle; and”

173. It is my understanding that Petitioner has alleged that the combination of Aker, Aker ‘724 and Thomas render claim element [1.3] as obvious. I disagree. The Petition cites back to claim element [9.3], provides additional citations, with no further allegations of obviousness.

174. Claim element [1.3] requires “a speed determining element configured to determine and output a speed of the patrol vehicle and **not receive signals or data from the patrol vehicle**” (Ex. 1001, claim element 1.3, bold emphasis added).

175. Indeed, this claim element was very closely reviewed by the examiner in the prosecution of the ‘039 patent where the examiner provided allowance over a previously rejected indefiniteness position. As disclosed in the ‘039, and the prosecution history it is very clear that the ‘039 patent claims obtaining the speed of the patrol vehicle from the speed determining element, and NOT from signals or data received from the patrol vehicle. Quite simply a POSITA would understand the ‘039 patent requires not to obtain the speed of the patrol vehicle from any device that receives signals or data, such as a speedometer from the patrol vehicle. Yet, the Petition has relied on obtaining speed of the patrol vehicle by interfacing to the patrol vehicle itself. In my opinion and applying the plain and ordinary meaning of claim element [1.3] a POSITA would recognize the significance that the ‘039 patent requires that the traffic radar system with patrol vehicle speed detection does not receive signals or data from the patrol vehicle in order to determine the speed of the patrol vehicle (e.g., the patrol vehicle speedometer).

176. In my review of the Petition and Thomas, it is my opinion that Petitioner has misrepresented the Thomas disclosure on several occasions. Thomas uses the word “speedometer” only twice and never refers to the speed derived from the GPS receiver as “GPS speedometer”, as ACI has mischaracterized in their Petition. (Paper 1 at 9, 10, 40, 42)

177. As describe above regarding claim element [9.3], Thomas’s controller 10 does not output position or speed.

178. A POSITA would recognize the output of the controller 10 are signals that travel over wires that go to the fuel injectors to either control (i.e., reduce the vehicle speed that has exceeded the speed limit) or control the fuel injectors in a nominal fashion (i.e., for a vehicle speed less than speed limit). A POSITA would recognize that controller 10 does not output any GPS position or speed information. Thus, it my opinion, the Petitioner has not provided sufficient evidence that the proposed combination renders claim 1 as obvious.

[1.4]: “a processing element configured to”

179. See [9.4] *supra*.

[1.6]: “receive the speed of the patrol vehicle from the speed determining element”

180. *See* [9.6] *supra*.

[1.8]: “convert the speed of the patrol vehicle to a frequency bin number”

181. *See* [9.8] *supra*.

Claim 2

182. Claim 2 is dependent on claim 1, therefor is not obvious. *See* claim 1 *supra*.

Claim 3

183. Claim 3 is dependent on claim 1, therefor is not obvious. *See* claim 1 *supra*. In addition, claim 3 is not obvious for the same reasons discussed above with respect to Ground 1A for claim 11.

Claim 6

184. Claim 6 is dependent on claim 1, therefor is not obvious. *See* claim 1 *supra*.

Claim 7

185. Claim 7 is dependent on claim 1, therefor is not obvious. *See* claim 1 *supra*.

Claim 8

186. Claim 8 is dependent on claim 1, therefor is not obvious. *See* claim 1 *supra*.

Claim 15

187. Claim 15 is dependent on claim 9, therefor is not obvious. *See* claim 9 *supra*.

Ground 1B: Claims 3-5, 11-13 are Not Obvious over Aker, Aker '724 and Thomas and Carmichael

188. The Petitioner has alleged that the combination of Aker, Aker '724 and Thomas and Carmichael render **claims 3-5, 11-13** as obvious. I disagree.

Ground	Challenged Claims	Basis for Rejection
1A	1-3, 6-11, 14, 15	Obviousness (§103) over Aker, Aker '724, and Thomas
1B	3-5, 11-13	Obviousness (§103) over Aker, Aker '724, Thomas, and Carmichael
2A	1-3, 6-11, 14, 15	Obviousness (§103) over Shelton, Henderson, and Thomas
2B	3-5, 11-13	Obviousness (§103) over Shelton, Henderson, Thomas, and Carmichael

The Petition states that a POSITA would have been “motivated to incorporate the automatic movement detection of Carmichael into the Aker-Thomas combination.” (Paper 1 at 34) I disagree. The Petitioner also states “A POSITA would have found it obvious to modify the previous Aker-Thomas combination based on Carmichael’s teachings”. I disagree.

Claim 11

[11.0]: “The traffic radar system of claim 9, wherein the processing element is further configured to determine whether the patrol vehicle is moving or stationary and convert the relative speed of the target vehicle to the absolute speed using the speed of the patrol vehicle only when the patrol vehicle is moving.”

189. Claim 11 is dependent on claim 9, therefor is not obvious. *See* claim 9.

190. It is my understanding the Petitioner alleges that Carmichael’s automatic switch over between stationary and moving mode, which uses a single zero speed threshold, modifies the Aker-Thomas combination to satisfy the claim limitations of claim 11, where Thomas’s controller 10 satisfies “a speed determining element”. (Paper 1 at 36) I disagree.

191. A POSITA would immediately recognize that Carmichael obtains vehicle speed information directly from the vehicle over a direct connection. In other words, Carmichael does not teach or even suggest obtaining the speed of the vehicle

through a satellite-based radio frequency link (i.e., GNSS). As described in the claim interpretation section of this declaration, a POSITA would understand the position and speed estimates from a GNSS receiver would be noisy, and the utilization of a single zero-speed threshold to determine if the vehicle is stationary or moving would always produce a “moving” determination. A POSITA would understand that even if a vehicle was stationary, the GNSS receiver would not output a speed of zero, due to the noisy position solution. Therefore, the proposed combination would not meet the limitation “convert the relative speed of the target vehicle to the absolute using the speed of the patrol vehicle only when the patrol vehicle is moving.”

Claim 12

[12.0]: “The traffic radar system of claim 9, wherein the speed determining element outputs the patrol vehicle speed in a stream of messages and the processing element is further configured to”

192. Claim 12 is dependent on claim 9, therefor is not obvious. *See* claim 9.

193. Regarding claim element [12.0], the Petitioner has stated “Thomas’s controller 10 sends a stream of messages at regular intervals including the current vehicle speed. *See id.* These messages comprise the “current-vehicle-speed signal” described in Thomas.” (Paper 1 at 37). I disagree.

194. It is my understanding that Petitioner alleges the speed control 10 satisfies the “**speed determining element outputs the patrol vehicle speed in a stream of messages and the processing element is further configured to**” of claim element [12.0]. I disagree. In fact, Thomas’s controller 10 does not output the patrol vehicle speed, not does it stream any messages. As stated previously, the output of the Thomas’s controller 10 is a control signal that goes to fuel injectors. A POSITA would understand that Thomas’s controller 10, outputs 12volt control signals on a wire going to the fuel injectors. (Ex. 1005 at 10, ll. 8-20, Figure 1, 2, 4, 5)

195. The Petition does not provide any basis or engineering analysis on how the controller 10 disclosed by Thomas would output the patrol vehicles speed in a stream of messaged that would go to a processing element required by claim 12. The Petitioner’s modified Figure 2 of Thomas only shows a single line connected to the modified controller 10, with no foundation for how the controller 10, is modified to satisfy the speed determining element outputs the patrol vehicle speed in a stream of messages, required in claim 12. A POSITA would understand that Thomas’s controller 10 does not output a stream of messages.

[12.1]: “determine that the patrol vehicle is moving when the patrol vehicle speed is greater than a first threshold value for a predetermined number of successive messages, and”

[12.2]: “determine that the patrol vehicle is stationary when the patrol vehicle speed is less than a second threshold value for a predetermined number of successive messages.”

196. Claim element [12.1] and [12.2] are dependent on claim 9, therefore is not obvious. *See* claim 9 *supra*.

197. Claim elements [12.1] and [12.2] require the use of a predetermined number of successive messages and a “first threshold” and a “second threshold”. See claim interpretation section above. As required in claim 12, the Petitioner fails to describe how Carmichael compares successive messages against a first threshold. Indeed, Carmichael does not disclose this element. Likewise, the Petitioner fails to describe how Carmichael compares successive messages against a second threshold. Carmichael also fails to disclose this element because it does not describe a use of a threshold other than zero and does not disclose the use of dual positive thresholds that are different. A POSITA would understand the proposed combination does not disclose all the limitations of the claim 12. The Petition does not actually state the Aker-Thomas-Carmichael combination satisfy this claim limitation.

Claim 13

198. Claim 13 is dependent on claim 12, therefor is not obvious. *See* claim 9 *supra*.

Claim 3

199. Claim 3 is dependent on claim 1, therefor is not obvious. *See* claim 1 *supra*.

Claim 4

200. As described in the claim interpretation section, claim 4 uses the same claim language as claim elements [12.0] and [12.1], and therefore is not obvious. Claim 4 is dependent on claim 1, and therefore is not obvious. *See* claim 1 and claim elements [12.0] and [12.1], *supra*.

Claim 5

201. As described in the claim interpretation section, claim 5 used the same claim language as claim elements [12.0] and [12.2], and therefore is not obvious. Claim 5 is dependent on claim 1, and therefore is not obvious. *See* claim 1 and claim elements [12.0] and [12.2], *supra*.

Grounds 2A: Claims 1-3, 6-11, 14, 15 are not Obvious over Shelton in view of Henderson and Thomas.

202. As described above in detail, a POSITA would not be motivated to combine Thomas with Shelton and Henderson nor have a reasonable expectation of success in achieving the combination because Thomas's GPS receiver did not have the accuracy to reliably center a window over the patrol vehicle radar returns to effectively determine the relative target speed and effectively determine the absolute target speed using the patrol vehicle speed. Moreover, a POSITA would not be motivated to look towards a simple fuel injector controller for a much more complicated GNSS-based traffic radar system.

203. Even assuming a POSITA would have a reason to make the proposed combination, and a reasonable expectation of success, I disagree that the combination of Shelton, Henderson and Thomas render **claims 1-3, 6-11, 14, and 15** obvious.

Ground	Challenged Claims	Basis for Rejection
1A	1-3, 6-11, 14, 15	Obviousness (§103) over Aker, Aker '724, and Thomas
1B	3-5, 11-13	Obviousness (§103) over Aker, Aker '724, Thomas, and Carmichael
2A	1-3, 6-11, 14, 15	Obviousness (§103) over Shelton, Henderson, and Thomas
2B	3-5, 11-13	Obviousness (§103) over Shelton, Henderson, Thomas, and Carmichael

Claim 9

[9.3] a speed determining element configured to receive and process radio frequency signals from a global navigation satellite system to determine and output a speed of the patrol vehicle; and

204. The Petitioner has alleged that the combination of Shelton in view of Henderson and Thomas render claim 9 obvious. I disagree. Specifically, the requirement of element 9.3 would not be met. The Petitioner relies on Thomas's speed controller 10 configured to determine and output the speed of the patrol vehicle.

205. The Petition states that "in the present combination, the controller 10 from Thomas (including the GPS receiver 12) provides a pulse signal representing the current vehicle speed as calculated based on the GPS data to the DSP of Shelton (the processing element, *see* Grounds 2A [9.4] *infra*) in the same manner as the

‘electronic speedometer’ described herein”. (Paper 1 at 49) It is my understanding that Petition is alleging that the Thomas controller 10 satisfies the speed determining element of claim 9.3. (*Id.*) I disagree.

206. As described earlier regarding claim element [9.3] in Grounds 1A, Thomas’s controller 10 outputs a control signal going to a fuel injector. *See* Grounds 1A [9.3] *supra*.

207. This output controls the fuel injector and is not a speed signal. For example, if the operator takes their foot off the gas, under nominal (i.e., non-speed control conditions), the output of Thomas’s control does not relate to speed. Likewise, if Thomas’s controller 10 is in a speed control condition (i.e., decreasing the speed of the vehicle), the output of Thomas’s controller 10 is not speed. It is a control signal going to the fuel injectors.

[9.4]: “a processing element configured to”

208. The Petition cites to Shelton’s DSP (a processing element) that performs various processing tasks related to target speed determination. (Paper 1 at 49-50) followed by a conclusory statement. The Petition fails to describe with any detail how the processing element is **configured** to satisfy the claim limitations stated in the rest of the claim. The ‘039 teaches sending multiple commands to the

GNSS receiver to configure it for the traffic radar system with speed detection. *See* Grounds 1A [9.3] *supra*.

209. The Petition fails to describe how a processing element is **configured** to receive the speed of the patrol vehicle from the speed determining element. (Ex. 1001, at 13, 6-64-7:26.) Once again, the Petitioner only provides a conclusory statement “Accordingly, the Shlton-Henderson-Thomas combination renders this limitation obvious.” (Paper 1 at 50) The Petition fails to provide technical basis for the conclusory statement. It is my understanding that conclusory statements of obviousness do not provide sufficient technical basis for an obviousness position.

[9.6]: “receive the speed of the patrol vehicle from the speed determining element”

210. Petitioner does not mention or describe at all how the processor is configured to receive speed of the patrol vehicle from the speed determining element. (Paper 1 at 50-51). The Petitioner only describes Shelton’s speedometer and DSP. As describe earlier in claim element [9.3] of this declaration, the Petitioner relies on Thomas’s controller 10 but here in claim element [9.6] the Petitioner only describes Shelton’s speedometer. (Paper 1 at 50-51). Claim 9 requires that the speed determining element outputs a speed of the patrol vehicle (i.e., from GNSS) and that

speed is received by the processing element. *See* Grounds 1A [9.3] *supra*. The Petition fails to provide technical basis for the conclusory statement. It is my understand that conclusory statements of obviousness do not provide sufficient technical basis for an obviousness position.

[9.8]: “convert the speed of the patrol vehicle to a frequency bin number”

211. Again, the Petitioner does not mention or describe at all how the speed of the patrol vehicle from the speed determining element (i.e., from GNSS) is converted to a frequency bin number (Paper 1 at 52-53). The Petitioner only describes Shelton’s speedometer input and the DSP. As describe earlier in claim element [9.3] of this declaration, the Petitioner relies on Thomas’s controller 10 but here in claim element [9.6] describes Shelton’s speedometer and DSP operation. (Paper 1 at 52-53). Claim 9 requires that the speed determining element outputs a speed of the patrol vehicle (i.e., from GNSS) and that speed is converted to a frequency bin number, which the Petitioner fails to describe at all. The Petition fails to provide technical basis for the conclusory statement. It is my understanding that conclusory statements of obviousness do not provide sufficient technical basis for an obviousness position.

Claim 10

212. Claim 10 is not obvious as discussed above regarding Grounds 2A claim 9.

Claim 11

[11.0]: “The traffic radar system of claim 9, wherein the processing element is further configured to determine whether the patrol vehicle is moving or stationary and convert the relative speed of the target vehicle to the absolute speed using the speed of the patrol vehicle only when the patrol vehicle is moving.”

213. Claim 11 is not obvious as discussed above regarding Grounds 2A claim 9. Furthermore, the Petition fails to identify the claim element “the processing element is further configured to determine whether the patrol vehicle is moving or stationary . . .” Petitioner points to Shelton, which describes that the “configuration” is accomplished with buttons on the front panel of the radar unit pressed by an operator selecting moving or stationary mode. (Petition at 60). The plain meaning of processor configured to **determine** excludes a system that relies on the operator to determine the mode.

Claim 14

214. Claim 14 is dependent on claim 9, therefor is not obvious. *See* Grounds 2A claim 9 *supra*.

Claim 1

Claim element 1.3 is not obvious over Shelton in view of Henderson and Thomas

[1.3]: “a speed determining element configured to determine and output a speed of the patrol vehicle and not receive signals or data from the patrol vehicle; and”

215. It is my understanding that Petitioner has alleged that the combination of Shelton in view of Henderson and Thomas renders claim element 1.3 as obvious. I disagree. The Petition merely cites back to claim element [9.3], with no further allegations of obviousness.

216. Claim element 1.3 requires “a speed determining element configured to determine and output a speed of the patrol vehicle and **not receive signals or data from the patrol vehicle**” (Ex. 1001, claim element 1.3, bold emphasis added). Yet the Petitioner proposed Shelton-Henderson-Thomas combination does receive signals or data from the patrol vehicle, and therefore does not render claims element [1.3] as obvious. Also see Grounds 1A [1.3] *supra*.

217. As describe above regarding claim element [9.3], Thomas’s controller 10 does not output position or speed.

218. A POSITA would recognize the outputs of Thomas’s controller 10 are control signals that travel over wires that go to the fuel injectors. A POSITA would

recognize that controller 10 does not output any GNSS position or speed information. Thus, in my opinion, the Petitioner has not provided sufficient evidence that the proposed combination renders claim element 1.3 as obvious. *See* Grounds 2A [9.3] *supra*.

[1.4]: “a processing element configured to”

219. *See* Grounds 2A [9.4] *supra*.

[1.6]: “receive the speed of the patrol vehicle from the speed determining element”

220. *See* Grounds 2A [9.6] *supra*.

[1.8]: “convert the speed of the patrol vehicle to a frequency bin number”

221. *See* Grounds 2A [9.8] *supra*.

Claim 2

222. Claim 2 is dependent on claim 1, therefor is not obvious. *See* Grounds 2A claim 1 *supra*.

Claim 3

223. Claim 3 is dependent on claim 1, therefor is not obvious. *See* Grounds 2A claim 1 *supra*. Furthermore, claim 3 is not obvious for the same reasons as discussed above for Ground 2A, claim 11.

Claim 6

224. Claim 6 is dependent on claim 1, therefor is not obvious. *See* Grounds 2A claim 1 *supra*.

Claim 7

225. Claim 7 is dependent on claim 1, therefor is not obvious. *See* Grounds 2A claim 1 *supra*.

Claim 8

226. Claim 8 is dependent on claim 1, therefor is not obvious. *See* Grounds 2A claim 1 *supra*.

Claim 15

227. The Petition cites back to claim 8, but claim 15 is not dependent upon claim 8. (Paper 1 at 65). Claim 15 is dependent on claim 9, therefor is not obvious. *See* Grounds 2A claim 9 *supra*.

Ground 2B: Claims 3-5, 11-13 are Not Obvious over Shelton, Henderson, Thomas, and Carmichael

228. For the same reasons explained above for Grounds 1A, 1B, and 2A, a POSITA would not be motivated to combine Thomas with Shelton and Henderson (including Carmichael) nor have a reasonable expectation of success in achieving

the combination because Thomas's GPS receiver did not have the accuracy to reliably center a window over the patrol vehicle radar returns to effectively determine the relative target speed and effectively determine the absolute target speed using the patrol vehicle speed. Moreover, a POSITA would not be motivated to look towards a simple fuel injector controller for a much more complicated GNSS-based traffic radar system.

229. Even assuming a POSITA would have a reason to make the proposed combination, and have a reasonable expectation of success, I disagree that the combination of Shelton, Henderson and Thomas in view of Carmichael render **claims 3-5, 11-13** as obvious.

Ground	Challenged Claims	Basis for Rejection
1A	1-3, 6-11, 14, 15	Obviousness (§103) over Aker, Aker '724, and Thomas
1B	3-5, 11-13	Obviousness (§103) over Aker, Aker '724, Thomas, and Carmichael
2A	1-3, 6-11, 14, 15	Obviousness (§103) over Shelton, Henderson, and Thomas
2B	3-5, 11-13	Obviousness (§103) over Shelton, Henderson, Thomas, and Carmichael

230. The Petition states that a POSITA would have been “motivated to incorporate the automatic movement detection of Carmichael into the previous Shelton-Henderson-Thomas combination.” (Paper 1 at 65) I disagree. The Petitioner also states, “A POSITA would have found it obvious to modify the previous Shelton-Henderson-Thomas combination based on Carmichael’s teachings”. I disagree.

Claim 11

[11.0]: “The traffic radar system of claim 9, wherein the processing element is further configured to determine whether the patrol vehicle is moving or stationary and convert the relative speed of the target vehicle to the absolute speed using the speed of the patrol vehicle only when the patrol vehicle is moving.”

231. Claim 11 is dependent on claim 9, therefor is not obvious. *See* Grounds 2A claim 9.

232. It is my understanding the Petitioner alleges that Carmichael’s automatic switch over between stationary and moving mode, which uses a single zero speed threshold, modifies the Shelton-Henderson-Thomas combination to satisfy the claim limitations of claim 11. (Paper 1 at 67-68) I disagree.

233. A POSITA would immediately recognize that Carmichael obtains vehicle speed information directly from the vehicle over a direct connection. In other

words, Carmichael does not teach or even suggest obtaining the speed of the vehicle through a satellite-based radio frequency link (i.e., GNSS).

234. As described in the claim interpretation section of this declaration, a POSITA would understand the position and speed estimates from a GNSS receiver would be noisy, and the utilization of a single zero-speed threshold to determine if the vehicle is stationary or moving would always produce a “moving” determination.

235. The Petition describes radar Doppler frequency shifts and seems to imply that these Doppler returns are used as a basis for moving determination to satisfy claim 11. I disagree.

236. The ‘039 patent teaches that the processor receives the patrol vehicle speed from the speed determining element (i.e., from GNSS) and then sets the speed mode to “stationary” or “moving”. (Ex. 1001 Figure 10A, 7:49-55, 9:14-24)

Claim 12

[12.0]: “The traffic radar system of claim 9, wherein the speed determining element outputs the patrol vehicle speed in a stream of messages and the processing element is further configured to”

237. Claim 12 is dependent on claim 9, therefor is not obvious. *See* claim 9.

238. Regarding claim element [12.0], the Petitioner has stated “Thomas’ controller 10 sends a stream of messages at regular intervals including the current vehicle speed.” (Paper 1 at 69). I disagree.

239. It is my understanding that Petitioner alleges the speed control 10 satisfies the “**speed determining element outputs the patrol vehicle speed in a stream of messages and the processing element is further configured to**” of claim element [12.0]. I disagree. In fact, Thomas’s controller 10 does not output the patrol vehicle speed, nor does it stream any messages. As stated previously, the output of the Thomas’s controller 10 is a control signal that goes to fuel injectors. (Ex. 1005 at 10, ll. 8-20, Figure 1, 2, 4, 5)

240. The Petition does not provide any basis or engineering analysis on how the controller 10 disclosed by Thomas would output the patrol vehicles speed in a stream of messages that would go to a processing element required by claim 12. A POSITA would understand that Thomas’s control 10 does not output a stream of messages.

[12.1]: “determine that the patrol vehicle is moving when the patrol vehicle speed is greater than a first threshold value for a predetermined number of successive messages, and”

[12.2]: “determine that the patrol vehicle is stationary when the patrol vehicle speed is less than a second threshold value for a predetermined number of successive messages.”

241. Claim elements [12.1] and [12.2] require the use of a predetermined number of successive messages and a “first threshold” and a “second threshold”. See claim interpretation section above. As required in claim 12, the Petitioner fails to describe how Carmichael compares successive messages against a first threshold. Indeed, Carmichael does not disclose this element. Likewise, the Petitioner fails to describe how Carmichael compares successive messages against a second threshold. Carmichael also fails to disclose this element. Carmichael also fails to disclose both elements because it does not describe a use of a threshold other than zero and does not disclose the use of dual positive thresholds that are different values. A POSITA would understand the proposed combination does not disclose all the limitations of the claim 12.

242. The Petition fails to provide technical basis for the conclusory statement “Accordingly, the Shelton-Henderson-Thomas-Carmichael combination renders this limitation obvious.” (Paper 1 at 69-70) It is my understanding that

conclusory statements of obviousness do not provide sufficient technical basis for an obviousness position.

Claim 13

243. Claim 13 is dependent on claim 12, therefor is not obvious. *See* Grounds 2A claim 9 *supra*.

Claim 3

[3.0] The traffic radar system of claim 1, wherein the processing element is further configured to determine whether the patrol vehicle is moving or stationary and convert the relative speed of the target vehicle to the absolute speed using the speed of the patrol vehicle only when the patrol vehicle is moving.

244. Claim 3 is dependent on claim 1, therefor is not obvious. *See* Grounds 2A claim 1 *supra*. Furthermore, claim 3 is not obvious for the same reasons as discussed above for Ground 2A, claim 11.

245. It is my understanding the Petitioner alleges that Carmichael's automatic switch over between stationary and moving mode, which uses a single zero speed threshold, modifies the Shelton-Henderson-Thomas combination to satisfy the claim limitations of claim 3. (Paper 1 at 70) I disagree.

246. A POSITA would immediately recognize for the reasons discussed above with respect to claim 11 that the Thomas GNSS system does not output speed,

and if it did, it would always indicate the patrol is moving and therefore would not meet the claim limitation “convert the relative speed of the target vehicle to the absolute speed using the speed of the patrol vehicle only when the patrol vehicle is moving.”

Claim 4

247. As described in the claim interpretation section, claim 4 uses the same claim language as claim elements [12.0] and [12.1], and therefore is not obvious. Claim 4 is dependent on claim 1, and therefore is not obvious. *See* Grounds 2A claim 1 and claim elements [12.0] and [12.1], *supra*.

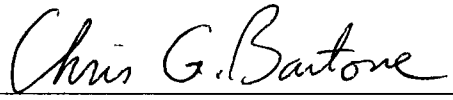
Claim 5

248. As described in the claim interpretation section, claim 5 used the same claim language as claim elements [12.0] and [12.2], and therefore is not obvious. Claim 5 is dependent on claim 1, and therefore is not obvious. *See* Grounds 2A claim 1 and claim elements [12.0] and [12.2], *supra*.

249. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the

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like so made are punishable by fine or imprisonment, or both, under Section 1001 of
Title 18 of the United States Code.



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Date: 2/13/2025