IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF DELAWARE

HONEYWELL INTERNATIONAL, INC., et al.,	:	
Plaintiffs,	:	
v.	:	C. A. No. 02-359-MPT
UNIVERSAL AVIONICS SYSTEMS CORP., et al.,	:	
Defendants.	:	

MEMORANDUM

Thomas C. Grimm, Esquire, and Jack C. Schecter, Esquire, Morris, Nichols, Arsht & Tunnell, 1201 N. Market Street, P.O. Box 1347, Wilmington, Delaware 19899, attorneys for Plaintiffs, Honeywell International Inc., and Honeywell Intellectual Properties Inc.

Frederick L. Cottrell, II, Esquire, and David A. Felice, Esquire, Richards, Layton &Finger, One Rodney Square, P.O. Box 551, Wilmington, Delaware 19899, attorneys for Defendant, Universal Avionics Systems Corp., and Goodrich Corporation Goodrich Avionics Systems Inc.

Thomas L. Halkowski, Esquire, Fish & Richardson, P.C., 919 N. Market Street, Suite 1100, P.O. Box 1114, Wilmington, DE 19899-1114, attorneys for Defendant, Sandel Avionics, Inc.

Dated: May 30, 2003

Wilmington, Delaware

Thynge, U.S. Magistrate Judge

I. INTRODUCTION

This is a patent infringement case involving technology in the aviation industry. Initially plaintiffs, Honeywell International Inc. and Honeywell Intellectual Properties Inc. ("Honeywell") filed suit against four defendants[1] in May 2002, alleging infringement of five patents: U.S. Patent 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"). Subsequently, Honeywell dismissed two of the original defendants and now pursues its infringement claims against the remaining defendants, Universal Avionics Systems Corp. ("Universal"), and Sandel Avionics ("Sandel"). Presently before the court are the parties' arguments on claim construction on the five patents-in-suit. The court conducted a claims construction hearing on April 9, 2003. This is the court's opinion construing the claims of the patents-in-suit.

II. BACKGROUND[2]

Each of the five patents in this case concerns terrain warning systems which warn pilots when the danger of having a "controlled flight into terrain" ("CFIT") accident increases. *See* D.I. 81 at 1. The parties have divided the patents-in-suit into two main categories: "look ahead patents" ('080, '570, and '592) and the "display patents" ('060 and '009). *See* D.I. 86 at 2-3. The primary patent in this litigation is the '080 patent,

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[1]The original defendants in this case were Universal Avionics Systems Corp., Goodrich Corporation, Goodrich Avionics Systems Corp., and Sandel Avionics, Inc. In late January 2003, Honeywell settled with the Goodrich defendants.

[2] All information and facts included in this opinion were taken from the parties' briefs and oral arguments.

which claims "the core forward-looking terrain alerting system." *Id.* 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 teach two methods for displaying the alert information on a visual screen in the cockpit. The '060 patent claims a system which causes certain information, including the severity of an alert, to "pop-up" on the pilot's screen. Similarly, the '009 patent claims a system which displays terrain information, as well as, compares the terrain and aircraft altitude and colors certain parts of the display based on this comparison. *Id.*

A. '080 Patent

In July 1995, a group of inventors filed the application for the '080 patent.[3] Approximately a year and a half later, the Patent and Trademark Office ("PTO") Examiner rejected all five of the patent claims as indefinite under 35 U.S.C. § 112, and found that claims 1 and 3 were also anticipated under 35 U.S.C. § 102 by U.S. Patent No. 5,488,563 ("Chazelle patent").[4]

In late 1997, Honeywell filed an Amendment and Remarks cancelling all five claims of the '080 patent, and adding claims 6 through 18, to clarify, inter alia, that the

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[3]Honeywell's predecessor, AlliedSignal, Inc. was the assignee of the patent.

[4]The Examiner stated: "Chazelle et al. teach a method and device for preventing collisions with the ground for an aircraft. Chazelle et al. teach means for receiving aircraft position signals . . . means for storing terrain data . . . and means for determining the current altitude of each aircraft . . . . Chazelle et al. further teach first generating means for generating a first envelope . . . means for aircraft vertical speed signals . . . and means for generating a second envelope." D.I. 82 at A-179.

'080 invention included alert envelopes, which were not present in the Chazelle patent.[5] Thereafter, the Examiner issued a Notice of Allowability.[6]

Honeywell has asserted independent claims 1[7] and 9,[8] and dependent claims 7,

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[5]In that submission, Honeywell stated: "In the invention of Chazelle, a plurality of ellipsoids are generated at points along the aircraft's predicted flight path. The axes of the ellipsoids are generated at points along the aircraft's predicated flight path. The axes of the ellipsoids represent the uncertainty of the aircraft horizontal position and altitude. The perimeter surfaces of these ellipsoids are connected to form a 'tube' of predicted aircraft movement. The Chazelle references further consist of a terrain database over which an altitude safety margin is laid to create a terrain profile beneath the aircraft. An alert is generated when the 'tube' of predicted movement intersects the terrain profile. The Examiner contends that Chazelle teaches a method and device for preventing collisions with the ground including a means for receiving position signals, means for storing terrain data and means for generating a first and second warning envelopes. Because Chazelle fails to disclose or suggest a first or second alert envelopes defined as a level of terrain threat, Chazelle fails to disclose or suggest the present invention. The parameters of the 'tube' of predicted movement disclosed by Chazelle is defined by uncertainty in aircraft position and is not a function of the aircraft's flight path angle. The various dimensions of the tube reflect uncertainty in position and do not reflect a degree of terrain threat. The terrain profile of Chazelle and 'tube' of position are not alert envelopes that represent a severity of terrain hazard. For at least three reasons, Chazelle fails to disclose or suggest the present invention." D.I. 85, Ex. 13 at 4-5 (emphasis in original).

[6]Three months after the Examiner issued the Notice of Allowability, Honeywell filed a Supplemental Information Disclosure Statement, and in August 1998 the Examiner issued a Second Notice of Allowability. In the original Notice of Allowability, the Examiner stated his reasons for allowance: "the prior art of record doe[sic] not teach or make obvious an apparatus or method for alerting a pilot of an aircraft of the proximity to terrain starting using signals representative of the position of the aircraft, a flight path angle of the aircraft and a speed of the aircraft by defining a first alert envelope indicative of a first severity of terrain threat (using a first function of position, flight path angle and speed of the aircraft), and thereform[sic] outputting an alert signal (to a pilot) when a subset of the stored terrain information is located within the boundaries of at least one of the first and second alert envelopes." D.I. 85, Ex. 14 at 2.

[7]Claim one of the patent states:

1. As an apparatus for alerting a pilot of an aircraft of proximity to terrain, the apparatus comprising:
an input for receiving signals representative of a position of the aircraft, a flight path angle of the aircraft and a speed of the aircraft, and coupled to a data base of stored terrain information;

an output;

a signal processing device, coupled to said input, and coupled to said output for:
(a) defining a look ahead distance as a function of the speed of the aircraft;
(b) defining a first alert envelope, indicative of a first severity terrain threat.
wherein boundaries of said first alert envelope are determined as a first function of the flight path angle, said look

8, 10, and 13 against both defendants. Claims 7 and 8 depend on claim 1, while claims 10 and 13 depend on claim 9.

B. '592 Patent

The inventors of the '080 patent filed the application for the '592 patent on May 8, 1998,[9] as a continuation of the '080 patent. On the same day, the inventors filed an Amendment striking the original five claims of the patent and adding claims 6 through 21. In August 2000, the Examiner issued a Notice of Allowability for those claims.

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ahead distance, and terrain floor boundary;
(b) [sic] defining a second alert envelope, indicative of a second severity of terrain threat, wherein boundaries of said second alert envelope are determined as a second function of the flight path angle, said look ahead distance and said terrain floor boundary; and
(d) outputting an alert signal when a subset of the stored terrain information is located within the boundaries of at least one of said first and said second alert envelopes.

[8]Claim 9 of the patent states:

9. A method for alerting a pilot of hazardous proximity to terrain comprising the steps of:
accessing a data base of terrain information;
receiving signals representative of a position of the aircraft, a flight path angle of the aircraft and a speed of the aircraft;
defining a look ahead distance as a function of the speed of the aircraft;
defining a first alert envelope, indicative of a first severity of terrain threat, wherein boundaries of said first alert envelope are determined as a first function of the flight path angle, said look ahead distance, and a terrain floor boundary;
defining a second alert envelope, indicative of a second severity of terrain threat, wherein boundaries of said second alert envelope are determined as a second function of the flight path angle, said look ahead distance and said terrain floor boundary, and
outputting an alert signal when a subset of the stored terrain information is located within the boundaries of at least one of said first and said second alert envelopes.

[9]Again, AlliedSignal was the assignee of the patent.

Honeywell has asserted independent claims 1, 8, and 15 and dependent claims 6, 7, 13, and 14. Claims 6 and 7 are dependent on claim 1, while claims 13 and 14 are dependant on claim 8.

C. '570 Patent

In June 1998, the same inventors filed the application for the '570 patent, also a continuation of the '080 patent.[10] Again, the inventors filed an Amendment, cancelling all claims and adding claims 6 through 22, on the day that the patent application was filed. The Examiner rejected claims 9, 14, and 19 for indefiniteness, because the inventors did not clearly point out the subject of the invention. Due to double patenting of claims 1 and 9 of the '080 patent, the Examiner also rejected claims 6, 11, 19, and 20 of the '570 patent. Based on the Examiner's suggestion, Honeywell filed an Amendment clarifying the subject of the invention and included a terminal disclaimer which limited all aspects of the '570 patent to the term of the '080 patent. *See* D.I. 81 at 12. Thirteen months after the '570 application was filed, the Examiner issued a Notice of Allowability.

Honeywell asserts independent claims 1, 6, 14, and 15 and dependent claims 2-5, 7-11 and 16 against Universal. Additionally, Honeywell asserts claims 1, 5, 6, 10, 11, 14-16 against Sandel.

D. '060 Patent

The inventors of the '060 patent filed their application in September 1997, as a

[10]As with the '080 and '592 patents, AlliedSignal was the assignee of the '570 patent.

continuation-in-part of the '080 patent.[11] In June 1998, an Amendment adding the word "automatically" to claims 1 and 11 was filed. However, the Examiner rejected claims 1 through 16, because of double patenting of the '080 patent, but indicated that adding a terminal disclaimer would cure the defects in the '060 patent. Honeywell filed the disclaimer and received a Notice of Allowability in late March 2000.

Honeywell asserts independent claims 1, 11 and 12 and dependent claims 2-6 and 13-16 against Universal, and claims 1-4 against Sandel.

E. '009 Patent

The inventors of the '009 patent filed their application in July 1997.[12] In early 1998, Honeywell filed a Request for Corrected Non-Provisional Application Filing Receipt, which claimed priority over provisional application 08/509,642 and non-provisional application number 08/509,642.[13] The Examiner rejected all of the claims of the '009 patent application because of double patenting over the '080 application, and again suggested a terminal disclaimer. In February 2000, after Honeywell filed a Response explaining that the '009 application displayed terrain data without indicating the severity of terrain threat, the Examiner issued a Notice of Allowability.

Honeywell asserts independent claims 1, 27, 34, 41, 43-45 and dependent claims 2, 3, 8, 9, 13, 24, 28-33, 35, and 36 against both defendants. Additionally,

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[11]Although there is some overlap, this group of inventors was not identical to the inventors for the prior three patents. However, as with the other patents, Honeywell's predecessor, AlliedSignal was the assignee of the '060 patent.

[12]Similar to the '060 patent, the '009 patent had inventors different than the other patents, but had the same assignee, AlliedSignal. In 1996, provisional application No. 60/023,305 was filed. The 1997 application of the '009 patent priority claimed over this provisional application.

[13]The non-provisional application was the '080 application which was pending at that time.

Honeywell asserts claim 23 and 39 against Universal.

III. CLAIM CONSTRUCTION

A. Legal Principles

In a patent infringement case, the court's analysis requires two steps. First, the court must determine as a matter of law the correct scope and meaning of the disputed claim terms.[14] Second, "the analysis requires a comparison of the properly construed claims to the accused device, to see whether that device contains all the limitations, either literally or by equivalents, in the claimed invention."[15]

In making its determination of the proper construction of a claim, the court may consider "both intrinsic evidence (*e.g.*, the patent specification and file history) and extrinsic evidence (*e.g.*, expert testimony)," but should first examine "the intrinsic evidence of record, *i.e.*, the patent itself, including the claims, the specification and, if in evidence, the prosecution history."[16] Only when the court is "unable to determine the meaning of the asserted claims after assessing the intrinsic evidence" should the court consider extrinsic evidence.[17] Starting with the intrinsic evidence, the analysis should be done in a particular order.[18]

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[14] See *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002) (citing *Johnson Worldwide Assocs., Inc. v. Zebco Corp.,* 175 F.3d 985, 988 (Fed. Cir. 1999)).

[15] *Id.*

[16] *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996). Normally, however, it will be unnecessary for the court to consider extrinsic evidence in interpreting claim language.

[17] *See Bell Atlantic Network Servs., Inc. v. Covad Communications Group, Inc.*, 262 F.3d 1258, 1269 (Fed. Cir. 2001).

[18] *See Digital Biometrics, Inc. v. Identix, Inc.*, 149 F.3d 1335, 1344 (Fed. Cir. 1998) (noting that "[e]ven within the intrinsic evidence . . . there is a hierarchy of analytical tools").

The starting point for the court's examination of the intrinsic evidence is the language of the disputed claims themselves, as the words of the claim, chosen by the inventor, delimitate the breadth of protection provided by the patent grant.[19] There is a "heavy presumption" that a claim term carries its ordinary and customary meaning, and, if the claim includes a term of art, that term is given its ordinary and accustomed meaning to one of ordinary skill in the relevant art at the time of the invention.[20] "'If an apparatus claim recites a general structure without limiting that structure to a specific subset of structures, we will generally construe the term to cover all known types of that structure' that the patent disclosure supports."[21] The "heavy presumption" of the ordinary meaning of a claim term may be overcome and the term narrowed, but an accused infringer cannot simply point to "the preferred embodiment or other structures or steps disclosed in the specification or prosecution history."[22] A patentee need not "describe in the specification every conceivable and possible future embodiment of his invention."[23]

Rather, a court may constrict the ordinary meaning of a claim term in at least four ways, as recently outlined by the Federal Circuit in *CCS Fitness, Inc. v. Brunswick*

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[19] *See Phonometrics, Inc. v. Northern Telecom Inc.*, 133 F.3d 1459, 1464 (Fed. Cir. 1998); *Vitronics*, 90 F.3d at 1582; *Bell Communications Research Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620 (Fed. Cir. 1995).

[20] *Zelinski v. Brunswick Corp.*, 185 F.3d 1311, 1315 (Fed. Cir. 1999); *see also Johnson Worldwide Assoc.*, 175 F.3d at 985.

[21] *CCS Fitness, Inc.*, 288 F.3d at 1367 (citing *Renishaw PLC v. Marposs Societa' Per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998)).

[22] *CCS Fitness, Inc.*, 288 F.3d at 1367.

[23] *Rexnord Corp. v. Laitram Corp.*, 274 F.3d 1336, 1344 (Fed. Cir. 2001) (citations omitted).

Corp.[24]

First, a patentee is permitted to be his own lexicographer. However, for the court to accept a suggested meaning that is contrary to the ordinary and accustomed meaning of a word, the novel meaning must be clearly set forth in either the specification or the prosecution history "so as to put one reasonably skilled in the art on notice that the patentee intended to so redefine the claim term."[25] To determine whether the patentee has used a term in a manner contrary to its accepted meaning, the court's next step is to review the patent's specification.[26] Because the specification must include a written description which is sufficient to enable one of ordinary skill in the art to make and use the invention, "the specification is always relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term."[27] Although the specification "provide[s] a context to illuminate the meaning of claim terms,"[28] the court should not interpret those claim terms "by adding limitations appearing only in the specification."[29] Furthermore, the general rule is that unless the claims themselves so limit, "the claims of a patent are not limited to the

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[24] 288 F.3d 1359 (Fed. Cir. 2002).

[25] *CCS Fitness, Inc.*, 288 F.3d at 1367-68; *Bell Atlantic Network Servs., Inc.*, 262 F.3d at 1268.

[26] *Vitronics Corp.*, 90 F.3d at 1582.

[27] *Id.*

[28] *Abtox, Inc. v. Exitron Corp.*, 122 F.3d 1019, 1023 (Fed. Cir. 1997).

[29] *Electro Medical Sys., S.A. v. Cooper Life Sciences, Inc.*, 34 F.3d 1048, 1054 (Fed. Cir. 1994)

preferred embodiment" set forth in the specification.[30] Additionally, the court may consider a patent's prosecution history in determining the meaning of a claim term. The prosecution history "may contain contemporaneous exchanges between the patent applicant and the PTO about what the claims mean."[31]

Second, a claim term will not carry its ordinary meaning "if the intrinsic evidence shows that the patentee distinguished that term from prior art on the basis of a particular embodiment, expressly disclaimed subject matter, or described a particular embodiment as important to the invention."[32] Amendments to the patent and arguments made to the patent examiner may each be used to exclude an interpretation disclaimed during prosecution[33] and each are given equal weight by the court in its interpretation.[34]

Third, "a claim term also will not have its ordinary meaning if the term 'chosen by the patentee so deprives the claim of clarity' as to require resort to the other intrinsic evidence for a definite meaning." Finally, if the patentee phrased a claim in a means-plus-function format, the claim term will only cover the corresponding structure or step, or its equivalents, disclosed in the specification.[35]

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[30] *Karlin Technology, Inc. v. Surgical Dymanics, Inc.*, 177 F.3d 968, 973 (Fed. Cir. 1999); *see also Laitram Corp. v. NEC Corp.*, 163 F.3d 1342 (Fed. Cir. 1998) (stating that "the mere repetition in the written description of a preferred aspect of a claimed invention does not limit the scope of an invention that is described in the claims in different and broader terms").

[31] *Digital Biometrics, Inc.*, 149 F.3d at 1344.

[32] *CCS Fitness, Inc.*, 288 F.3d at 1367-68 (citations omitted).

[33] *Southwall Technologies, Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1576 (Fed. Cir. 1995).

[34] *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 979 (Fed. Cir. 1999).

[35] *CCS Fitness, Inc.*, 288 F.3d at 1368 (citations omitted).

Only if there is still ambiguity as to the meaning of a claim after reviewing the intrinsic evidence should a court consider extrinsic evidence, such as, expert or inventor testimony.[36]

The Federal Circuit recently revisited the issue of a court's use of dictionaries when construing claim terms in *Texas Digital Sys., Inc. v. Telegenix, Inc.*[37] Prior opinions had referred to dictionaries as a "special form of extrinsic evidence" which courts consulted during claim construction.[38] In contrast to those earlier opinions, the *Texas Digital* court stated that "categorizing [dictionaries, encyclopedias and treatises available at the time a patent issued] as 'extrinsic evidence' or even a 'special form of extrinsic evidence' is misplaced and does not inform the analysis."[39] In its extensive commentary on the use of dictionaries in claim construction, the *Texas Digital* court reiterated longstanding precedent that dictionaries are useful resources always available to the court to determine the meanings of claim terms.[40] The court noted that "[d]ictionaries . . . publicly available at the time the patent issued, are objective resources that serve as reliable sources of information on the established meanings that would have been attributed to the terms of the claims by those of skill in the art."[41]

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[36] *Vitronics Corp.,* 90 F.3d at 1584.

[37] 308 F.3d 1193 (Fed. Cir. 2002).

[38] *See Intel Corp. v. Broadcom Corp.*, 172 F. Supp. 2d 478, 486 (D. Del. 2001) (stating that "[d]ictionaries, however, are a special form of extrinsic evidence that may be considered along with the intrinsic evidence in determining a claim's ordinary meaning" (citing *Interactive Gift Express, Inc. v. CompuServe Inc.*, 231 F.3d 859, 866 (Fed. Cir. 2000)).

[39] *Texas Digital Sys., Inc.,* 308 F.3d at 1203.

[40] *Id.* at 1202.

[41] *Id.* at 1202-03.

Since dictionary definitions recite the meanings of terms unbiased by motives of parties engaged in litigation, the outcome of which may depend on the court's construction of those terms, dictionaries (along with encyclopedias and treatises) "may be the most meaningful sources of information to aid judges in better understanding both the technology and the terminology used by those skilled in the art to describe the technology."[42] The *Texas Digital* court suggests that when construing the words of a claim, the court should first determine the ordinary and accustomed meanings of disputed claim words through an examination of relevant dictionaries, encyclopedias, or treatises. This determination will reveal the broadest definition of those terms as understood by one of skill in the art. Having made that determination, the *Texas Digital* court suggests, as in *CCS Fitness*,[43] that a court must next examine the written description and prosecution history to determine whether the scope of a disputed term has been limited as a result of the patentee clearly setting forth an inconsistent definition of the disputed term or otherwise disavowing or disclaiming the full scope of the term's meaning. Following this procedure, the court construing claims may avoid improperly importing limitations into a claim based on a single embodiment described in the specification, which might occur if the court begins its analysis with an examination of the written description and the prosecution history.[44]

In addition to the construction of various claim terms, the parties also dispute whether some claims were written in "means-plus-function" form, where the limitation

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[42] *Id.* at 1203.

[43] *CCS Fitness, Inc.*, 288 F.3d at 1368.

[44] *Texas Digital Sys., Inc.,* 308 F.3d at 1204-05.

does not describe a specific structure, but instead describes a function and claims a "means" for accomplishing that function. Pursuant to 35 U.S.C. § 112, ¶ 6, limitations drafted in means-plus-function form are construed to "cover the [functionally] corresponding structure, material, or act described in the specification and equivalents thereof." *Odetics, Inc. v. Storage Tech. Corp.*, 185 F.3d 1259, 1266-67 (Fed. Cir. 1999). Section 112, ¶ 6 provides a compromise to patentees: patentees may express a limitation in their patent claims "as a means or a step for performing a specified function without the recital or structure . . . in support thereof; "such a claim, however, will not be interpreted to cover all structures . . . which would perform that function, but only "the corresponding structure . . . described in the specification and equivalents thereof." 35 U.S.C. § 112, ¶ 6; *see also J&M Corp. v. Harley-Davidson, Inc.*, 269 F.3d 1360, 1367 (Fed. Cir. 2001) ("the scope of such [means plus function] claim language is sharply limited to the structure disclosed in the specification and its equivalents"). The duty to link or associate structure to a claimed function is the quid pro quo for the convenience of employing the means-plus-function claiming technique of § 112, ¶ 6. *B. Braun Medical Inc. v. Abbott Labs.*, 124 F.3d 1419, 1424 (Fed. Cir. 1997).

Determining whether a given claim limitation is subject to § 112, ¶ 6 is a question of law. *See Kemco Sales, Inc. v. Control Papers Co.*, 208 F.3d 1352, 1361 (Fed. Cir. 2001). Through a series of cases, the Federal Circuit has established a framework for determining when § 112, ¶ 6 applies to a claim limitation. *Micro Chem. Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250 (Fed. Cir. 1999).

First, if the word "means" appears in a claim limitation in combination with a function, § 112, ¶ 6 is presumed to apply. *See Micro Chem., Inc. v. Great Plains Chem.*

Co., 194 F.3d 1250, 1257 (Fed. Cir. 1999); *York Prods. Inc. v. Cent. Tractor Farm & Family Ctr.*, 99 F.3d 1568, 1574 (Fed. Cir. 1996). This presumption arises because "the use of the term 'means' has come to be so closely associated with 'means-plus-function' claiming that it is fair to say that the use of the term 'means' . . . generally invokes section 112(6)." *Greenberg v. Ethicon Endo-Surgery, Inc.*, 91 F.3d 1580, 1583 (Fed. Cir. 1996). Additionally, if a claim recites "means" language, but does not include sufficient structure to perform the function, it is interpreted as a means-plus-function claim under § 112, ¶ 6. *See, e.g., Wegner Mfg. Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1232 (Fed. Cir. 2001) (holding that "air circulation means" was subject to § 112, ¶ 6, because it recited the function of "circulating through said reel," without reciting any structure for performing that function).

Second, the presumption that § 112, ¶ 6 applies to claim terms using the term "means" may be overcome – and the claim term should not be construed as a means-plus-function limitation – if the claim contains a sufficiently detailed recitation of structure, material, or acts to perform the claimed function. *See Personalized Media Comms. v. Int'l Trade Comm.*, 161 F.3d 696, 704 (Fed. Cir. 1998); *see also Sage Prods. v. Devon Indus., Inc.*, 126 F.3d 1420, 1427-28 (Fed. Cir. 1997) ("[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in the means-plus-function format" even if the claim uses the terms "means"); *but see Laitram Corp. v. Rexnord, Inc.*, 939 F.2d 1533, 1535 (Fed. Cir. 1991) (holding that structural description that served merely to further specify the function of the recited means did not take the claims outside the scope of § 112, ¶ 6).

Third, the presumption that § 112, ¶ 6 applies to a claim limitation using the term "means" may also be overcome if the limitation does not link the "means" to a function. *See York*, 99 F.3d at 1574 (holding that claim with a "detailed recitation of structure" but no connection to any function was not subject to § 112, ¶ 6); *see also Rodime PLC v. Seagate Tech., Inc.*, 174 F.3d 1294, 1303 (Fed. Cir. 1999) (holding "positioning means" was not subject to § 112, ¶ 6 where the claim recited a detailed list of structural elements). If no function is linked to the "means" in a claim limitation, that claim limitation cannot be a means-plus-function limitation. *York*, 99 F.3d at 1574.

Finally, if a claim element does not use the word "means," it is presumed to fall outside § 112, ¶ 6. *Micro Chem., Inc.*, 194 F.3d at 1257. Such claim limitations, however, may still be subject to § 112, ¶ 6, even if the limitation does not use the word "means," where the limitation is written in functional terms and does not recite sufficient structure to describe the performance of that claimed function. *See, e.g., Id.; Mas-Hamilton Group v. LaGard, Inc.*, 156 F.3d 1206, 1213-15 (Fed. Cir. 1998) (holding that "lever moving element" and "movable link member" were means-plus-function limitations, even though the term "means" was not used in claims, because the limitations did not recite definite structure and did not give generally understood structural meanings in the art).

Once the court has determined that a claim element is subject to § 112, ¶ 6, the court must first identify the claimed function, and, second, determine the corresponding structure disclosed in the specification. *See IMS Tech., Inc. v. Haas Automation, Inc.*, 206 F.3d 1422, 1430 (Fed. Cir. 2000); *Micro Chem.*, 194 F.3d at 1258. To determine the appropriate structure, the court should look not only to the specification, but to the

prosecution history, as patentees will be estopped from asserting an interpretation of a means-plus-function claim that would be broad enough to cover a prior art reference that the patentee disclaimed coverage of during prosecution. *Alpex Computer Corp. v. Nintendo Co. Ltd.*, 102 F.3d 1214, 1221 (Fed. Cir. 1996) ("positions taken before the PTO may bar an inconsistent position on claim construction under § 112, ¶ 6"); *see also Ballard*, 268 F.3d at 1361.

B. The Court's Claim Construction of Disputed Terms[45]

I. "Signals representative of"[46]

Honeywell's Proposed Construction	Sandel's Proposed Construction	Universal's Proposed Construction	**Court's Construction**
Electronic, visual, audible, or other indications used to convey information, serving to represent, portray, or typify.	The signals received by the apparatus are instantaneous values of the recited variables; i.e. they indicate the numerical value of that variable at a given sampling time.	The input receives signals from other devices which represent discrete numeric values of the recited variables.	**The signals received by the apparatus are instantaneous values of the recited variables; i.e. they indicate the numerical value of that variable at a given sampling time.**

Honeywell argues that this phrase has a plain and ordinary meaning in the art, and needs no further construction. However, Honeywell provided a definition of "signal" for the court to consider should the court decide it needs construction. It relied on

[45]On April 28, 2003 the parties submitted a joint summary which included their positions on the appropriate construction of the disputed terms, a list of terms which do not require the court's construction, and a list of claim terms requiring the court's construction, although the parties agree upon the proposed definition. For clarity, the court will maintain the parties' formatting for the disputed terms, including a brief description of the support for their arguments, and the reasoning behind the court's construction. *See generally* D.I. 119 for the parties' proposed construction of each term.

[46]This construction applies to 080, '592, '570, and '009 Patents.

various dictionaries in reaching this definition. Honeywell also provided a construction of "representative of," again relying on various dictionary definitions. The thrust of Honeywell's argument is that the patent is not limited to specific numerical values. Rather, it includes any signal representing flight path angle, speed or aircraft position.

Sandel agrees with Honeywell's definition of "signal" as an "electrical current one voltage used to communicate a condition, value or other information from one place in the system to another." However, Sandel also contends that "representative of," the crux of the parties' dispute, should be given its plain and ordinary meaning, as understood by those skilled in the art. Further, Sandel urges the court to consider the context of the system claimed in the patent when construing "representative of." In explaining this context, Sandel emphasizes that in the look ahead patents, the various signals are representative of flight path angle, speed, and position of the aircraft, which are all shown to the pilot in numbers. They argue that the signals are "representative" only because it takes time to collect, translate, and display the information to the pilot.

The patents in this case deal with a warning system for pilots. When a pilot is flying too close to dangerous terrain, the warning system will provide an alert to this potential danger. In order to do that, the alarm system must have stored information about the terrain in the vicinity of the plane, and also must have access to how fast the plane is traveling, the angle of the flight path, and the position of the plane, all which would affect whether the plane is in danger of coming into contact with the terrain. Honeywell argues that its patents cover any signal relating to the angle, position and speed of the flight. Universal and Sandel maintain that it covers only specific numerical values. The terrain awareness systems compare flight data with stored terrain

information, in order to warn the pilots of danger. If the court construed Honeywell's patent to include any signal representing one of the previously mentioned variables, it would claim both signals which indicate a threat, and signals which do not. Since the point of the invention is to warn of dangerous conditions, the patent should be limited to signals which represent a threat. Because a pilot cannot read a signal, the signals are transformed into numbers, thus "dangerous signals" are understood in terms of numbers. Some of those numbers would clearly indicate a threat, while others would clearly indicate no threat. Also, there would be a range of numbers in the middle which might pose a threat. Thus, reading the patents in the broad manner that Honeywell proposes, that is, allowing the patents to apply to the entire spectrum of signals, would defeat the purpose of the patent.[47]

[47]When Honeywell distinguished the prior art from the patent, it recited: "While the [prior terrain awareness systems] do provide advisory and warning signals in the event of proximity to terrain, the warnings generated by such systems are based solely upon flight conditions of the aircraft and do not utilize any navigational information. Consequently, the sensitivity of such systems must be adjusted to provide adequate warnings when a hazardous flight condition exists without generating false or spurious warnings. However, such an adjustment can result in a compromise that may still result in nuisance warnings over terrain unique to particular geographic areas and shorter than desired warning times in yet other geographic areas." D.I. 81, Ex. 1 at Col. 1: 38-49.

2. "Look ahead distance"[48]

Honeywell's Proposed Construction	Sandel's Proposed Construction	Universal's Proposed Construction	**Court's Construction**
A distance that the system looks ahead of the aircraft.	Has no established meaning in the art and is defined by the specification to mean a distance along the ground track that marks the outer limit of the alert envelopes and that is a function of aircraft speed and time to complete an evasive maneuver.	Has no established meaning in the art and is defined in the '080 Patent as a distance along the ground track of the aircraft that marks the outer limit of each alert envelope.	**A distance along the ground track of the aircraft that marks the outer limit of each alert envelope and that is a function of aircraft speed and time to complete an evasive maneuver**.

Honeywell maintains that look ahead distance has a plain and ordinary meaning to one skilled in the art of aviation, and thus, requires no construction.[49] To support its position, Honeywell cites to various documents which allegedly use the term in the same common usage, including Sandel's product literature, a Sandel patent filed in 2001, and information from Universal's website, dated 2002.

Sandel argues that there was no ordinary meaning associated with look ahead distance that existed at the time the patent was filed. According to Sandel, the specification dictates that "look ahead distance" be construed consistent with Sandel's proposed definition. Additionally, Sandel notes that basic principles of physics prevent defining "look ahead distance" solely as a function of the speed of the aircraft, since

[48]This construction applies to the '080, '592, and '570 Patents.

[49]Again, Honeywell included its proposed definition only as an alternative measure should the court decide to construe the term.

distance cannot be calculated unless it uses speed and some other variable, usually some measurement of time.[50] Thus, Sandel maintains that Honeywell's definition renders the claim indefinite and as a result, invalid.

In response to Honeywell's allegations that its own literature shows the common usage of "look ahead distance," Sandel emphasizes that at the time the patent was filed "look ahead distance" was not commonly used or understood in the art. According to Sandel, after heavy lobbying by Honeywell, the Federal Aviation Association ("FAA") used some of the language from Honeywell's patent when drafting its Technical Standard Order ("TSO"), which requires the installation of a terrain awareness system in every commercial aircraft by 2005. One of the terms from the Honeywell patent that the FAA used in the TSO was "look ahead distance." Thereafter, the phrase became more commonly used in the industry as the result of the FAA's TSO.

Universal argues that "look ahead distance" has no particularized meaning in the art. Like Sandel, Universal looks to the specification for support, noting that it contains only one embodiment. Additionally, Universal relies upon prosecution history estoppel, arguing that the patentee's statements to the PTO during prosecution, which distinguished the Chazelle patent, prevents a definition of "look ahead distance" which only employs the speed of the aircraft. According to Universal, the Examiner issued the Notice of Allowability because of Honeywell's assertions that Chazelle was distinguishable from its patent because it used flight path angle, look ahead distance and first and second alert envelopes.

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[50]Here, Sandel claims that the time is the time it would take the pilot to complete an evasive procedure.

In response to the prosecution history estoppel arguments, Honeywell contends that Universal mischaracterizes the basis for the granting of the patent by the Examiner as solely due to Honeywell's representations that speed and time defined the look ahead distance.

In patent cases, when a term does not have a common usage at the time that the patent was filed, the patentee's specialized definition, as seen through the specification, controls the interpretation of the claim language. When only one embodiment is included, and the patentee fails to support a broad meaning of the disputed language, the court may limit the patentee to that embodiment. *Kraft Foods, Inc. v. International Trading Co.,* 203 F.3d 1362 (Fed. Cir. 2000). When neither the claim language and specification, nor the prosecution history indicate the meaning of the claim term, then, and only then, may the court consider extrinsic evidence.

Here, Honeywell presented no evidence that indicates a common understanding of "look ahead distance" in 1995, when the patent application was filed.[51] Although Honeywell cites to Sandel's usage of "look ahead distance" which is consistent with its proposed definition, the court cannot rely on such evidence for two reasons. First, all of the documents on which Honeywell relies, are dated in 2001 or 2002, more than five years *after* the '080 patent was filed. Secondly, those documents are extrinsic evidence. The court may only consider such information if the intrinsic evidence does not assist in construing the disputed term. To the contrary, both the specification and

[51]It is telling that Honeywell failed to cite any dictionaries showing the common usage of "look ahead distance", particularly since it referenced several dictionary definitions when discussing other claim language.

prosecution history provide insight into the meaning of the “look ahead distance.” Thus, there is no need for the court to resort to extrinsic evidence.

Moreover, the court adopts Sandel’s construction, rather than Universal’s construction because when reading the claims, specification, and prosecution history in the context of the purpose of the invention, it is evident that Sandel’s definition is a better representation of the purpose of the invention, warning the pilot of potential danger.

3. "Alert envelope"; "First alert envelope"/"second alert envelope; "[52]

Honeywell's Proposed Construction	Sandel's Proposed Construction	Universal's Proposed Construction	**Court's Construction**
A search volume around the aircraft.	Term of art in avionics and means an at least 2-dimensional region in the vertical plane surrounded by a continuous boundary such that, if this boundary is "pierced" by a terrain feature, the claimed apparatus will trigger an alert.	An area in the vertical plane along the ground track of and beneath the aircraft. It forms a continuous boundary that triggers an alert when "pierced" by a terrain feature.	**Term of art in avionics and means an at least 2-dimensional region in the vertical plane surrounded by a continuous boundary.**
there are at least two envelopes corresponding to at least two degrees of terrain threat.	Two distinct alert envelopes, the boundaries of which are independently determined by distinct first and second functions of the same variables; specifically flight path angle, look ahead distance and terrain floor boundary**.**	The phrases confirm that there are two distinct protection zones, the boundaries of which are independently determined by distinct first and second functions of three (3) variables, as explained above.	**Two distinct alert zones, the boundaries of which are independently determined by distinct first and second functions of the same variables; specifically flight path angle, look ahead distance and terrain floor boundary.**

Honeywell argues that "alert envelopes" are commonly understood in the art, and that both Sandel and Universal propose unduly restrictive constructions. That is, Honeywell objects to Sandel's construction because it calls for an alert to be triggered

[52]'This construction applies to the 080, '592, and '570 Patents.

any time one of the alert envelopes is pierced by terrain. Honeywell maintains that claim language requires that an alert be triggered "only when a subset of the stored terrain information is located within the boundaries of at least one of the alert envelopes."

The language set forth in the claim limits the definitions of "alert envelope;" "first alert envelope;" and "second alert envelope," and cannot support Honeywell's very broad proposed constructions. Honeywell argues for a broad application of alert zone by arguing that a subset of terrain information, rather than the presence of terrain within the alert envelope controls the triggering of an alert. Such a broad definition is defeated by the claim language, which carefully defines the boundaries of each alert envelope. If a subset of the terrain information dominated the triggering of an alert, the claim language defining such zones would be useless. Additionally, since the invention focuses on warning pilots when terrain is close to the airplane, it is necessary that there be an area around the plane that is considered a danger zone. The claim language describes the alert envelopes in this way. Thus, Honeywell's broad definition is inconsistent with purpose of its invention, warning pilots of a threat within a certain distance of the plane.

Further, the claim language clearly sets forth that there are two distinct alert zones, with boundaries that are formed as a first and second function of the flight path angle, look ahead distance, and terrain floor boundary. Again, Honeywell's proposed construction is too broad, and contradicts the plain language of the claim. Because Sandel's proposed constructions more closely track the claim language (as opposed to Universal's construction), the court adopts with some modification those constructions.

4. "When a subset of the stored terrain information is located within boundaries"[53]

Honeywell's Proposed Construction	Sandel's Proposed Construction	Universal's Proposed Construction	**Court's Construction**
Means when a portion of terrain information in the terrain database is located within the boundaries. It does not require an alert signal to be outputted every time the terrain information intersects with the boundaries of an alert envelope.	An alert signal is outputted every time the terrain data intersects with one of the "alert envelopes."		**An alert signal is outputted every time the terrain data intersects with one of the "alert envelopes."**

When reading this claim language in the context of the invention, it is clear that the patent refers to any piercing of the alert zones, since it does not limit the term subset in either the claim or specification. To hold otherwise would render some of the claim language moot. Thus, for the reasons set forth under "alert envelope," the court will apply Sandel's proposed construction.

[53]This construction applies to the 080, '592, and '570 Patents.

5. "Terrain floor boundary"[54]

Honeywell's Proposed Construction	Sandel's Proposed Construction	Universal's Proposed Construction	**Court's Construction**
A segment extending downwardly from the current position and altitude of the aircraft as a predetermined function of the distance of the aircraft to a predetermined reference point.	A boundary that extends vertically beneath the aircraft which is proportional to the distance to the closest runway.	A distance ΔH below the aircraft which is proportional to the distance to the closest runway to prevent nuisance warnings when the aircraft is taking off and landing, while providing adequate protection in other modes of operation.	**A boundary that extends downwardly below the aircraft which is proportional to the distance to the closest runway.**

Honeywell argues that both Universal and Sandel's proposed constructions improperly limit the definition of "terrain floor boundary," by reading the preferred embodiment as a limit on the claim language. Specifically, Honeywell notes that Universal improperly interprets the prosecution history when it claims that the prosecution history prevents a broad application of the claim language. Additionally, Honeywell maintains that Sandel's definition is too narrow.

Universal asserts that the term "terrain floor boundary" has no ordinary meaning in the art. To support this argument, Universal notes that the term was not used in any of the prior art references cited in the '080 patent.[55] Additionally, Universal argues that the doctrine of prosecution history estoppel again prevents the court from accepting

[54]This construction applies to the '080, '592, and '570 Patents.

[55]Universal also emphasized that there were 113 prior art references.

Honeywell's definition. As noted by Universal, when Honeywell distinguished its patent from Chazelle, it used alert zones formed by specific elements, one of them being "terrain floor boundary." Therefore, Honeywell is estopped from asserting its patent against technology which uses some other variable to form the lower boundary of the alert zone. [56] Sandel echos Universal's arguments. The court agrees with the defendants' prosecution history estoppel arguments based on the Remarks Honeywell made to the PTO after its claims were initially rejected. [57] Further, there is no evidence to indicate that "terrain floor boundary" was a term having an ordinary meaning known to one skilled in the art at the time of the filing of the patent application.

The court adopts, with modifications as noted, Sandel's construction of "terrain floor boundary" because it is less restrictive than Universal's proposed construction which incorporates language from the specification which defines terrain floor. Moreover in its brief, Universal notes "[t]errain floor boundary is properly limited to a distance below the aircraft which is proportional to the distance to the closest runway." D.I. 84 at 16.

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[56] According to Universal, during the prosecution of the '080 patent's European counterpart, Honeywell stated: "We point out that the term 'terrain floor boundary' is clearly defined in the specification as originally filed as being a distance below the aircraft which is proportional to the distance to the nearest runway. This is clearly described on page 21, lines 9-19. There is no justification for the Examiner interpreting the term as meaning the surface of the underlying terrain." D.I. 84 at 16.

[57] *See* note 5.

6. "Function of"; "Function of the flight path angle"; "Function of . . . said look ahead distance"[58]

Honeywell's Proposed Construction	Sandel's Proposed Construction	Universal's Proposed Construction	**Court's Construction**
A mathematical or logical relationship.	A mathematical expression using numerical values.		**A mathematical or logical relationship**.
A mathematical or logical relationship to the flight path angle.	The boundaries of the alert envelope are determined using a discrete numeric value of the flight path angle as a variable in their computation.		**A mathematical or logical relationship to the flight path angle.**
A mathematical or logical relationship to the look ahead distance.	The boundaries of each alert envelope are determined using the same discrete numerical value for look ahead distance as a variable in their computation.		**A mathematical or logical relationship to the look ahead distance.**

Again, Honeywell argues that this term has a plain and ordinary meaning in the art, and that Sandel is attempting to restrict that definition. Honeywell alleges that Sandel is attempting to read specific numerical values into the claim language, and urges the court to include logical relationships. Additionally, Honeywell does not object

[58]This construction applies to the '080, '592, and '570 Patents.

to a construction of “function of” which includes a logical relationship in addition to a mathematical relationship.

Sandel argues that “function of” is commonly used in the avionics industry, and defines, inter alia, a direct mathematical relationship between two variables. In support, it cites various dictionary definitions, and notes that both the specification and prosecution history are consistent with its proposed definition.

“”Function of” is commonly known as a mathematical or logical relationship between two or more variables. That is, an unknown variable can be defined as a function of some other variable. Thus, one can determine the unknown variable by reference to another variable. Honeywell’s definition includes a mathematical and logical relationship, which is consistent with the common usage. The court rejects Sandel’s proposed definition because it is too narrow, and unsupported by the claim language.

7. "Configurable"[59]

Honeywell's Proposed Construction	Sandel's Proposed Construction	Universal's Proposed Construction	**Court's Construction**
Arranged, set up, or shaped in a certain form.	"Projecting a line out from each of said first and said second points at a configurable angle" based upon common usage and in context of the specification means extending a line forward from the starboard and port points, according to a predetermined angle, i.e. a pre-selected constant that does not vary with flight conditions.		**Arranged, set up, or shaped in a certain form.**

Honeywell asserts that Sandel is again attempting to improperly limit the claim language by using the patent specification. Sandel argues that its proposed construction is consistent with the specification, as well as dictionary definitions.

In its brief, Honeywell cites two dictionary definitions which sufficiently describe "configurable." The court rejects Sandel's proposed construction because it is too

[59]This construction applies to the '592 Patent, as found in dependent claim 4 (a configurable datum) and independent claim 8 (a configurable angle).

narrow, and imports a limitation from the specification which is not present in the claim language.

8. "A controller, coupled to the visual display, for automatically determining when the [ter]rain information is displayed on the visual display"[60]

Honeywell's Proposed Construction	Sandel's Proposed Construction	Universal's Proposed Construction	**Court's Construction**
This is not a means-plus-function element under § 112(6). **"Controller"** means a lever, switch, cable, knob, push-button, or other device or apparatus by means of which direction, regulation, or restraint is exercised over something.	**This claim element is subject to analysis under § 112(6).** The corresponding structure is at: Figs. 1B, 23, and 48; 2:57 - 65; 3:1-5; 3:27 - 28; 6:12-15; 12:64 - 67; 13:42-45; and 32:5-34:55. **"Controller"** means an apparatus that determines the state of another device.	**This claim element is subject to the provisions of 35 U.S.C. § 112(6).** The term **"controller"** means an apparatus that determines the state of another device. This claim limitation requires the precise controller described in the specification (and equivalents thereof), which includes a switch and an embedded computer program that operates to automatically display terrain information without direction from a pilot.	**This is not a means-plus-function element under § 112(6). A lever, switch, cable, knob, push-button, or other device or apparatus by means of which direction, regulation, or restraint is exercised over something.**

[60]This construction applies to Claim 1 of the '060 Patent.

Honeywell argues that this claim is not written in means plus function format, and that "controller" and "automatically" should be given their plain and ordinary meaning. Again, Honeywell cites various dictionaries in support of its proposed construction. Further, Honeywell asserts that one skilled in the art would recognize the controller structure, and that contrary to defendants' assertions, "controller" does not lack a specific structure.

Sandel asserts that controller has no recognized meaning or structure in the art, noting that the only definition of controller in the aviation industry is an air-traffic controller. Additionally, Sandel argues that the term is vague and could include any number of things.

Universal asserts that the patent fails to set forth a definitive structure, so it should be limited to the controller described in the specification. The "controller" described in the specification is a computer program that corresponds to a switch.

Because the claim does not contain the term "means" it is presumed that this is not a means-plus function claim. Therefore, it is the defendants' burden to show that Honeywell failed to show a *"sufficient*" structure. Once again, it is necessary for the court to evaluate the parties' arguments in light of the context of the patented invention. Honeywell claimed a system which automatically displayed the terrain information, without any action on the part of the pilot. Thus, although Sandel may be technically correct in asserting that a "controller" may be a director of air traffic, it is clear that this is not the case in the context of the '060 patent. From reading the patent, Honeywell's description of "controller" would be clear to someone skilled in the art, as a device which governs when something else moves, acts or happens. Here, the controller

governs when the terrain information will display to the pilot. Honeywell's description is sufficient to describe the structure, and thus, the court adopts its proposed construction.

9. "Means for determining a severity of a terrain threat, wherein the terrain information on the visual display changes color based on said severity"[61]

Honeywell's Proposed Construction	Sandel's Proposed Construction	Universal's Proposed Construction	**Court's Construction**
This is a means-plus-function element under Section 112(6). The corresponding structure is at Cols. 29:35-30:49; 9:47-22:14.	**This claim element is subject to analysis under § 112(6).** The corresponding structure is at: Fig. 1B; 5:51 - 65; 9:47 - 22:14; 23:4 - 42; 24: 12 - 28; and 30:1 - 32:50.	No corresponding structure identified.	**This is a means-plus-function element under Section 112(6).** No further construction is provided.

The parties agree that this claim is written in means-plus-function format.[62] This is because the claim element uses means language, recites a function, and does not recite a structure that performs this function, i.e., "means for determining a severity of a terrain threat," is not understood to connote structure that performs the recited function;

[61]This construction applies to the '060 Patent. Claim 1 of the'060 patent claims:
1. 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, coupled to the terrain awareness device, for displaying the 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."

[62]This relates to claim 4 of the '060 patent which claims:
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.

rather it is stated in purely functional terms. As such, the court must construe both the claimed function and the corresponding structure associated with "means for determining a severity of a terrain threat" that is disclosed in the specification.

The parties do not dispute the function of the means. It is clear from the claim itself that the function of the means is to advise the pilot of the severity of the warning by using different colors. The parties' dispute, instead, centers on the proper corresponding structure.

None of the parties discussed their positions on the corresponding structures. Honeywell submits that one corresponding structure is the "Look-ahead Warning Generator." Sandel also cites this generator as a corresponding structure. Universal, however, has not identified a corresponding structure.

The Federal Circuit instructs that when construing the corresponding structure for a means-plus-function element, the court should include all alternative structures described in the specification, and not simply the preferred embodiment. *See Budde v. Harley-Davidson, Inc.*, 250 F.3d 1369, 1379 (Fed. Cir. 2000); *Micro Chem.*, 194 F.3d at 1258. Moreover, "[a]ll that one needs to do to obtain the benefit of that [means-plus-function] claiming device is to recite some structure corresponding to the means in the specification, as the statute says, so that one can readily ascertain what the claim means . . ." *Atmel Corp. v. Information Storage Devices, Inc.*, 198 F.3d 1374, 1382 (Fed. Cir. 1999).

Based on the disclosures in the specification, the court finds that the corresponding structure to the means includes "Look-ahead Warning Generator" or its structural equivalents. However, what both Honeywell and Sandel propose as a

corresponding structure by citing to practically the entire specification and/or a number of figures in the patent provides no direction to this court and is unacceptable. Should the parties desire a construction of this claim, they shall provide reasonable claim construction proposals with analysis on or before June 10, 2003. The parties supplemental submissions shall be limited to ten pages.[63]

[63]Initially, the parties submitted a laundry list of disputed terms. Before the claims construction hearing, the parties revised that list, eliminating some of the terms. During and after the hearing, the parties further refined the terms requiring construction from the court. Prior briefing never addressed this claim specifically. No analysis of the claim was included in the briefing and the parties have not provided a basis for their proposed construction.

10. "Wherein said contour display includes highest hmax and lowest hmin terrain levels of said portion of terrain"[64]

Honeywell's Proposed Construction	Sandel's Proposed Construction	Universal's Proposed Construction	**Court's Construction**
"Wherein said contour display includes the highest h_{MAX} and lowest h_{MIN} terrain levels of said portion of terrain" means where the contour display includes the highest and lowest terrain levels 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"** means that 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.	The phrase **"wherein said contour display includes the highest h_{max} and lowest h_{max} terrain levels of said portion of the terrain"** means that the contour means must display terrain indicative of the highest and lowest portions of terrain proximate to the an aircraft. The terms h_{max} and h_{min} are defined in the specification as the highest and lowest points of terrain proximate to an aircraft.	**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.**

Like "signals representative of" the highest and lowest points are transmitted to the pilot as numerical figures. Without the numeric values, the highest and lowest points display would be useless to the pilot because he would have no frame of

[64]This applies to the '009 Patent and is found in independent claims 1and 34, and their related dependent claims.

reference of the terrain in relation to the aircraft. Thus, the court adopts Sandel's proposed construction.

C. The Court's Claim Construction of Undisputed Terms

The parties have included proposed definitions for the following undisputed terms. After a review of those definitions, the court finds that they are consistent with the claim language. Thus, the court adopts the parties' proposed construction of these terms.

Term	Parties' agreed upon construction	**Court's Construction**
"Flight path angle" *See* asserted claims in the '080, '592, and '570 patents.	The angle of climb or descent relative to level flight	**The angle of climb or descent relative to level flight**
"In a first plane" *See* asserted claims of the '592 patent.	In a plane that is substantially vertical.	**In a plane that is substantially vertical.**
"In a second plane" *See* asserted claims of the '592 patent.	In a plane substantially horizontal.	**In a plane substantially horizontal.**
"Displaying at least a subset of said stored terrain information located within the boundaries of at least one of said first and said second alert envelopes" *See* claim 6 of the '570 patent.	Showing on the display at least the terrain feature(s) that generated an alert (i.e. penetrated the boundaries of an alert envelope) and some visual indication of the alert condition.	**Showing on the display at least the terrain feature(s) that generated an alert (i.e. penetrated the boundaries of an alert envelope) and some visual indication of the alert condition.**

"Terrain Awareness Device" *See* Claim 1 of the '060 patent.	A device that is aware of terrain in the vicinity of the current position of the aircraft.	**A device that is aware of terrain in the vicinity of the current position of the aircraft.**
"Automatically determining when the [ter]rain information is displayed on the visual display" *See* claim 1 of the '060 patent.	Deciding when to display or not to display terrain information without human intervention. This disclosure does not preclude additional modes where pilot intervention triggers the visual display of terrain information.	**Deciding when to display or not to display terrain information without human intervention. This disclosure does not preclude additional modes where pilot intervention triggers the visual display of terrain information.**

C. Conclusion

The court construes the following disputed terms as follows:

Claim Language	Court's Construction
"Signals representative of"	The signals received by the apparatus are instantaneous values of the recited variables; i.e. they indicate the numerical value of that variable at a given sampling time.
"Look ahead distance"	A distance along the ground track of the aircraft that marks the outer limit of each alert envelope; that is a function of aircraft speed and time to complete an evasive maneuver.
"Alert envelope"	Term of art in avionics and means an at least 2-dimensional region in the vertical plane surrounded by a continuous boundary.

“First alert envelope”/”Second alert envelope”	Two distinct alert zones, the boundaries of which are independently determined by distinct first and second functions of the same variables; specifically flight path angle, look ahead distance and terrain floor boundary.
“When a subset of the stored terrain information is located within boundaries”	An alert signal is outputted every time the terrain data intersects with one of the “alert envelopes.”
“Terrain floor boundary”	A boundary that extends downwardly below the aircraft which is proportional to the distance to the closest runway.
“Function of”	A mathematical or logical relationship.
“Function of the flight path angle”	A mathematical or logical relationship to the flight path angle.
“Function of . . . said look ahead distance”	A mathematical or logical relationship to the look ahead distance.
“Configurable”	Arranged, set up, or shaped in a certain form.
“A controller, coupled to the visual display, for automatically determining when the [ter]rain information is displayed on the visual display”	A lever, switch, cable, knob, push-button, or other device or apparatus by means of which direction, regulation, or restraint is exercised over something.
“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 means-plus-function element. No further construction is provided.
“Wherein said contour display includes highest hmax and lowest hmin terrain levels of said portion of terrain”	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.

Additionally the court has construed the undisputed terms in the following manner:

Term	Court's Construction
"Flight path angle" *See* asserted claims in the '080, '592, and '570 patents.	The angle of climb or descent relative to level flight
"In a first plane" *See* asserted claims of the '592 patent.	In a plane that is substantially vertical.
"In a second plane" *See* asserted claims of the '592 patent.	In a plane substantially horizontal.
"Displaying at least a subset of said stored terrain information located within the boundaries of at least one of said first and said second alert envelopes" *See* claim 6 of the '570 patent.	Showing on the display at least the terrain feature(s) that generated an alert (i.e. penetrated the boundaries of an alert envelope) and some visual indication of the alert condition.
"Terrain Awareness Device" *See* Claim 1 of the '060 patent.	A device that is aware of terrain in the vicinity of the current position of the aircraft.
"Automatically determining when the [ter]rain information is displayed on the visual display" *See* claim 1 of the '060 patent.	Deciding when to display or not to display terrain information without human intervention. This disclosure does not preclude additional modes where pilot intervention triggers the visual display of terrain information.