United States District Court,
D. Delaware.

HONEYWELL INTERNATIONAL, INC., et al,
Plaintiffs.
v.
UNIVERSAL AVIONICS SYSTEMS CORP., et al,
Defendants.

No. CIV.A. 02-359-MPT

Oct. 16, 2003.

Patent assignee brought action alleging infringement of patents related to terrain warning systems used in aircraft. Defendant competitor asserted counterclaims of invalidity, unenforceability, and noninfringement. After patent claims were construed, 264 F.Supp.2d 135, defendants moved for partial summary judgment. The District Court, Thynge, United States Magistrate Judge, held that: (1) assignee's withdrawal of certain claims from suit did not negate district court's subject matter jurisdiction over competitors' counterclaims for declaratory judgment of noninfringement and invalidity as to those claims; (2) multiple claims were invalid as anticipated; but (3) other claims were not invalid for obviousness.

Granted in part and denied in part.

6,092,009, 6,138,060. Invalid in Part.

Thomas C. Grimm, Esquire, and Jack C. Schecter, Esquire, Morris, Nichols, Arsht & Tunnell, Wilmington, DE, for Plaintiffs, Honeywell International Inc., and Honeywell Intellectual Properties Inc.

Frederick L. Cottrell, II, Esquire, and David A. Felice, Esquire, Richards, Layton & Finger, Wilmington, DE, for Defendant, Universal Avionics Systems Corp.

Thomas L. Halkowski, Esquire, Fish & Richardson, P.C., Wilmington, DE, for Defendant, Sandel Avionics, Inc.

MEMORANDUM

THYNGE**, United States Magistrate Judge.**

I. Introduction

This is a patent infringement case involving technology in the aviation industry. On May 10, 2002, plaintiffs, Honeywell International Inc. and Honeywell Intellectual Properties, Inc. ("Honeywell") FN1 filed

a complaint alleging infringement of five U.S. patents: Nos. 5,839,080 ("the '080 patent"), 6,219,592 ("the '592 patent"), 6,122,570 ("the '570 patent"), 6,138,060 ("the '060 patent") and 6,092,009 ("the '009 patent"). D.I. 1.FN2 Honeywell pursues its infringement claims against defendants, Universal Avionics Systems Corp. ("Universal") FN3 and Sandel Avionics, Inc. ("Sandel").FN4 Universal and Sandel filed their respective answers denying Honeywell's allegations and counterclaims alleging that the patents are invalid, unenforceable and not infringed. *See* D.I. 19, 20.FN5

FN1. Honeywell International Inc. is a Delaware corporation with its principal place of business in New Jersey and Honeywell Intellectual Properties Inc. is an Arizona corporation with its principal place of business in Arizona.

FN2. An order entered January 31, 2003, dismissed two of the original defendants, Goodrich Corporation and Goodrich Avionics Systems, Inc. *See* D.I. 67.

FN3. Universal is a Delaware corporation.

FN4. Sandel is a Delaware corporation.

FN5. The defendants were afforded the opportunity to amend their answers. *See* D.I. 90, 91.

Pursuant to *Markman v. Westview Instruments, Inc*.FN6 and local practice, oral argument was held on April 9, 2003, regarding the parties' claim interpretations. The court set forth its construction memorandum of the disputed claims of the patents-in-suit on May 30, 2003. Pretrial case dispositive summary judgment motions were to be filed by September 3, 2003 and briefing was completed on October 1, 2003. Trial is scheduled to commence on October 31, 2003. This memorandum addresses defendants' joint motion for summary judgment alleging invalidity of the asserted claims of the '009 and '060 patents.FN7

FN6. 52 F.3d 967 (Fed.Cir.1995) (*en banc*), *aff'd,* 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996).

FN7. This motion was originally filed by Sandel (D.I.157) and was later joined by Universal (D.I.175). Defendants have also filed summary judgment motions asserting invalidity based on public use and on-sale bar, as well as, non-infringement. These motions will be discussed in separate opinions.

II. Background FN8

FN8. All facts are taken from the parties' briefs.

Each of the five patents-in-suit reference terrain warning systems which warn pilots when the danger of having a "controlled flight into terrain" ("CFIT") accident increases. The parties have divided the patents-in-

suit into two main categories: the "look ahead patents" ('080, '570, and '592) FN9 and the "display patents" ('060 and '009). Honeywell, the assignee of these patents, uses the technology in its Enhanced Ground Proximity Warning System ("EGPWS"). Honeywell asserts that each defendants' Terrain Awareness and Warning System ("TAWS") infringes on its EGPWS.

FN9. The primary patent in this litigation is the '080 patent, which claims "the core forward-looking terrain alerting system." D.I. 81 at 2. The '570 patent, a continuation-in-part of the '080 patent, claims the core system in addition to the ability to visually display the alert to the pilot. Id. at 2-3. The '592 patent, also a continuation-in-part of the '080 patent, claims the core system in addition to algorithms which allow the system to detect horizontal, as well as, vertical terrain threats. Id. at 3.

The display patents are the subject of this jointly filed summary judgment motion. The display patents teach two methods for displaying the alert information on a visual screen in an aircraft cockpit. Briefly summarized, the '060 patent claims a system, which causes certain information, including the severity of an alert, to "pop-up" on the pilot's screen. The '009 patent claims a system, which displays terrain information, as well as, compares the terrain and aircraft altitude. Based on this comparison, certain parts of the display are colored.

III. Standard of Review

A grant of summary judgment pursuant to Fed.R.Civ.P. 56(c) is appropriate "if the pleadings, depositions, answers to interrogatories, and admissions on file, together with the affidavits, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to a judgment as a matter of law." FN10 This standard is applicable to patent cases.FN11 A Rule 56(c) movant bears the burden of establishing "that there is an absence of evidence to support the nonmoving party's case." FN12 The nonmovant must be given the benefit of all justifiable inferences and the court must resolve any disputed issue of fact in favor of the nonmovant.FN13

FN10. FED. R. CIV. PRO. 56(c).

FN11. Johnston v. IVAC Corp., 885 F.2d 1574, 1576-77 (Fed.Cir.1989).

FN12. Celotex Corp. v. Catrett, 477 U.S. 317, 325, 106 S.Ct. 2548, 91 L.Ed.2d 265 (1986).

FN13. Eastman Kodak Co. v. Image Technical Servs., Inc., 504 U.S. 451, 456, 112 S.Ct. 2072, 119 L.Ed.2d 265 (1992).

IV. Positions of the Parties

Honeywell asserts claims 1-3, 8, 9, 13, 24, 27-36, 41 and 43-45 of the '009 patent and claims 1-4 of the '060 patent against Sandel. Honeywell asserts claims 1-3, 8-9, 13, 23, 24, 27-36, 39, 41 and 43-45 of the '009 patent, as well as, claims 1-5 FN14 and 11-16 of the '060 patent against Universal.

FN14. Although not specifically enumerated as an asserted claim in the summary of argument portion of the supplemental memorandum filed, Universal argues that claim 6 of the '060 patent is also invalid. See D.I. 175 at 2, 12.

Defendants divide the asserted claims of the '009 patent into three categories: " 'h_{max}' claims", "warning display claims" and "relative altitude claims". Claims 1-3, 8-9, 13, 23, 24, 34-36, 39 and 41 are referred to as the " 'h_{max}' claims" because the claims require a map display with a plurality of terrain contours "including the highest h_{max} and lowest h_{min} terrain levels of said proportion of the terrain". Claims 27-33 are the "warning display claims" since they teach a visual display in combination with the "warning display" of the type disclosed in the look ahead patents. The final grouping, the "relative altitude claims" (claims 43-45), recite the additional limitation of color-coded contours based on elevation of the terrain relative to the proximity of the aircraft.

Defendants contend that the asserted 'h_{max}' claims and relative altitude claims are invalid as anticipated by prior art in the field of avionics terrain altering systems. They further assert that the warning display claims of the '009 patent are invalid based on the combined teaching of prior art references in the field, i.e., the asserted claims are invalid as obvious.

Arguing that the '060 patent claims are anticipated by the prior art, defendants contend that claims 1-3 and 11-16 are invalid. Further, they also argue that claims 4-6 of the '060 patent are obvious in light of the prior art references in the field.

Honeywell is only pursuing infringement as to claims 27-33 of the '009 patent and claims 4 and 5 of the '060 patent. When responding to defendants summary judgement motions, Honeywell represented that it does not intend to pursue certain claims of the '009 and '060 patent, that is, the claims defendants assert invalidity based on anticipation. According to Honeywell, these claims have been withdrawn. Honeywell argues that defendants, in an attempt to avoid liability for willful infringement by arguing that certain claims are obvious in light of various combinations of prior art, have not met their burden of proving obviousness by clear and convincing evidence and have not met the requisite standard for summary judgment.

V. Jurisdiction

Honeywell had accused defendants of infringing the display patents generally by the manufacture, use and sale of their terrain awareness warning systems which allegedly embody the claimed invention. Both Sandel and Universal counterclaimed seeking declaratory judgment, pursuant to the Declaratory Judgment Act, 28 U.S.C. s. 2201 and s. 2202, of non-infringement and invalidity of the '009 and '060 patent.

[1] Because Honeywell represented to defendants in writing of its present and future intent not to pursue infringement of certain previously asserted claims of the '009 and '060 patents, it now argues that defendants have no standing to seek declaratory judgment as to the withdrawn claims.FN15 As a result, Honeywell contends that the court no longer has subject matter jurisdiction with respect to those claims based on the absence of a case or controversy.

FN15. Those claims remaining are claims 27 through 33 of the '009 patent and claims 4 and 5 of the '060 patent.

Defendants argue that Honeywell cannot unilaterally and without leave of court, withdraw part of its action. Defendants contend that Honeywell's attempted withdrawal of part of its infringement case, at this late date, provides no guarantee these claims will not be asserted in another action or against other products. Notably, Honeywell continues to pursue alleged infringement of other claims of the display patents. Moreover, defendants argue that a case or controversy exists as to the withdrawn claims, since the parties are currently engaged in a separate infringement action before this court on a related patent, and thus, no guarantee exists that similar claims will not arise in that litigation. Defendants, therefore, assert that the withdrawn claims remain ripe for decision.

[2] [3] A case or controversy is a jurisdictional predicate for declaratory judgment under 28 U.S.C. s. 2201. Grain Processing Corp. v. American Maize-Prods., 840 F.2d 902, 905 (Fed.Cir.1988). This requirement precludes a party from asserting a claim for declaratory judgment of non-infringement or invalidity unless the defendant objectively has a "reasonable apprehension that it will face an infringement suit." *See* Mobil Oil Corp. v. Advanced Environmental Recycling Techs., Inc., 826 F.Supp. 112, 114 (D.Del.1993). Once established, jurisdiction vanishes only when subsequent events render the threat of an infringement action nonexistent. *Id*.

[4] Typically, when the patentee institutes an action for infringement and the alleged infringer counterclaims that the patent is invalid, unenforceable, and/or not infringed, the action may proceed on the counterclaim, even if the patentee voluntarily dismisses the charge of infringement and stipulates to non-infringement. *See* Biacore v. Thermo Bioanalysis Corp., 79 F.Supp.2d 422, 454 (D.Del.1999). However, for a court to retain jurisdiction over counterclaims seeking declaratory judgment of non-infringement and invalidity, once the infringement claims have been withdrawn, the defendant must show, by a preponderance of the evidence, that it has a reasonable apprehension that it will be sued on the non-asserted claims. *Id*. The defendants have met this standard.

[5] Determining whether a party is in reasonable apprehension of being sued by the patentee on a particular claim requires a two-step analysis:

There must be both (1) an explicit threat or other action by the patentee, which creates a reasonable apprehension on the part of the declaratory plaintiff that it will face an infringement suit, and (2) present activity which could constitute infringement or concrete steps taken with the intent to conduct such activity. BP Chems. Ltd. v. Union Carbide Corp., 4 F.3d 975, 978 (Fed.Cir.1993).

Defendants maintain that they have a reasonable apprehension of facing an infringement suit on the non-asserted claims, and that Honeywell's reliance on *Grain Processing* to illustrate the absence of a case or controversy is misplaced. Honeywell continues to assert infringement of the display patents, and has not stipulated to non-infringement of claims 27-33 of the '009 patent and claims 4 and 5 of the '060 patent. In *Grain Processing,* the plaintiff had completely abandoned its infringement charge and "steadfastly refused to assert infringement" of those claims. Grain Processing Corp., 840 F.2d at 906. That case is distinguishable from the case at bar.

Here, litigation remains on certain dependant claims of the recently withdrawn independent claims which supports defendants' position. Biacore, 79 F.Supp.2d at 454. Claims 27-33 of the '009 patent related back to claim 1 and claims 4 and 5 are dependant of claim 1 of the '060 patent. Defendants' apprehension is reasonable considering the absence of any guarantee that issues relating to infringement, and thus,

invalidity, of the display patents will not resurface in future litigation. As such, the court will address the defendants' motion for summary judgment in its entirety.

VI. Analysis

[6] [7] [8] [9] A presumption of validity attaches to an issued patent; invalidity requires proof by clear and convincing evidence. 35 U.S.C. s. 282. This strong presumption of validity exists, even in the face of evidence that was not before the Patent and Trademark Office (PTO). Applied Materials, Inc. v. Advanced Semiconductor Materials of America, 98 F.3d 1563, 1569 (Fed.Cir.1996).FN16 Although neither the presumption of validity nor the standard of proof change, the burden may be more easily carried because of the additional evidence. *Id*. Once a *prima facie* case of invalidity has been established, the proponent of validity must come forward with evidence to counter this challenge. Tuff Torq Corp. v. Hydro-Gear Limited Partnership, 1994 WL 827767 at (D.Del. October 27, 1994). The issue of obviousness is a question of law, even though a determination of obviousness is based on factual inquiries. B.F. Goodrich Co. v. Aircraft Braking Sys. Corp., 72 F.3d 1577, 1582 (Fed.Cir.1996). Anticipation, on the other hand, is a question of fact. Glaverbel Societe Anonyme v. Northlake Marketing & Supply, Inc., 45 F.3d 1550, 1554 (Fed.Cir.1995).

FN16. Defendants cite four prior art references not considered by the PTO during prosecution of the display patents, which will be discussed herein: U.S. Patent No. 5,111,400 ("Yoder '400"), U.S. Patent No. 3,373,423 ("Levy '423"), documents dated May 11, 1992, related to a prototype system of Airshow, referred to as the Cockpit Information and Mapping System ("CIMS") and the 1993 article authored by James K. Kuchar and R. John Hansman, Jr. entitled *Results of the Terrain Database Resolution Requirements Study* ASL, Department of Aeronautics & Astronautics, Massachusetts Institute of Technology, June 30, 1993 ("Resolution Requirement Report").

A. The Prior Art

Defendants assert the following prior art references in support of their position:FN17

FN17. No objection has been raised to the consideration of these references as prior art.

Bateman 1991 article: The paper presented entitled *How to Terrain-Proof the World's Airline Fleet, Sundstand Data Control, Flight Safety Foundation,* 44th IASS, Singapore 1991 ("Bateman 1991") provides an overview of the problem of CFIT accidents and teaches potential solutions, which includes products and methodologies to combat this problem. Among the solutions described is an "Enhanced Situational Awareness Display." *See* D.I. 159, Ex. A. Bateman is an inventor on the look ahead patents and a Honeywell employee.

Yoder '400: U.S. Patent No. 5,111,400, issued on May 5, 1992, discloses a cockpit computer and display system, which includes features to alert the pilot of potential collisions with terrain, other aircraft, or problems due to inclement weather. Yoder '400 teaches the use of on-board sensors, a stored database, as well as, optional information transmitted from ground sites that provide display data for those aircrafts within a predetermined distance of an air traffic control facility. The system includes a program for detecting potential collisions and issues a warning based upon the level of collision threat and provides

information to facilitate collision avoidance. *See* D.I. 159, Ex. B.

Levy '423: U.S. Patent No. 3,373,423, issued on March 12, 1968, discloses an early implementation of a terrain display system. Generally, the low-level flight system disclosed provides a method where terrain information is received by the pilot's display device and, if the aircraft is within a predetermined distance to terrain, the pilot receives an indication of terrain danger. *See* D.I. 159, Ex. C.

Kuchar and Hansman 1993 Studies: These researchers developed prototypical terrain displays, then conducted experiments, which were detailed in papers released in June and September 1993. The terrain displays were implemented using a simulator system, referred to as, the "part-task simulator". Defendants rely on the documents collectively as evidence of knowledge of the system prior to patenting.

Two studies were performed "to investigate human factors issues associated with advanced terrain displays for transport aircraft" and were discussed in a paper presented at Aerotech ", *Past-Task Simulator Evaluation of Advanced Terrain Displays* ("the Aerotech " paper"). D.I.159, Ex. F at 119. The first study, *A Part-Task Simulation Study of Candidate Terrain Alerting Displays* ("the Part-Task Study Report"), was released on June 30, 1993. This study evaluated three prototypical terrain alerting displays, in which subjects flew the simulator while viewing the altering display formats. The second study, *Result of the Terrain Database Resolution Requirements Study* ("the Resolution Requirements Study"), was also released on June 30, 1993. This study researched pilot subjects use of two terrain awareness display formats. FN18

FN18. While the Resolution Requirement Study results were not presented to the PTO during prosecution of the display patents, the results this study, as well as, the Part-Task Study Report, were incorporated into the Aerotech " paper. The Aerotech " paper was presented to the PTO during prosecution.

Kuchar and Hansman 1991: This prior art reference is the result of a preliminary evaluation of terrain information presentation methods conducted in a part-task simulation study, entitled *Advanced Terrain Display for Transport Category Aircraft,* ASL, Department of Aeronautics & Astronautics,Massachusetts Institute of Technology, August 23, 1991 ("Kuchar and Hansman 1991"). Pilots, using cockpit simulators, were first tested in terrain situational awareness simulations that used erroneous terrain vectors. In a second simulation, the pilots were evaluated on several terrain situations which used differently designed display formats. A prototypical Graphical Ground Proximity Warning System ("GGPWS") was developed. D.I. 157, Ex. H.

Airshow's CIMS: This reference provides general information, specifications and operating procedures for the Airshow's Cockpit Information and Mapping System ("CIMS") prototype. The CIMS is a portable real time geographical information system that informs the pilot of his spatial relationship with respect to his current surrounding terrain. The CIMS prototype contained a digital processor that responded to positional information to retrieve terrain elevation data from a database. The system also displayed the aircraft's current position, altitude, heading and speed relative using retrieved data about nearby obstructions, airports and other geographic features. D.I. 159, Ex. G.

Chazelle '563: U.S. Patent No. 5,488,563, issued on January 30, 1996, teaches a mass memory storage database representing a substantial portion of the terrestrial globe. The database information uses grid configurations, which are more precise in the vicinity of an airport. An altitude envelope of the terrain is established where the aircraft is traveling using the stored database. The system may provide an alert to

prevent collision based upon the relationship between the altitude envelope of the terrain and the protection field. D.I. 171, Ex. 2.

B. Anticipation

Defendants have proven by clear and convincing evidence that claims 1-3, 8, 9, 13, 24, 41 and 43-45 of the '009 patent, as well as, claims 1-3 and 11-16 of the '060 patent are anticipated by several prior art references in the field. Honeywell has not presented any facts or evidence to counter defendants' challenge of invalidity based on anticipation.FN19

FN19. While disputing defendants' invalidity arguments as to obviousness, as set forth below, Honeywell, apparently, relies solely on its contention that the court lacks jurisdiction based on the absence of any case or controversy and has not addressed defendants' assertion that the 'h_{max}' claims and the relative altitude claims of the '009 patent, as well as, claims 1-3 and 11-16 of the '060 patent, are anticipated. *See* D.I. 182.

[10] [11] [12] [13] In order to anticipate, a single prior art reference must disclose each and every limitation of the claimed invention, either expressly or inherently. Telemac Cellular Corp. v. Topp Telecom, Inc. 247 F.3d 1316, 1327 (Fed.Cir.2001). Although anticipation is a question of fact, it may be decided on summary judgment if there is no genuine dispute of material fact on the record. *Id*. There must be no difference between the claimed invention and the reference disclosure as viewed by a person of ordinary skill in the field of the invention. *See* Scripps Clinic & Res. Found. v. Genentech, Inc., 927 F.2d 1565, 1576 (Fed.Cir.1991). Extrinsic evidence has a limited scope in determining anticipation, which may not be used to prove facts beyond those disclosed in the reference in order to meet the claim limitations. *Id*. Extrinsic evidence is to be used to educate the decision-maker as to what the reference meant to persons of ordinary skill in the art. *Id*.

[14] [15] Anticipation may be established if a missing claim element, while not explicitly present in the reference, is necessarily inherent in the reference. Atlas Powder Co. v. Ireco Inc., 190 F.3d 1342, 1347 (Fed.Cir.1999). If the prior art necessarily functions in accordance with, or includes, the claimed functions, then it anticipates. *Id*. However, in such cases, the evidence must make it clear that the "missing descriptive matter is necessarily present" in the asserted anticipatory reference. Continental Can Co. USA, Inc., v. Monsanto Co., 948 F.2d 1264, 1267-68 (Fed.Cir.1991).

The '009 Patent

With the exception of claims 27-33, all asserted claims of the '009 patent are anticipated by the cited prior art references, each standing alone, for the reasons set forth herein.

The 'h_{max}' claims

[16] Each of the 'h_{max}' claims recite a moving map display which includes a plurality of terrain contours. Each claim requires that the contour display "include the highest h_{max} and the lowest h_{min} terrain levels of said portion of the terrain."

Claim 1: An aircraft terrain information system for providing a visual display to the pilot of the contours of the terrain proximate to the aircraft, the warning system comprising:

positions means for receiving signals representative of FN20 **the position of the aircraft;**

FN20. The court construed the claim limitation "signals representative of" as "the signals received by the apparatus as instantaneous values of the recited variables; i.e., they indicate the numerical value of that variable at a given sampling time." D.I. 124 at 17.

terrain data means for storing terrain data representative of the terrain elevations;
a cockpit display; and

contour means, responsive to said position means and said terrain data means, for displaying on said cockpit display a display of the contours of at least a portion of the terrain proximate to the aircraft wherein said contour display includes the highest h_{max} and lowest h_{min} terrain levels of said portion of the terrain.FN21

FN21. The court construed the claim limitation "wherein said contour display including h_{max} and lowest h_{min} terrain levels of said portion of terrain" to mean "the apparatus show the highest and lowest points of the terrain within the portion of the terrain data displayed. This limitation requires that the display show a numeric value for the highest and lowest points." D.I. 124 at 37.

Three prior art references each anticipate claim 1 of the '009 patent by clear and convincing evidence. One element of this claim, which provides that the warning system include a "position means for receiving signals representative of the position of the aircraft" requires a structure for receiving signals, that reflects the numerical values associated with the position of the aircraft. The corresponding structure of this limitation is disclosed in the patent specification at Figure 1A and in the specification at 5:22-32, 5:53-6:31. The use of a satellite-based navigational system, including a global positioning system (GPS) or an FMS/INS (flight management system and/or inertial reference system), for obtaining positional information is well-known in the art.

The Kuchar and Hansman 1991 article discloses advanced ground proximity warning systems which could be based on internal terrain database or advanced sensor technologies. This prior art reference teaches that GPS or INS could provide the needed information that can determine the level of hazard posed to the aircraft.

Similarly, the Bateman 1991 article anticipates a system, which with the advent of GPS, topographic terrain data bases could be developed and used in displays that would show the pilot the current flight path, reflect appropriate and minimum altitudes, provide the vertical profile of the runway and display significant terrain along the approach path.

The specifications of the Airshow CIMS prototype disclose a system, which obtains the aircraft's current position, attitude, heading and speed through a GPS receiver. The information then is used to create an appropriate topographical map display indicating the aircraft's position.

Claim 1 also requires the terrain warning system to include a terrain data means for storing terrain data representative of the terrain elevations. This limitation is found at Figures 1A-4B, 27-34 A and 43-46 and in

the specification at 6:33-9:10; 23:61-26:32; 26:53-28:19 and 30:5-25:55 of the '009 patent. The disclosure describes a structure for storing digitized terrain elevation data and provides details regarding the format of the stored data, as well as, retrieving the data in response to aircraft movement.

The systems detailed in the three previously mentioned prior art references also anticipate this limitation. Kuchar and Hansman 1991 provides a display system that uses a computer and memory devices to store a database of terrain elevations. *See* D.I. 159, Ex. H at 37-38. Bateman 1991 discloses a system which stores topographical terrain databases. D.I. 159, Ex. A at 154-156. Finally, the CIMS prototype uses a stored database of terrain elevations. D.I. 159, Ex. G at 1.

Claim 1 also requires that the system be displayed in the airplane's cockpit. The system taught by Kuchar and Hansman 1991 uses a cockpit display, such as, a standard EHSI (Electronic Horizontal Situation Indicator). D.I. 159, Ex. H at 34-36. The warning display system taught by Bateman 1991 provides examples of various display devices used for displaying terrain information. D.I. 159, at 154-156, Figs. 7, 11 and 15. The CIMS prototype also discloses cockpit display to show terrain information. D.I. 159, Ex. G at 1.

The most distinguishing limitation disclosed in the claim 1 warning system requires the use of contour means, because it is responsive to said position means and said terrain data means to be displayed in the cockpit display. The contour display includes the highest h_{max} and lowest h_{min} terrain levels of said portion of the terrain.

The structure corresponding to contour means is disclosed in the specification at Figures 47, 47A and 48 and in the text of the '009 patent at 2:55-67, 35:56-38:64. Defendants' expert, Robert Gibson concludes that the disclosure suggests that the structure includes electric and/or computer hardware and software for performing the contour display function. D.I. 159, Ex. I para. 73. The disclosure, referring to the contour display as "Peaks mode", also describes the algorithms for creating the contour display, which requires the system to recognize numerical values of the highest and lowest elevations in the terrain data and use these values both in constructing the contour display and on the display itself. *Id*.

The Kuchar and Hansman 1991 article discloses a color-shaded smooth contour display, generated by computer software and hardware, which reveal numbers corresponding to all the terrain elevations, including the highest and lowest, near the current aircraft position. D.I. 159, Ex. H at 21-22, 34-36, 40-46. Also, Bateman 1991 discloses a contour means that responds to positional information so that terrain elevation data can be retrieved from the database.This information is displayed as a series of contours including the lowest and highest elevations of that terrain data near the current aircraft position. The different levels of terrain use color contours similar to that used in aircrafts of Lufthansa and British Airways in their approach plate procedures. The displays include numerical call outs for the terrain elevation. D.I. 159, Ex. A at 154-155 and Figs. 7,10-11. Finally, the CIMS prototype also anticipates this limitation as it contains a software-controlled digital processor that responds to positional information to retrieve terrain elevation data from the database and displays it as contours, which include the lowest and highest elevations of that terrain data near the current aircraft position, as well as, a numerical indication of the elevations. D.I. 159, Ex. G. at 1, Pictures 1-4.FN22

FN22. An Algorithm is "a sequence of steps designed for programing a computer to solve a specific problem." RANDOM HOUSE WEBSTER'S COLLEGE DICTIONARYNARY 33 (2nd ed.1997). Bateman 1991 explicitly refers to the use of algorithms to calculate terrain data. D.I. 157, Ex. A at 145. Moreover, based on this definition, the use of algorithms for such calculations of terrain data is inherent in both Kuchar

and Hansman 1991 and the CIMS prototype.

Claim 2: The system of claim 1 wherein said contour displayed on said cockpit display is independent of the aircraft's altitude.

The systems disclosed by Bateman 1991 and the CIMS prototype also include the Claim 2 limitation, as the contour displays are not dependant upon the aircraft's altitude. D.I. 159, Ex. I at para. 77. *See also,* D.I. 159, Ex. A at 154-155, Figs. 7, 10-11 (the Bateman system uses displays that are like "approach plates" which are topographical in nature); Ex. G at 1-2, 4-6 (the prototype specifications disclose colors that can be turned off, resulting in a contour line being displayed independent of aircraft altitude). As such, both of these prior art references, independently, anticipate the claim.

Claim 3: The system of claim 1 wherein said contour display is displayed as plurality of terrain contour layers between said highest and lowest levels.

The added limitation of claim 3 is also anticipated by prior art. Gibson opines that each display discussed in the previously cited references (Kuchar and Hansman 1991, Bateman 1991 and CIMS) is capable of displaying four or more contour levels, thus disclosing the limitation of displaying a plurality of contours, i.e., two or more, between the lowest and highest. Further, each of the figures, which describe the systems, are plain on their face to establish the said plurality of terrain contour layers between the high and low levels. D.I. 159, Ex. I at para. 78.

Claim 8: The system of claim 3 wherein the last or highest of said displayed contoured layers is displayed in a first color and the first or lowest contour layer is displayed in a second color.

Adding a limitation to the system set forth in claim 3, claim 8 is also anticipated by the prior art. Gibson opines that the use of colors was well known in the art at the effective date of filing. D.I. 159, Ex. I at para. 79. Kuchar and Hansman 1991 discloses a display where the highest contours are displayed in red and the lowest contours are displayed in black or green. D.I. 159, Ex. H at 43. CIMS prototype display was capable of displaying the highest contour layer in a first color such as red, with the lowest contours displayed in a second color, such as green. D.I. 159, Ex. G at 1-2, Pictures 1-4.

Claim 9: The system of claim 8 wherein said contour layers intermediate said first and said last contour layers are displayed in a third color.

The systems taught in both the Kuchar and Hansman 1991 article and the CIMS prototype discloses the use of a third color in the display system. The Kuchar and Hansman 1991 system uses yellow and/or various shades of green to display intermediate terrain colors. *See* D.I. 159 Ex. H at 43, 58-59. The CIMS uses multiple shades of green to differentiate between the lower the map contours, in addition to using yellow for terrain between the aircraft to 650 feet below. D.I. 159, Ex. G at 1-2; Pictures 1-4.

Claim 13: The system of claim 9 wherein said intermediate layers have a dot pattern density that increases with increasing altitude.

Both the Kuchar and Hansman 1991 article and the CIMS prototype, as noted above, use multiple colors to display the intermediate layers of terrain. While neither reference explicitly disclose using different pixel densities to create the third shaded intermediate color on a multi-colored contour display, Gibson opines that

the use of dot density to create a range of colors was well-known in the art at the time. D.I. 159, Ex. I at para. 83. Gibson notes that although the prior art references do not explicitly disclose using different pixel densities to create these shades, the use of dot density to create a range of colors is inherent in the nature of these displays generated by conventional graphics hardware. Gibson's opinion is not rebutted. This claim is anticipated by both Kuchar and Hansman 1991 and the CIMS prototype.

Claim 23: The system of claim 1 wherein said cockpit display is a weather display

The additional claim limitation of claim 23 is anticipated by Kuchar and Hansman 1991. Kuchar and Hansman 1991 disclosed a warning system that can be displayed on the EHSI, which also may be used to display weather. *See* D.I. 159, Ex. H at 36.

Claim 24: The system of claim 1 wherein said cockpit display is a navigational display.

Both the Kuchar and Hansman 1991 article and the Bateman 1991 article disclose that the terrain display can be combined with a navigational display. Kuchar and Hansman 1991 discloses that the described display can show navigational and terrain information based on the existing EHSI navigational display. D.I. 159, Ex. H at 34-36. Bateman 1991 discloses a system in which the terrain and navigational displays can be combined into one system. D.I. 159, Ex. A at 154-56.

Claim 34: A method for displaying terrain information to a flight crew comprising the steps of:

(a) obtaining information about aircraft position;

(b) accessing a data base of terrain information; and

(c) displaying on a display contours of at least a portion of the terrain proximate to the aircraft position wherein said contour display includes the highest h_{max} and lowest h_{min} terrain levels of said portion of the terrain. FN23

FN23. As noted previously herein, the court constructed the claim limitation "wherein said contour display including h_{max} and lowest h_{min} terrain levels of said portion of terrain" to mean "the apparatus shows the highest and lowest points of the terrain within the portion of the terrain data displayed. This limitation requires that the display show a numeric value for the highest and lowest points." D.I. 124 at 37.

This is a method claim restating claim 1. For the reasons stated above in connection with claim 1, this claim is also invalid as anticipated by the cited prior art references.

Claim 35: The method of claim 34 wherein the step of displaying said contours is independent of an altitude of the aircraft.

This is a method claim that corresponds to apparatus claim 2. For the reasons stated above in connection with claim 2, this claim is also invalid as anticipated by the cited prior art references.

Claim 36: The method of claim 34 wherein the step of displaying said contours further comprises the steps of displaying a plurality of contour levels and wherein a highest of said contour levels is

displayed in a first color and lowest of said contour levels is displayed in second color.

This is a method claim that corresponds to apparatus in claim 8. For the reasons stated above in connection with claim 8, this claim is also invalid as anticipated by the cited prior art references.

Claim 39: The method of claim 34 wherein said step displaying comprises displaying on a weather radar display.

Like claim 34, this is a method claim. Similar to claim 23, this claim is anticipated by Kuchar and Hansman 1991 based on that analysis as set forth above for claim 23.

Claim 41: A device for providing terrain information to the flight crew of an aircraft comprising:

an first input for receiving aircraft position data;

a second input coupled to a terrain database;

an output coupled to a display device; and

a processor coupled to said first and said second input and to said display device a plurality of contours of at least a portion of terrain information stored in said terrain database, proximate to the aircraft wherein the contours displayed on said display device include a highest h_{max} and lowest h_{min} terrain levels of said portion of terrain information.

This claim corresponds to claim 1 and is not materially different. In light of the analysis regarding claim 1, claim 41 is anticipated by the cited prior art references.

The relative altitude claims

[17] Similar to the 'h_{max}' claims, the prior art in the field anticipates the relative altitude claims. Claims 43-45 describe a contour map display in which at least four different contour levels are displayed and color-coded, based on elevation relative to the present altitude of the aircraft. The prior art references cited by defendants satisfy their burden to invalidate the relative altitude claims by clear and convincing evidence. While many of the prior art references were presented to the PTO during prosecution, the CIMS prototype was not. Based on the present record, no genuine issue of material fact exists, and, as such, defendants are entitled to summary judgment based on invalidity for the reasons set forth below.

Claim 43: An aircraft terrain information system for providing a visual display to the pilot of the contours of the terrain proximate to the aircraft, the warning system comprising:

position means for receiving signals representative of FN24 **the position of the aircraft;**

FN24. As previously stated herein, the court construed the claim limitation "signals representative of" as "the signals received by the apparatus as instantaneous values of the recited variables; i.e. they indicate the numerical value of that variable at a given sampling time."

terrain data means for storing terrain data representative of terrain elevations;
a cockpit display; and

contour means, responsive to said position means and said terrain data means, for displaying on said cockpit displaying:

a display of contours a first altitude above the aircraft in the first color;

a display of contours at a second altitude relative to the aircraft in the second color;

a display of contours at a third altitude relative to the aircraft in a third color; and

a display of contours at a fourth altitude relative to the aircraft in a fourth color.

This claim is drafted in means-plus-function form and shares several of the same elements previously discussed regarding claim 1 and those discussed below concerning claim 27.FN25 The position means, terrain data means and cockpit display recite in identical form to that of claims 1 and 27. For the reasons set forth in claim 1, the position means, terrain means and cockpit display elements of claim 43 are anticipated.

FN25. The claim uses means language, recites a function and does not recite a structure that performs this function.

The claims recites a "contour means", which is also used in claims 1 and 27. However, this claim also ascribes a different function to this means. This means adds the requirement that the display show at least four contour levels with one above the altitude of the aircraft and all levels displayed in different colors based on the "altitude relative to the aircraft." This function requires some structure to identify the altitude of the aircraft, when compared to the terrain elevation in the database. *See* D.I. 159, Ex. I at para. 121.

The parties agree that the corresponding structure of this contour means include Figures 1, 47, 47A and 48 and the specification set forth at 2:55-67; 5:22-34; 5:52-6:31 and 35:56-38.64. D.I. 81, Ex. 5. The CIMS prototype anticipates the contour means limitation of claim 43, since the display used in the prototype pulls terrain data from the data base, which was displayed as a series of contours near the current aircraft position. *See* D.I. 159, Ex. G at 1, 5-6. The CIMS had the capability to display contours colored according to their relative altitudes with respect to the aircraft, including at least one contour above the aircraft, one contour within 650 feet below the aircraft and terrain below in various shades of green with blue for water at sea level. Id. at 1, Picture 1-4.

The Kuchar and Hansman 1991 study also discloses a contour means that responds to aircraft position to retrieve terrain data from the data base, which is displayed in a series of contours located near the current aircraft position, as well as, numerical indication of elevations. D.I. 159, Ex. H at 29-30, 35, 40-45. According to Gibson, the contour display taught in this prior art was capable of color-coding the terrain contours based on relative altitude; specifically red for terrain within 500 feet above the aircraft, yellow for terrain within 1000 feet of the aircraft and various shades of green for "nonhazardous" contours below the aircraft. D.I. 159, Ex. I at para. 124, Ex. H at 43-45, 59. As such, the Kuchar and Hansman 1991 study anticipates each and every element of claim 43.

Claim 44: A device for providing terrain information to the flight crew of an aircraft comprising:

a first input for receiving aircraft position data;

a second input coupled to a terrain database;

an output coupled to a display device; and

a processor, coupled to said first and said second input and to said display device for displaying on the display device, a plurality of contours of at least a portion of terrain information stored in said terrain database, proximate to the aircraft wherein the contours displayed on the display device include:

contours at a first altitude relative to the aircraft in the first color;

contours at a second altitude relative to the aircraft in a second color;

contours at a third altitude relative to the aircraft in a third color; and

contours in a fourth altitude relative to the aircraft in a fourth color.

The anticipation analysis of claim 43 applies equally to claim 44. Both the CIMS and the Kuchar and Hansman 1991 study anticipate the limitations of claim 44. As such, the claim is invalid.

Claim 45: A method for providing terrain information to the flight crew of an aircraft comprising the steps of:

receiving aircraft position data;

accessing a terrain database;

displaying a plurality of contours of at least a portion of terrain information stored in said terrain database, proximate to the aircraft wherein the step of displaying contours includes the steps of:

displaying contours at a first altitude above the aircraft in a first color;

displaying contours at a second altitude relative to the aircraft in a second color;

displaying contours in a third altitude relative to the aircraft in a third color; and

displaying contours at a fourth altitude relative to the aircraft in a fourth color.

Claim 45 restates claim 43 as a method claim, which discloses precisely the same features outlined in claim 43. As such, the prior art cited invalidates the claim as anticipated.

The '006 patent

Defendants assert that the limitations and elements of claims 1-3 of the '060 patent are anticipated by the

prior art, specifically, Yoder '400, the Bateman 1991 article and the 1993 Kuchar and Hansman studies. For the reasons below, the court agrees.

Claim 1: A warning system for aircraft comprising:

a terrain awareness device FN26 **for receiving and storing terrain information relative to a position of an aircraft;**

FN26. The parties do not dispute that "terrain awareness device" means "a device that is aware of terrain in the vicinity of the current position of the aircraft." D.I. 124 at 39.

a visual display, coupled to the terrain awareness device, for displayingthe terrain formation to the pilot; and
a controller, coupled to the visual display, for automatically determining when the [ter]rain information is displayed on the visual display.FN27

FN27. The court construed "a controller, coupled to the visual display, for automatically determining when the [ter]rain information is displayed on the visual display" to mean "a lever, switch, cable, knob, push-button, or other device or apparatus by means of which direction, regulation, or restraint is exercised over something." D.I. 124 at 32.

The Kuchar and Hansman 1993 studies anticipate each and every element and limitation of claim 1 by clear and convincing evidence since the Aerotech " paper discloses each element and limitation. *See* D.I. 159, Exs. D, E, F. The two studies were conducted to investigate human factor issues associated with terrain displays. The researches sought to highlight the advantages and disadvantages of several possible display formats and obtain information on the terrain data resolution required for such displays. The devices used a database of stored terrain data that included a position means, which received signals representative of the position of a simulated aircraft. D.I. 159, Ex. F at 120-121; Ex. D at 3-4; Ex. E at 4-5, 7, 9-10. A simulated terrain alerting system provided a "pop-up" function disclosed in the study and displayed a terrain alert when the threat was detected. D.I. 159, Ex. F at 121-122; Ex. E at 4-5, 9-10.

The system terrain displays used a mode control panel, which received input information from other hardware, i.e., a controller using a visual display for automatic determination of terrain display. This analysis position is supported by Gibson, who concludes that the display of terrain was determined by the aircraft's position, whereby, such signals could be entirely simulated or could be generated in response to pilot input into control interfaces. D.I. 159, Ex. I at para. 38.

Moreover, the terrain awareness system taught in Yoder '400 anticipates the claim. There is no indication that this prior art reference was disclosed to the PTO. When a potential collision is detected, the display will automatically switch to a mode including a terrain display. D.I. 159, Ex. B at 3:10-17. Gibson concludes that this system applies the pop-up to terrain information and displays the terrain to the pilot, although Yoder '400 does discuss pop-up functionality in terms of alerts and dangers caused by other aircraft. D.I. 159, Ex. I at para. 33. The system provides a moving map display according to the location, heading and velocity of the aircraft. D.I.159, Ex. B at 14:16-19. The Yoder system uses "selector dial" to allow the selection of display information, while buttons can be used to display prior screens. Id. at 13:68-14:3.

Claim 2: The warning system of claim 1 wherein the controller comprises a selection switch for switching between the terrain information and other information.

The systems used in Yoder '400 and Kuchar and Hansman 1993 also include the added limitation. The Yoder system uses selection switches, which permits manual selection of terrain information. D.I. 159, Ex. B at 13:68-14:1. Moreover, one of the systems used in Kuchar and Hansman's 1993 studies allowed the subjects to modify the display using an on-screen control panel. D.I. 159, Ex. F at 120.

Claim 3: The warning system of claim 2 wherein the other information is selected from the group consisting essentially of weather and navigational information.

The system used in the Kuchar and Hansman's 1993 studies anticipates the added limitation. The article's system included an EHSI, which could also be used to display weather and navigational information. D.I. 159, Ex. I at para. 46; D.I. 157, Ex. D at 4-5; Ex. F at 124. The Yoder system teaches a display that can provide navigation and/or weather information, as well as, other information. D.I. 159, Ex. B at 1:51-2:2; 12:60-15:56.

Claim 11: A warning system for aircraft comprising:

a terrain awareness device for receiving and storing terrain information relative to a position of an aircraft;

a visual display for displaying terrain and weather information to the pilot; and

a controller for automatically determining when the terrain information is displayed and when the weather information is displayed.

Claim 11 is largely identical to claim 1, but adds the limitation that the display also display weather information. Claim 3 also adds a limitation related to the display of weather information along with terrain information. For the reasons set forth herein pertaining to claim 1 and claim 3, this claim is anticipated by the teachings of the Kuchar and Hansman's 1993 studies and Yoder '400.

Claim 12: A method for displaying terrain information to a pilot of an aircraft comprising:

receiving terrain information relative to a position of an aircraft;

determining when the terrain information should be displayed; and

visually displaying the terrain information on an existing display within the cockpit.

This is a method claim that is similar to claim 1. For the reasons set forth herein pertaining to claim 1, this claim is anticipated by the teachings of Kuchar and Hansman's 1993 studies and Yoder '400.

Claim 13: The method of claim 12 wherein the terrain information supplants the information on the existing display.

This is a method claim that is similar to claim 1. The added limitation is similar to claim 2. For the reasons previously set forth herein pertaining to claims 1 and 2, this claim is anticipated by the teachings of Kuchar and Hansman's 1993 studies and Yoder '400.

Claim 14: The method of claim 12 wherein the existing display is a weather display.

This method claim is similar to claim 1. The added limitation is similar to claim 3 and 11. For the reasons set forth herein pertaining to claims 1, 3 and 11, this claim is anticipated by the teachings of Kuchar and Hansman's 1993 studies and Yoder '400.

Claim 15: The method of claim 12 wherein the determining step is carried out by toggling a terrain selection switch.

This is a method claim that is similar to claim 1. The added limitation is similar to claim 2. For the reasons set forth herein pertaining to claims 1 and 2, this claim is anticipated by the teachings of Kuchar and Hansman's 1993 studies and Yoder '400.

Claim 16: The method of claim 12 wherein the determining step is carried out automatically based on the severity of the threat.

This method claim is similar to claim 1. Severity of the threat is the added limitation, which is taught by the Kuchar and Hansman's 1993 studies and Yoder '400. For the reasons set forth herein pertaining to claim 1, this claim is anticipated by the teachings of the Kuchar and Hansman's 1993 studies and Yoder '400.

C. Obviousness

Defendants assert that claims 27-33 (the warning display claims) of the '009 patent and claims 4-5 of the '060 patent are invalid based on the combined teachings of prior art references. Obviousness, under the statute, is described as:

the differences between the subject matter sought to be patented 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. 35 U.S.C. s. 103.

[18] [19] A party arguing that an issued patent is invalid for obviousness under 35 U.S.C. s. 103(a) must establish by clear and convincing evidence all factual findings necessary to support that "the differences between the claimed invention as a whole 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 of ordinary skill in the art." Litton Systems, Inc. v. Honeywell, Inc. 87 F.3d 1559, 1560 (Fed.Cir.1996) (quoting 35 U.S.C. s. 103), *vacated by* 520 U.S. 1111, 117 S.Ct. 1240, 137 L.Ed.2d 323 (1997), *reinstated in relevant part by* 140 F.3d 1449 (Fed.Cir.1998). Factors to be considered in this inquiry include: (1) the scope and content of the prior art; (2) the differences between the claims and the prior art; and (3) the level of ordinary skill in the pertinent art. Graham v. John Deere Co., 383 U.S. 1, 17, 86 S.Ct. 684, 694, 15 L.Ed.2d 545 (1966). Summary judgment, therefore, is proper if no genuine dispute regarding a material fact exists, that is, a reasonable juror would conclude that the display patents are obvious under 35 U.S.C. s. 103(a). FED. R. CIV. P. 56(c); Ryko Mfg. Co. v. Nu-Star, Inc., 950 F.2d 714, 716 (Fed.Cir.1991); Newell Cos. v. Kenney Mfg. Co. 864 F.2d 757, 762 (Fed.Cir.1988) *cert denied*. 493 U.S. 814, 110 S.Ct. 62, 107 L.Ed.2d 30 (1989); Chore-Time

Equip., Inc. v. Cumberland Corp., 713 F.2d 774, 779 (Fed.Cir.1983) ("[C]ourts should not hesitate to avoid an unnecessary trial by proceeding under FED. R. CIV. P. 56").

[20] In support of its motion, defendants cite numerous prior art references. Defendants argue that the combination of the Kuchar and Hansman 1991 article and the 1991 Bateman article, in conjunction with Chazelle '563 render the warning display claims of the '009 patent and claims 5-6 of the '060 patent invalid as obvious.

Honeywell contends that defendants fail to point to any evidence that the claims would have been obvious at the time of the invention. Honeywell assert that Chazelle '563 does not disclose any solution to the problem solved by its EGPWS, specifically the problem of landing at an airport. Defendants reply that Honeywell's argument is misplaced and is a veiled attempt to defend the validity of the display patents by asserting that *each* of the patents describe and claim the virtual look ahead system including inputs, a terrain database, envelopes and displays. Accordingly, defendants argue that Honeywell cannot defend the true scope of the asserted patents.

Based on the submissions of the parties, the question remaining is whether the combined teachings of the prior art references cited by defendants, reveal each and every element required by the asserted warning display claims and claims 4-5 of the '060 patent, by clear and convincing evidence. In light of the current record, the court cannot conclude that the defendants have satisfied their burden of establishinginvalidity and their motion for summary judgment is denied.

The warning display claims of the '009 patent

In support of its position, defendants rely upon the opinion of their expert, Robert Gibson, to invalidate claims 27-33 of the '009 patent.FN28

FN28. Gibson's opinion is based on the teachings of the Levy '423, Kuchar and Hansman 1991 and a prior art reference referred to as Fredrick '146. While Levy '423 and Kuchar and Hansman's 1991 were provided for review, a copy of Fredrick '146 was not provided to the court, and, as such cannot be evaluated in this analysis. See D.I. 159 Ex. I para. 88-90.

Claim 27: An aircraft terrain warning and information system for providing a visual display to the pilot of a warning of terrain proximate to the aircraft and alternatively a display of the contours of the terrain proximate to the aircraft, the warning system comprising:
position means for receiving signals representative of FN29 **the position of the aircraft;**

FN29. As previously noted, the term "signal representative of" was construed by the court. This limitation was constructed as "the signals received by the apparatus as instantaneous values of the recited variables; i.e. they indicate the numerical value of that variable at a given sampling time."

terrain data means for storing terrain data representative of terrain elevations;
altitude means for generating altitude signals representative of the altitude of the aircraft;

a cockpit display;

warning means responsive to said position means, said altitude signal and said terrain data means, for generating on said cockpit display a warning display of terrain proximate to the aircraft in response to predetermined warning criteria; and

contour means, responsive to said position means and said terrain data means, for displaying on said cockpit display a display of the contour of the terrain proximate to the aircraft, wherein said displaying of the contour of terrain is performed independently of the degree of hazard of said terrain to the aircraft.

The position means, terrain data means and cockpit display limitations have been discussed previously. The analysis of those limitations is incorporated herein by reference. The limitation requiring the system to include an "altitude means for generating altitude signals representative of the attitude of the aircraft", uses a sensor or other structure to derive a numerical indication of the aircraft's present altitude. D.I. 159, Ex. I at para. 95. The corresponding structure for this disclosure is located in the specification at Figure 1A and text 5:22-34 and 5:52-6:31. The disclosure shows a conventional differential GPS or barometric altimeter working alone or in combination to provide an altitude signal. Gibson opines that a radio altimeter may also be an acceptable alternate structure for generating the altitude signal. D.I. 159, Ex. I at para. 95. According to Gibson, one of ordinary skill in the art would recognize that the sources of altitude information disclosed in the art are identical to the altitude means disclosed in the specification. Id. *See also,* Ex. H at 24, 28 and 42 (Kuchar and Hansman 1991 disclosing signals from a GPS and radio altitude signals); Ex. C at 2:53-64 (Levy '423 disclosing various altimeters for determining the aircraft's altitude).

However, the claim also requires that a "warning means" perform the function of responding to the position signals from the position means, the altitude signals from the altitude means and the terrain data means to generate a "warning display" of terrain near the aircraft based on "predetermined warning criteria". The corresponding structures are the subject of almost the entire specification, including Figures 1, 5-26, 35-42 and 46 and the text at 2:45-48; 5:42-51; 9:13-18:15; 21:43-23:60; 28:20-32:5 and 36:29-35.

Much of this disclosure describes the "Look-ahead Warning Generator", as discussed in claim 4 of the '060 patent. The Look-ahead Warning Generator uses hardware and software to implement the specific altering algorithms disclosed in the specification. The corresponding structure of the warning means element includes all the detailed disclosure of the look-ahead alerting algorithms, including the two alert envelopes defined as functions of look ahead distance, flight path angle and terrain floor boundary. D.I. 159, Ex. I at para. 97.

Defendants assert that the combination of Chazelle '563 and Bateman 1991 or George 1994 (with the warning display system of Fredrick '146) renders obvious the specific altering system disclosed in the '080 patent, and therefore the "warning means" of the '009 patent is obvious as well. D.I. 159, Ex. I at para. 97. The court does not agree with this conclusion.

It is Gibson's opinion that, in view of the nature of the problem being solved, i.e. providing terrain-based alerting systems and an appropriate display of the terrain alerts, the claim would be obvious based on the cited references, Chazelle '563 and Bateman 1991 or George 1994 (with the warning display system of Fredrick '146). However, the defendants do not provide adequate justification for such a conclusion by clear and convincing evidence that the "warning means" limitation is obvious based on the prior art presented, since much of this claim limitation corresponds directly to the functions of the '080 patent. The defendants

seek to use the alleged obviousness of the '080 system as proof of the invalidity of this claim, without providing any basis for obviousness of the '080 claims. No adequate evidence has been presented to justify such a conclusion.

Although claim 27 contains additional limitations, since defendants have failed to prove obviousness of the "warning means" limitation, no further analysis of this claim is required and defendants have not met their burden.

Claim 28: The system of claim 27 including selection means for selecting contour display on said cockpit display.

Claim 29: The system of claim 28 wherein said selection means includes a switch located in the cockpit to enable the pilot to select said contour display.

Claim 30: The system of claim 28 wherein said selection means includes a switch located in the cockpit display.

Claim 31: The system of claim 28 means responsive to said warning criteria for replacing said contour display with said warning display.

Claim 32: The system of claim 27 wherein said contour displayed on said cockpit display is independent of the aircraft's altitude.

Claim 33: The system of claim 27 wherein said contour display is displayed as plurality of terrain contour layers between highest and lowest levels of said terrain proximate to the aircraft.

For the above claims dependent on claim 27, since defendants have not satisfied their burden of proving obviousness of each and every limitation disclosed in claim 27, they have also not met their burden on those dependent claims. Since claim 28 is dependent of claim 27 and claims 30 and 31 are dependent of claim 28, the same analysis applies and, as a result, the same conclusion. Therefore, defendants have not satisfied their burden of proving obviousness of claims 30 and 31.

The '006 patent

[21] Based on the following analysis, defendants have also not satisfied their burden to invalidate claims 4-6 of the '060 patent based on obviousness.

Claim 4: The warning system of claim 1 further comprising means for determining a severity of a terrain threat, wherein the terrain information on the visual display changes color based on said severity.

This is a dependant claim of claim 1, but adds the limitation that the warning system of claim 1 is a means for determining a severity of terrain threat, wherein the terrain information on the visual display changes color based on said severity. The court interpreted this claim as a means-plus-function element under 35 U.S.C. s. 112, para. 6.FN30 D.I. 124 at 34. As noted herein, a complete construction of claim 4 of the '060 patent was not provided by the court before summary judgment briefing occurred. The parties are in partial agreement regarding the corresponding structure of the "means for determining." D.I. 129, 130, 163. As

decided previously, it includes the look-ahead warning generator, as described in the specification at Column 9, lines 49-55, which "generates both a terrain advisory signal and a terrain warning signal based upon the position and trajectory of the aircraft related to stored terrain data." Further, according to Column 9, lines 52-53, there are two aspects of the generated signals: "look-ahead distance/direction; and terrain threat boundaries." The text that follows explains in detail these two aspects of a look-ahead warning generator and includes algorithms and calculations in relation thereto. The calculations of look-ahead distance/direction are described in Column 9, line 56 through Column 11, line 41, while the algorithms of the terrain threat boundaries are described in Column 11, line 42 through column 22, line 14, and include a terrain floor boundary, terrain advisor boundaries and terrain warning boundaries. In subsequent paragraphs of the specification, the structures necessary to translate the determined "severity of terrain threat" into a visual display are described. 23:4-42; 24:12-18; 30:1-32:50. They include algorithms necessary to convert the information into a form compatible with a display device. Figure 1B represents a block drawing of the Look-ahead Warning Generator and Figure 1 is described at Column 5:51-65.

FN30. The parties do not dispute the function of the means is to advise the pilot of the severity of the warning using different colors on a display. Rather, the issue focuses on the proper corresponding structure. As a result, the court determined that the corresponding structure to the means included the "Look-ahead Warning Generator" or its structural equivalents and invited the parties, since they had not done so previously, to provide analysis and argument regarding the corresponding structure. The parties did so on June 10, 2003. D.I. 129, 130. Thereafter, a telephonic conference occurred on August 11, 2003, to allow further argument on this issue. D.I. 163.

[22] Under the requirements of 35 U.S.C. s. 112, para. 6, means-plus-function language of the claims is permitted, "but with the proviso that the claims are limited to the structure, material or acts disclosed in the specification and their equivalents." WMS Gaming Inc. v. Int'l Game Tech., 184 F.3d 1339, 1348 (Fed.Cir.1999), *citing* Valmont Indus., Inc. v. Reinke Mfg. Co., 983 F.2d 1039, 1042 (Fed.Cir.1993). The function is for determining the severity of terrain threat and the structure that performs this function must be specifically programmed to perform the disclosed algorithms and calculations. As a result, the details of the algorithms or calculations contained in the specification are essential to the structure of this means and serve to limit the structure and its equivalents. *Id.* at 1349. Accordingly, the portions of the specification outlined herein disclose the corresponding structure that determines the terrain threat and supplies the information to the display to enable it to make the required color changes to the terrain information. To be an equivalent, the structure must implement the disclosed algorithms or calculations substantially the same as those disclosed in the specification.

In as much as this construction pervades defendants' assertion of obviousness, their motion for invalidity of claim 4 of the '060 patent is denied. None of the prior art references cited clearly and convincingly warrant a finding of obviousness, and at a minimum, material fact exists as to whether these prior art references when combined, suggest either implicitly or explicitly to a person of ordinary skill in the art that each element and limitation is embodied in claim 4.

Claim 5: The warning system of claim 1 wherein the controller comprises a first state, in which the visual display depicts no information, a second state in which the visual display depicts terrain information and a third state in which the visual display depicts weather information.

Claim 5 is a dependant claim of claim 1, but adds a limitation which requires a controller having first,

second and third states which display no information, terrain information and weather information. In addition to the prior art references relied upon by defendants regarding claim 1 (Kuchar and Hansman's 1993 studies and Yoder '400), the 1991 Kuchar and Hansman article is cited, which discloses a system whereby a pilot has the ability to select and deselect terrain and other information using control switches. D.I. 159, Ex. H at 49.

While the prior art is persuasive, when considering the elements of the claim as a whole, defendants have not satisfied their burden by clear and convincing evidence to invalidate claim 5. The claim requires that the display provides information in three states, with each state providing specific information, or lack thereof. The controller comprises a first state, in which the visual display depicts no information, a second state in which the visual display depicts terrain information and a third state in which the visual display depicts weather information. Defendants have not demonstrated that the prior art references, in combination, account for the controller involved in displaying the three states and, as such, have failed to prove obviousness.

Claim 6: The warning system of claim 5 further comprising a terrain selection switch for moving the controller between the second and third states.

This claim adds the limitation of a terrain selection switch for moving the controller between the second and third states. Since defendants have not met their the burden for claim 5, they have failed show that claim 6 is obvious, that is, the differences between the claimed invention as a whole and the prior art would have been obvious to a person of ordinary skill in the art.

VII. Conclusion

For the reasons contained herein, defendants' motion for summary judgement is GRANTED in part and DENIED in part. Defendants' motion for summary judgment of anticipation on claims 1-3, 8, 9, 13, 23, 24, 34-36, 39, 41 and 43-45 of the '009 patent and claims 1-3 and 11-16 of the '060 patent is GRANTED. Defendants' motion for summary judgment of obviousness on claims 27-33 of the '090 patent and claims 4-6 of the '060 patent is DENIED. An appropriate order consistent with this memorandum will follow.