

Filed on behalf of: Kustom Signals Inc.

Filed: August 12, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Applied Concepts Inc.,  
Petitioner,

v.

Kustom Signals Inc.,  
Patent Owner.

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Case IPR2024-00829  
Patent No. 11,194,039

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**PATENT OWNER'S PRELIMINARY RESPONSE**

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## **I. Introduction**

Pursuant to 35 U.S.C. § 313 and 37 C.F.R. § 42.107, Patent Owner, Kustom Signals Inc., submits the following Preliminary Response to the Petition for *Inter Partes* Review of claims 1–15 of U.S. Patent No. 11,194,039 filed by Petitioner, Applied Concepts Inc. Institution of inter partes review is discretionary. *Cuozzo Speed Techs., LLC v. Lee*, 579 U.S. 261, 273 (2016); *SAS Institute Inc. v. Iancu*, 138 S. Ct. 1348, 1356 (2018); *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1367 (Fed. Cir. 2016). For the reasons stated below, Kustom asks the Board to exercise its discretion and deny institution of IPR.

ACI fails to demonstrate that a person of ordinary skill in the art (“POSA”) would have any “apparent reason” to combine the proposed prior art. *E.g.*, *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). In fact, ACI misquotes the prior art to concoct an alleged reason to combine references. But ACI’s misapplication of the prior art’s teachings is only a thin veil to hide ACI’s hindsight reconstruction of the prior art. That alleged reason to combine fails when a POSA consults the actual teachings of the prior art, which clearly teaches a POSA that the proposed combination teaches away from the claimed invention.

## **II. The Challenged '039 Patent**

### **A. The '039 Patent's Disclosure**

U.S. Patent No. 11,194,039 was filed on September 21, 2018. (Exhibit 1001 at face.) The '039 patent claims priority to U.S. Provisional Application Serial Nos. 62/569,667 (filed October 9, 2017), 62/569,923 (filed October 9, 2017), and 62/570,446 (filed October 10, 2017). (*Id.*)

The '039 patent discloses vehicular traffic radio and ranging systems implemented with radar in law enforcement patrol vehicles. (EX1001, 1:30–32). Systems of the type described in the '039 patent typically include at least one radar transceiver that transmits a radar beam and receives reflections of the radar beam as it bounces off target vehicles. (EX1001, 1:30–35). “The received reflections of the radar beam are converted to an electronic signal which is processed to determine the speeds of the target vehicles, which may then be displayed on a display.” (EX1001, 1:34–37). When determining targeted vehicle speeds, “it is necessary to know the speed of the patrol vehicle” and to distinguish between radar returns that are from the ground or stationary objects, reflecting the patrol vehicle's speed and target vehicle speeds. (EX1001, 1:1:37–39, 10:4-17).

The '039 patent discloses that “[p]rior art traffic radar systems have accessed the patrol vehicle speed from the patrol vehicle itself. But, connecting the 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 use 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.” (EX1001, 1:39–48). Consequently, embodiments of the invention disclosed in the '039 patent include “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 interface” and includes a GPS in some embodiments. (EX1001, 1:52–58, 15:49–51, 17:1–4).

Since the '039 patent involves radar-based traffic enforcement efforts, a POSA would understand that accuracy of patrol speed determination and therefore target speed is of paramount importance. A POSA would understand that traffic enforcement, and the legal proceedings arising from it, mandate the most accurate and defensible solution available.

### **B. The '039 Patent's Challenged Claims**

ACI challenges claims 1–15 of the '039 patent. The two independent claims—claim 1 and claim 9—are representative.

Independent claim 1 of the '039 patent recites:

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

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

convert the relative speed of the target vehicle to an absolute speed using the speed of the patrol vehicle.

(EX1001, at 17).

Independent claim 9 of the '039 patent recites:

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 receive and process radio frequency signals from a global navigation satellite system to determine and output a speed of the patrol 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

convert the relative speed of the target vehicle to an absolute speed using the speed of the patrol vehicle.

(EX1001, at 17–18).

### III. Asserted Grounds of Unpatentability

In its Petition, ACI identifies the following grounds of alleged unpatentability:

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

(Paper 1, at 2).

**A. ACI's Alleged Aker and Aker '724 Prior Art**

ACI relies on the Aker and Aker '724 prior art in grounds 1A and 1B. Thus, ACI relies on Aker and Aker '724 as primary references to attack each of independent claims 1 and 9 of the '039 patent.

The Aker references are owned by ACI. (EX1004, at 1; EX1007, at 1:41–43). ACI treats Aker and Aker '724 together. As ACI explains, “Aker discloses a ‘traffic radar’ system ‘with direction sensing capability’ in which reflected radar signals ‘are digitized and the samples are processed by a digital signal processor programmed to find one or more selected target speeds.’” (Paper 1, at 5). ACI argues “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 further argues that the combination of Aker and 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.” (EX1004, [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. Generally speaking, 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 he [sic] prior art” or “by means of a link to the speedometer.” (EX1004, [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.

(EX1004, [0051]). Aker explains 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.” (EX1004, [0099]). Figure 1 of Aker depicts a block diagram relevant to this disclosure and showing the signal paths and DSP:

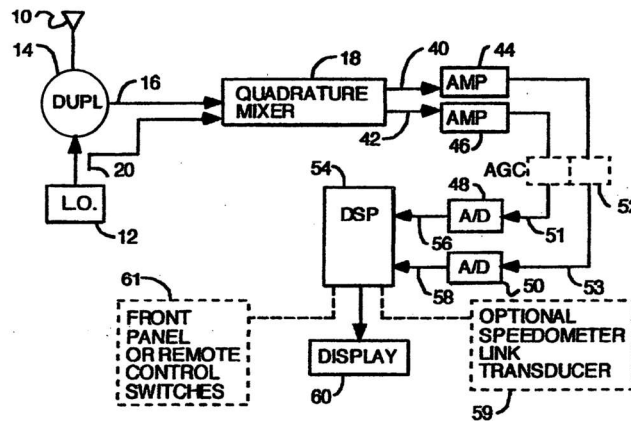


FIG. 1

Aker also discloses “a process for a multimode digital FFT, direction sensing, doppler radar where the operator can select between” various modes in which the patrol vehicle is either stationary or moving.” (EX1004, [0008]–[0025]). Importantly for purposes of this proceeding, Aker’s teaching specifically discloses that the operator selects whether the patrol vehicle is stationary or moving. (EX1004, [0049]–[0050]).

ACI argues that Aker ’724 further details the operation of the Aker disclosure (Paper 1, at 6). To that end, Aker ’724 discloses that “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).” (EX1007, 18:31–35; *id.*, at 75–102). Figure 18 of Aker ’724 depicts that DSP and “speedometer interface 424”:

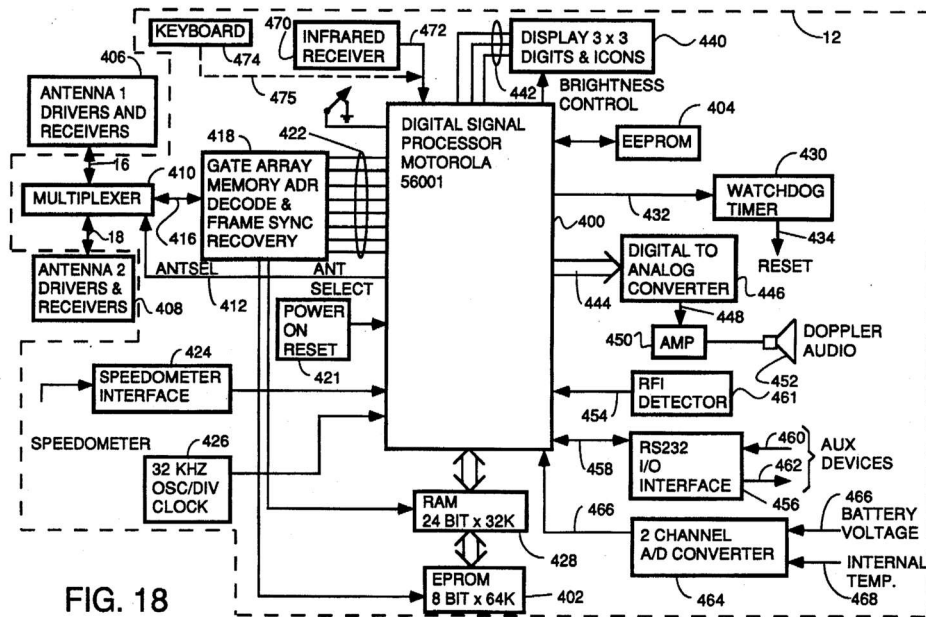


FIG. 18

(EX1007, 27:60–61; Fig. 18).

Aker '724 further explains 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.” (EX1007, 20:34–38). But Aker '724 cautions “[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.” (EX1007, 20:38–40). Aker '724 elaborates:

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 re-calculate it from a different radar return.

(EX1007, 20:42–55).

Together, Aker and Aker '724 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, critically, ACI's code programmed for the Motorola 56001 "does not use the actual speedometer speed as the patrol speed because this is not accurate enough." (EX1007, 20:38–40). Because the optional patrol vehicle speed determined by tapping a patrol vehicle's in-car speedometer is not accurate enough, the prior art relies instead on radar returns from the ground to calculate the

patrol vehicle's speed. (EX1007, 20:42–55). Even in situations where the radar-calculated patrol vehicle speed differs from the speed read from the patrol vehicle's speedometer 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.” (EX1007, 20:51–55). Consequently, even if an error is found to exist as a result of the speed comparison step, Aker '724 still teaches use of radar-based patrol vehicle speed calculations rather than use of a vehicle's speedometer.

**B. ACI's Alleged Thomas Prior Art**

ACI relies on the Thomas prior art in grounds 1A, 1B, 2A, and 2B. (Paper 1, at 2). ACI relies on Thomas as secondary reference to modify its primary references to attack independent claims 1 and 9 of the '039 patent. (Paper 1, at 8–11, 33, 42–44, 65–67).

Thomas “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” (EX1005, at 5, ll. 1–6). Thomas acknowledges “a widespread need to be able to ensure that vehicles adhere to speed limits especially within urban districts. There has been proposed [sic] 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.” (EX1005, at 5, ll. 1–6).

To accomplish its objective, Thomas's device needs to understand a vehicle's speed. Thomas discloses 3 ways to determine vehicle speed:

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).

(EX1005, at 9, ll. 5–14; *see also* at 16, ll. 24–30).

With respect to the GPS signals, at that time of Thomas's disclosure, Thomas notes "[t]here are a number of standard receivers used to interpret the GPS signals from the collection of satellites used for global positioning. *These receivers allow determination 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.*" (EX1005, at 11, ll. 15–21) (emphasis added). Thomas further 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.” (EX1005, at 11, ll. 32 – 12, l. 1). When using the GPS to calculate speed, Thomas discloses “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.” (EX1005, at 17, ll. 11–15).

**C. ACI's Alleged Carmichael Prior Art**

ACI does not use Carmichael in any grounds challenging the independent claims of the '039 patent. If the Board ultimately institutes a trial in this proceeding, Kustom will address ACI's grounds relying on Carmichael at that time.

**D. ACI's Alleged Shelton Prior Art**

Shelton discloses a “speedometer assisted patrol speed search for DSP traffic radar.” (EX1008, Title). Shelton discloses “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.” (EX1008, 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.

(EX1008, 1:53:59).

In particular, Shelton discloses 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.” (EX1008, 2:44–46). By counting the pulses from the speedometer to determine speed, the Shelton disclosure teaches that the vehicle radar returns can be analyzed more accurately by creating a narrow search window in the radar returns and thereby reduce false returns. (EX1008, 1:53–59; 4:42–46; Fig. 4). The search window Shelton identifies is  $\pm 5$  mph. (EX1008, Fig. 4, #82; 4:16–19).

#### **E. ACI's Alleged Henderson Prior Art**

Henderson discloses that a “traffic radar processes 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.” (EX1009, Abstract). Henderson further discloses “systems [that] 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.” (EX1009, 2:63–67).

Henderson states 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.” (EX1009, 8:1–7). Henderson notes that “[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.” (EX1009, 9:5–7). Thus, Henderson relies on radar return signature matching or strongest return to calculate vehicle speed. (EX1009, 8:2–16, 9:5–7, 9:13–22).

#### **IV. Claim Construction**

ACI offers no claim constructions for the Challenged Claims, relying instead on ordinary meaning. (Paper 1, at 4–5) (*citing Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); 37 C.F.R. § 42.100)). If the Board ultimately institutes a trial in this proceeding, Kustom will address pertinent claim construction issues at that time. The Board need not expressly construe any claim term for purposes of a decision to deny institution of a trial. *See, e.g., Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’”

(quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))). As set forth below, at this stage of the proceeding, no construction is necessary to appreciate that ACI's proposed obviousness combinations are flawed and institution of *inter partes* review should be denied.

## **V. Level of Ordinary Skill in the Art**

ACI argues that a POSA “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 one to two years of related work experience with Doppler radar systems. ... Alternatively, the person could have also had a Master of Science degree in electrical engineering with less than a year of related work experience in the same discipline.” (Paper 1, at 4). If the Board ultimately institutes a trial in this proceeding, Kustom will address ACI's contention about the level of ordinary skill in the art at that time.

## **VI. Institution Should be Denied on the Merits.**

### **A. Legal Framework**

In an IPR, “the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc.*, 815 F.3d at 1363 (citing 35 U.S.C. § 312(a)(3) and requiring *inter partes* review petitions to

identify “with particularity ... the evidence that supports the grounds for the challenge to each claim”). This burden of persuasion *never* shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

A finding of obviousness based only on the conclusion that prior art references *could* be combined is erroneous as a matter of law. *See Virtek Vision Int’l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 887 (Fed. Cir. 2024) (“The mere fact that these possible arrangements existed in the prior art does not provide a reason that a skilled artisan would have substituted the one-camera angular direction system in Keitler and Bridges with the two-camera 3D coordinate system disclosed in Briggs.”). “The obviousness inquiry does not merely ask whether a skilled artisan

could combine the references, but instead asks whether ‘they would have been motivated to do so.’” *Adidas AG v. Nike, Inc.*, 963 F.3d 1355, 1359 (Fed. Cir. 2020) (quoting *InTouch Techs., Inc. v. VGO Commcn’s, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014)). Consequently, ACI must establish that a person of ordinary skill in the art would have been motivated to combine its proposed prior art references and reasonably expect success in achieving the claimed invention. *Personal Web Techs. LLC v. Apple, Inc.*, 848 F.3d 987, 993 (Fed. Cir. 2017).

A “prior art reference is said to teach away from the claimed invention if a skilled artisan ‘upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken’ in the claim.” *AstraZeneca AB v. Mylan Pharms. Inc.*, 19 F.4th 1325, 1337 (Fed. Cir. 2021). A reference that teaches away from a proposed combination can preclude a determination of obviousness. *Id.*

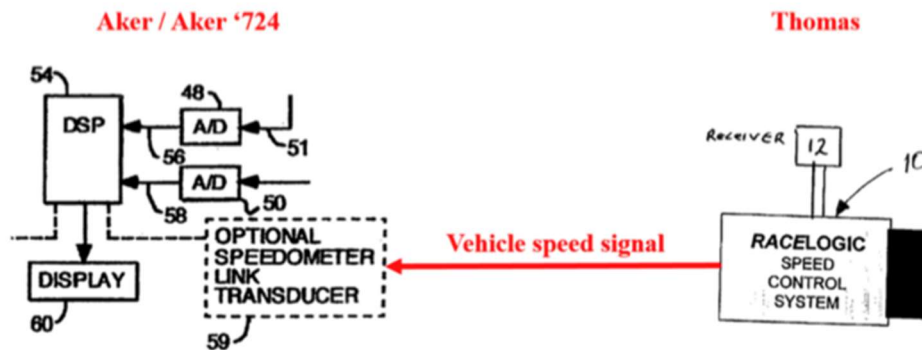
**B. Grounds 1A and 1B Based on Aker, Aker ’724, Thomas, and Carmichael Fail Because There Is No Motivation to Combine.**

**1. ACI’s “Compatibility” Arguments Fail as a Matter of Law.**

ACI’s alleged motivations to combine the Aker references with Thomas are riddled with holes, errors, and outright misrepresentations fatal to its proposed combination. Properly analyzed, there simply is no reason to combine the Aker

references with Thomas, and a POSA would be motivated against ACI's proposed combination.

The heart of ACI's proposed combination is to use Thomas' controller 10 as the optional speed link transducer 59 taught by the Aker references:



(Paper 1, at 8) (original red annotations from ACI's petition). In a nutshell, ACI argues this combination is appropriate because "Aker discloses receiving a current vehicle speed from a speedometer, *without limitation to any specific type of speedometer* and thus *is compatible* with a GPS speedometer such as that disclosed in Thomas," which "Thomas emphasizes '*can be retro-fitted to 99% of cars on the road today.*'" (Paper 1, at 9–10) (emphases added). As explained *infra*, § VI.B.3, Aker in fact discloses that its speedometer must be sufficiently accurate for its intended purpose—determining the patrol vehicle's speed—which is the opposite of ACI's alleged limitless potential speedometers. As Aker explains a POSA would not uncritically adopt "any speedometer" for the application critical task of determining the speed of the patrol vehicle. (EX1007, 20:38–40). Thus, within the confines of

the accuracy required for law enforcement use of the radar systems, a POSA would require a reason to select a GPS based speedometer solution.

ACI's simplistic and repeated arguments that Thomas is "compatible" with the Aker references, "may simplify vehicle design," and "can be retro-fitted to 99% of the cars on the road today" (*see* Paper 1, at 9–10) cannot establish obviousness as a matter of law. *Virtek*, 97 F.4th at 887; *Adidas*, 963 F.3d at 1359. These statements of mere possible combination are not statements that a POSA *would be* motivated to combine Thomas with the Aker references. *Id.* Consequently, these purported rationales for combining the Aker references with Thomas must fail.

**2. ACI Misconstrues Thomas to Misidentify the Problem that Thomas Purportedly Solves.**

ACI fails to establish that Thomas is concerned with the problems addressed in the '039 patent. To broadly state that Thomas discloses a GPS speedometer does not demonstrate its utility for use in the law enforcement environment. Thomas's disclosed speed limiter addresses distinctly different concerns than those present with radar-based speed enforcement and the accuracy required therewith. If Thomas's GPS based speed calculation is inaccurate in its application, it does not have the same consequence as the legal enforcement environment of the '039 patent. Thus ACI has failed to establish why Thomas's GPS based speedometer would commend itself to a POSA.

ACI argues that

“Thomas discloses a GPS speedometer, and states that ‘[t]he information available from the GPS system can be used to calculate speed, therefore obviating the need for a separate speed sensor input.’ ACI-1005, 7:32–8:1. *Thomas discloses such sensors as ‘largely mechanical and tend to be complex and expensive to fit to a vehicle.’ Id., 1:12–13.*”

(Paper 1, at 9) (emphasis added). With this argument ACI implies that “a separate speed sensor input” is “largely mechanical and tend to be complex and expensive,” which therefore is a problem to be solved by Thomas’s disclosure and that the use of GPS in fact solves the problem. But ACI misleadingly links separate statements as if Thomas’ GPS solves a “mechanical” and “complex” sensor problem. Thomas does no such thing.

While Thomas does recognize a “GPS system can be used to calculate speed, *therefore obviating the need for a separate speed sensor input*” (EX1005, at 7, l. 32 – 8, l. 1) (emphasis added), Thomas does not remark about the complexity of *such sensors*. In fact, the section of Thomas that ACI tries to link to “such sensors” is not related to sensors at all. It states, in full:

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. Such systems are also imprecise in their control of the vehicle speed.

(EX1005, at 5, ll. 8–14) (underlining added). Thomas plainly recognizes that throttle-control systems and their associated linkages are “largely mechanical and tend to be complex and expensive to fit to a vehicle.” *Id.* But ACI misleadingly cites Thomas to assert that it discloses complaints about the effectiveness of existing speed sensor systems that it does not make. To the contrary, Thomas recognizes that alternatives exist and are equally useful as the GPS sensors it mentions. (*See* EX1005, at 16, ll. 24–30). Moreover, Thomas clearly teaches *minimizing* additional sensors, (EX1005, at 6, ll. 10–12; at 7, l. 32 – 8, l. 1), which is contrary to ACI’s fundamental combinatorial logic.

**3. ACI’s Combination Ignores the Teachings of Aker, Aker ’724, and Thomas, Which Demonstrate that GPS Is Not Suitable in Aker’s Solution**

ACI continues with its argument that Aker is “without limitation to any specific type of speedometer.” (Paper 1, at 9). But Aker specifically identifies precise sources of speed (speedometer- and radar-derived) and an important requirement for those sources (accuracy). The Aker references disclose an

embodiment in which “patrol car speed *is determined from the car’s speedometer,*” which Aker ’724 confirms when disclosing its “DSP can read *the actual patrol car speed*” which is “*the actual speedometer speed.*” (EX1004, [0051]; EX1007, 20:34–40) (emphasis added). Aker itself describes the “use of a ‘hardwired’ link to the speedometer via transducer 59” confirming that Aker derives its patrol car speed from the car’s electronic signals used for the in-dash speedometer. (EX1004, [0099]). ACI provides no evidence to establish why a POSA would understand those passages mean anything other than the ordinary English understanding, which is data derived from a patrol car’s speedometer.

Aker also discloses its preferred embodiment for determining speed by “processing returns from stationary objects such as the ground,” which Aker ’724 clarifies to mean “Doppler shifted radar returns from the ground.” (EX1004, [0051]; EX1007, 20:40–42). Aker ’724 makes clear that radar-derived returns for determining speed are its preferred method because it has actually implemented software that runs on microprocessors that relies on radar-derived speed determinations and, more importantly, specifically criticizes speedometer-derived speed: “[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.” (EX1007, 20:38–40) (emphasis added). Aker ’724 so prioritizes radar-derived returns over the less

accurate speedometer-derived data that Aker '724 chooses to recalculate a radar-derived speed rather than simply rely on speedometer-derived data if there is a discrepancy between the two:

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 re-calculate it from a different radar return.

(EX1007, 20:42–55; *see also* EX1007, Abstract (“The counting and display unit has a computer programmed to perform digital signal processing on the digital data received from the antenna to improve the quality and accuracy of the calculated speeds for patrol speed, strongest target speed and fastest target speed”)).

Thus, contrary to ACI's factually incorrect argument that the Aker references disclose a generic teaching of any speedometer “without limitation to any specific type of speedometer” (Paper 1, at 9), the Aker references teach specific speed-determining sources, a strong preference for radar-derived speed, and the importance of accuracy of the determined speed. Consequently, a POSA reading the Aker references together would conclude that while using the vehicle's own speedometer is possible, it's not accurate enough for purposes of the invention. Stated another

way, ACI's own references in fact teach a *specific limitation* as to the speedometer: it must be sufficiently accurate.

Understanding the demands and application of the Aker references, a POSA would not be motivated to use Thomas' GPS teaching in the "optional transducer 59" of Aker because Thomas expressly explains that its GPS transceivers are not accurate enough for the speed-determination of the Aker references. Thomas states:

There are a number of standard receivers used to interpret the GPS signals from the collection of satellites used for global positioning. *These receivers allow determination 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.*

(EX1005, at 11, ll. 15–21) (emphasis added). When using GPS to calculate speed, Thomas discloses:

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. This can then be used to work out vehicle speed."

(EX1005, at 17, ll. 11–15).

Rudimentary math demonstrates the large errors produced by the GPS-derived speed of Thomas's disclosure. Take as a baseline a vehicle traveling 60 mph over 5 seconds. That vehicle will travel 134.10 meters (a little longer than an NFL football field and its endzones) in that time.



**At 60 mph, a car travels about 134.10 meters in 5 seconds**

Various scenarios using Thomas' disclosures of error demonstrate the vast inaccuracies that a POSA would recognize in Thomas' use of GPS to determine speed:

| Thomas' GPS ( <u>no differential receiver</u> )    |                       |                                                    |                                               |                                 |
|----------------------------------------------------|-----------------------|----------------------------------------------------|-----------------------------------------------|---------------------------------|
| Thomas discloses <u>minimum 50 meter GPS error</u> |                       |                                                    |                                               |                                 |
| Origin<br>error:                                   | Termination<br>error: | GPS calculated<br>Meters traveled in<br>5 seconds: | GPS<br>calculated<br>speed over 5<br>seconds: | Minimum<br>Error from<br>60 mph |

|            |            |        |                                     |          |
|------------|------------|--------|-------------------------------------|----------|
| –50 meters | +50 meters | 234.10 | <u><b>104.7 mph<sup>1</sup></b></u> | 44.7 mph |
| +50 meters | –50 meters | 34.10  | <u><b>15.26 mph</b></u>             | 44.7 mph |

| Thomas' GPS ( <u><b>with differential receiver</b></u> )  |                       |                                                    |                                               |                                 |
|-----------------------------------------------------------|-----------------------|----------------------------------------------------|-----------------------------------------------|---------------------------------|
| Thomas discloses <u><b>minimum 10 meter GPS error</b></u> |                       |                                                    |                                               |                                 |
| Origin<br>error:                                          | Termination<br>error: | GPS calculated<br>Meters traveled in<br>5 seconds: | GPS<br>calculated<br>speed over 5<br>seconds: | Minimum<br>Error from<br>60 mph |
| –10 meters                                                | +10 meters            | 154.10                                             | <u><b>68.94 mph</b></u>                       | 8.94 mph                        |
| +10 meters                                                | –10 meters            | 114.10                                             | <u><b>51.05 mph</b></u>                       | 8.95 mph                        |

If Aker '724 complains that the “actual speedometer speed” is not sufficiently accurate, a POSA would understand that a separately installed GPS receiver as disclosed by Thomas would produce greater error, which teaches away from the purported combination of the Aker references with Thomas.

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<sup>1</sup> One mile is 1609.34 meters. One hour is 3600 seconds. Thus, conversion from meters/second to miles/hour is accomplished according to the formula:

$$\text{mph} = (\text{X meters/second}) (1 \text{ mile} / 1,609.34 \text{ meters}) (3600 \text{ seconds} / 1 \text{ hour})$$

Moreover, Aker '724 discloses the preferred embodiment compares the patrol vehicle speedometer output to the radar calculated patrol vehicle speed and rejects the calculated speed if it varies by more than 3 mph from the speedometer speed. (EX1007, 20:50–55). As demonstrated above, a POSA understands that the potential errors from Thomas's GPS speedometer far exceed Aker '724's maximum 3 mph variance from a patrol vehicle actual speed. Thus, a POSA would be taught away from using GPS in Aker's invention because the proposed modification would render Aker unsatisfactory for its intended purpose. *See In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984); *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009). Furthermore, a POSA would have no reasonable expectation of success in the combination. Aker '724 establishes a 3 mph tolerance band between speedometer output and ground reflected speed that, if exceeded, requires recalculation of patrol speed from different radar reflections. A POSA knows that Thomas's GPS speedometer is inherently capable of far greater variance from actual speed potentially causing multiple recalculations and errors and would not create a reliable system. This could be especially problematic for use in police enforcement. Thus a POSA would have no reasonable expectation of success in making such a combination.

In addition, Thomas does not teach simultaneously using multiple alternative methods to determine speed. Rather, Thomas teaches the use of one method at a

time: “The absolute speed of the vehicle is normally measured using one of three methods.” (EX1005, at 16 ll. 24–25. *See also id.* at 9, ll. 6–7). 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.*” (EX1005, at 11, l. 32–12, l. 1) (emphasis added). This is unsurprising because, as ACI acknowledges, (Paper 1, at 9–10), Thomas teaches simplification of its apparatus and minimization of change: “[i]n this way no additional sensors are required *thus minimizing the changes to the vehicle.*” (EX1005, at 6, ll. 11–12). As ACI characterizes it, “[e]liminating such sensors may simplify the vehicle design, leading to a more robust final product.” (Paper 1, at 9–10). Consequently, by ACI’s own logic, a POSA would be led away from the proposed combination. And the teaching of Thomas confirms that a POSA would not combine the references as ACI proposes.

Furthermore, ACI argues that there is a reason to use Thomas’s GPS “in the event of an issue with the existing speedometer in the vehicle.” (Paper 1, at 10). But this argument studiously overlooks that the Aker references *already disclose, and in fact prefer, an alternative method for determining speed: radar-returns.* (EX1007, 20:38–55; *see also* EX1007, Abstract (“The counting and display unit has a computer programmed to perform digital signal processing on the digital data received from the antenna to improve the quality and accuracy of the calculated speeds for patrol speed, strongest target speed and fastest target speed”)). Thus, it is

disingenuous to suggest that the less-accurate GPS of Thomas will correct the inaccuracies of a car's built-in speedometer when the Aker references already completely solve that problem with their preferential use of radar-derived speed determination.

Finally, a POSA would not have to rely on Thomas alone to recognize GPS-based speed calculations are prone to inaccuracies. Other art recognizes and confirms a POSA would know use of GPS presents additional problems and inaccuracies, thereby teaching a POSA against ACI's proposed combination. For instance, U.S. Patent No. 7,444,240 to MacNielle (EX2001) describes a collision avoidance system using GPS signals. (EX2001, 1:5–11) However, MacNielle recognizes that errors inherent with GPS signals render their use unsuitable for use in a context like that proposed by ACI's combination. MacNielle describes that “system errors, for example, can include synchronization errors between satellites, synchronization errors with a central clock, inaccuracies in Satellite PVT data, number of visible satellites at any given time, Velocity and timing aspects within the satellites, and accuracy of the timing signal shape. Also, the relative position of the satellites affects geometric dilution of precision (GDOP), which amplifies range errors. Range errors refer to the distance between the satellites and the GPS receivers. Small angle between the range lines causes high GDOP. High GDOP

refers to magnification in measurement errors in the length of the range lines due to the satellites being located near the horizon.” (EX2001, 3:17–58).

**C. Grounds 2A and 2B Based on Shelton, Henderson, Thomas, and Carmichael Fail**

ACI's grounds 2A and 2B repeat the same logic for combining Thomas's GPS teaching with Shelton and Henderson's radar-based system. (Compare Paper 1, at 42–44 with Paper 1, at 9–11). Consequently, the same frailties in ACI's combinatorial logic persist:

- ACI's compatibility-based arguments for the combination are inadequate as a matter of law. *See, supra*, § VI.B.1. ACI's simplistic and repeated arguments that Thomas is “compatible” with the Shelton/Henderson, “may simplify vehicle design”, and “can be retro-fitted to 99% of the cars on the road today” (*See* Paper 1, at 9-10 ) cannot establish obviousness as a matter of law. *Virtek*, 97 F.4th at 887; *Adidas*, 963 F.3d at 1359. These statements of mere possible combination are not statements that they *would be* motivated to be used with the Aker references. *Id.* , 97 F.4th at 887; *Adidas*

- ACI misleadingly cites Thomas in support of its argument that GPS units should be used in place of car speedometers because the speedometers are “largely mechanical and tend to be complex and expensive.” In fact, the cited passage of Thomas refers to replacing *linkages used in speed limiters* with Thomas’s electronic controller, which is entirely unrelated to replacing a car speedometer with a GPS unit. *See, supra*, § VI.B.2.
- ACI’s proposed combination ignores the teachings of the prior art, which demonstrates that Thomas’ GPS-based solution is too inaccurate and therefore not suitable for combination. *See, supra*, § VI.B.3.

As to the last point, a POSA would not look at Thomas’s GPS disclosure and seek to combine its teachings with Shelton/Henderson because, again, a POSA reading Thomas would understand GPS-based speed determination is too inaccurate to reasonably expect to successfully use its teachings in the speed enforcement system taught in Shelton/Henderson.

Shelton teaches creating a hard-wired connection to the patrol vehicle speedometer to establish a patrol vehicle speed. The speedometer reading is based on pulses sent from sensors that detect wheel rotation. Shelton discloses counting

pulses from the speedometer to determine patrol speed and utilizing the speedometer speed to establish a patrol speed window used to analyze radar returns. “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.” (EX1008, 1:53–59) The vehicle radar returns can be analyzed more accurately by having a narrow search window, thereby reducing false returns or calculations of patrol vehicle speed. (EX1008, 3:12–31; 4:42–46; Fig. 4). Thus, a search window—or filter—used to reduce false returns is disclosed by Shelton to be  $\pm 5$  mph around the patrol vehicle speedometer output. (EX1008, Fig. 4, #82; 4:16–19).

A POSA would not seek to employ Thomas' GPS-based system because, as discussed above, a POSA would recognize its error is too large to be successfully employed in Shelton's system. Shelton assumes speedometer accuracy of at worst  $\pm 5$  mph, which it uses to establish the center of a narrow filter intended to identify patrol speed returns and exclude false returns. As with Aker above, and contrary to ACI's argument that any speedometer may be used, Shelton specifically discloses the patrol vehicle speedometer as its input, and critically assumes a minimum level of accuracy from such a system to properly function. Thomas's best-case accuracy

at  $\pm 9$  mph is facially inadequate for Shelton's solution. Thus, for the same reasons discussed above, a POSA would be taught away from making the proposed combination and would have no reasonable expectation of success in making the combination. Moreover, with the known inaccuracies inherent in GPS speed determination, a GPS speedometer would not recommend itself to a POSA seeking to accomplish the accurate determination of target vehicle speeds in a moving patrol vehicle that is required for the law enforcement application of the invention. *See, supra*, § VI.B.3.

Likewise, Henderson's teaching of determining patrol vehicle speed through radar-signal pattern recognition (successful only about 70% of the time) "with strongest return still used as a fallback" when signal pattern-matching fails (EX1009, 8:2–16, 9:5–7, 9:13–22) would lead a POSA against the combination with Thomas. Because there is no suggestion in Henderson to rely on a speedometer external to the radar system, the reasons the proposed combination would not be made are neither addressed nor cured by ACI's citation to Henderson. Thomas teaches that its GPS-based speed determinations are too inaccurate for use in traffic enforcement efforts. A POSA would understand that teaching and understand that ACI's proposed combinations are improper and would not reasonably expect success with ACI's proposed combinations.

## VII. Conclusion

For at least the reasons set forth above, the Board should deny institution of ACI's Petition. The Petition fails on the merits, as ACI does not establish a reasonable likelihood of prevailing as to any challenged claims.

Dated: August 12, 2024

Respectfully submitted,

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**Certificate of Word Count Compliance**

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that this *Patent Owner Preliminary Response* complies with the type-volume limits of 37 C.F.R. § 42.24(a)(1)(i) by virtue of 37 C.F.R. § 42.24(b)(1), because it contains 7,290 words, according to the word-processing system used to prepare this paper, excluding the words in the Table of Contents, Table of Authorities, Certification Under § 42.24(d), and Certificate of Service, as set forth in 37 C.F.R. § 42.24(a)(1).

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**Certificate of Service**

Pursuant to 37 C.F.R. § 42.6(e), I certify that on this 12th day of August, 2024, a true and correct copy of the foregoing **Patent Owner's Preliminary Response** was served by electronic mail on Petitioner's lead and backup counsel at the following email addresses:

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