

出國報告(出國類別：開會)

參與美國實驗飛機協會(EAA)休閒航空運動 展心得報告

服務機關：中山科學研究院電子系統研究所

姓名職稱：聘用技士許東榮

派赴國家：美國

報告日期：97.08.18

出國時間：97.07.27/97.08.03

國防部軍備局中山科學研究院出國報告建議事項處理表

報告名稱	參與美國實驗飛機協會(EAA)休閒航空運動展心得報告		
出國單位	中山科學研究院 電子系統研究所	出國人員級職/姓名	聘用技士許東榮
公差地點	美國	出/返國日期	<u>97.07.27</u> / <u>97.08.03</u>
建議事項	<p>此次參訪收集到許多電子飛行儀表系統(Electronic Flight Instrument System, EFIS)、姿態方位角參考系統 (Attitude and Heading Reference System, AHRS) 及航電市場發展趨勢及相關資料，這些資料都是本計畫「輕航機暨航空關鍵系統整合技術三年計畫」目前急需獲得的關鍵技術。以最新航電關鍵技術及航電市場發展趨勢看來，在硬體上利用微機電製程技術開發的 AHRS 與 EFIS 整合的產品已成為發展的主軸。在軟體上，將飛行姿態、近地警告系統(GPWS)的地形資訊整合並利用 3D 顯示以及將其他儀表利用切換的方式一併整合，也成為發展的趨勢。另外全球定位系統(GPS)與慣性導航系統(INS)的整合也是在導航技術上的重要關鍵技術。而這也是本計畫接下來所應該積極發展的目標。</p>		
處理意見	<p>本院執行「輕航機暨航空關鍵系統整合技術」計畫時花了許多時間研擬研發，本次出國參加航空展，確切獲得國際各大廠商研發姿態方位角參考系統及各類電子飛行儀表系統的方向，縮短本院規劃研發方向所需的時程，並將國際大廠研發產品之整體方向納入本計畫重點發展項目。</p>		

國防部軍備局中山科學研究院
九十七年度出國報告審查表

出國單位	中山科學研究院 電子系統研究所	出國人員 級職姓名	聘用技士許東榮
單 位	審 查 意 見	簽 章	
一級單位			
計 品 會			
保 防 安 全 處			
企 劃 處			
批		示	

國外公差人員出國報告主官（管）審查意見表

參加 EAA 2008 Air Venture Oshkosh (July 28 ~ August 3) 實驗飛機協會在威斯康辛州的 Oshkosh 所舉辦的年度休閒航空展覽會，藉由此次參訪與美國休閒航空業輕航機技術進行交流，並進一步蒐集有關電子飛行儀表系統(EFIS)、姿態方位角參考系統(AHRS)及全球定位系統(GPS)與慣性導航系統(INS)的整合，最新航電相關技術在軟體與硬體上的發展趨勢，以及航電產品在休閒航空業的市場商情。在 AHRS 系統硬體發展上，由於微機電製程的加速儀與陀螺儀精確度越來越高，所以利用微機電製程的加速儀與陀螺儀做為發展上的主要元件，經成為趨勢，尤其是在休閒航空業的輕航機與個人小型飛機上。而 AHRS 與 GPS 資料又需進一步整合並顯示在 EFIS 儀表系統上，所以顯示與整合計算軟體也是發展上的重點。

此次參訪蒐集的相關資訊，提供本所在執行經濟部「輕航機暨航空關鍵系統整合技術」科專案上發展的重要方向與參考價值，並希望能將此一航電技術推廣於國內的輕航機市場。

出國報告審核表

出國報告名稱：參與美國實驗飛機協會(EAA)休閒航空運動展心得報告		
出國人姓名（2人以上，以1人為代表）	職稱	服務單位
許東榮	聘用技士	中山科學研究院電子系統研究所
出國期間：97年07月27日至97年08月03日		報告繳交日期：97年08月18日
計 畫 主 辦 機 關 審 核 意 見	<input type="checkbox"/> 1.依限繳交出國報告 <input type="checkbox"/> 2.格式完整（本文必須具備「目的」、「過程」、「心得及建議事項」） <input type="checkbox"/> 3.內容充實完備 <input type="checkbox"/> 4.建議具參考價值 <input type="checkbox"/> 5.送本機關參考或研辦 <input type="checkbox"/> 6.送上級機關參考 <input type="checkbox"/> 7.退回補正，原因： <input type="checkbox"/> 不符原核定出國計畫 <input type="checkbox"/> 以外文撰寫或僅以所蒐集外文資料為內容 <input type="checkbox"/> 內容空洞簡略或未涵蓋規定要項 <input type="checkbox"/> 電子檔案未依格式辦理 <input type="checkbox"/> 未於資訊網登錄提要資料及傳送出國報告電子檔 <input type="checkbox"/> 8.本報告除上傳至出國報告資訊網外，將採行之公開發表： <input type="checkbox"/> 辦理本機關出國報告座談會（說明會），與同仁進行知識分享。 <input type="checkbox"/> 於本機關業務會報提出報告 <input type="checkbox"/> 其他_____	
	<input type="checkbox"/> 9.其他處理意見及方式：	

說明：

- 一、各機關可依需要自行增列審核項目內容，出國報告審核完畢本表請自行保存。
- 二、審核作業應儘速完成，以不影響出國人員上傳出國報告至「政府出版資料回應網公務出國報告專區」為原則。

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11.附 記			

行政院及所屬各機關出國報告提要

出國報告名稱：參與美國實驗飛機協會(EAA)休閒航空運動展心得報告
頁數 70 含附件：■是□否

出國計畫主辦機關/聯絡人/電話

出國人員姓名/服務機關/單位/職稱/電話

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關鍵詞：EFIS、AHRS、EAA

內容摘要：

參與美國最著名的實驗飛機協會(Experimental Aircraft Association, EAA) 在威斯康辛州的 Oshkosh 所舉辦為期一週的年度休閒航空展，並進一步蒐集有關電子飛行儀表系統(Electronic Flight Instrument System, EFIS)、姿態方位角參考系統(Attitude and Heading Reference System, AHRS)及全球定位系統(GPS)與慣性導航系統(INS)的整合，最新航電相關技術在軟體與硬體上的發展趨勢，以及航電產品在休閒航空業的市場商情、最新輕航機發展趨勢。藉由此次參與發現，利用微機電(Microelectromechanical systems, MEMS)製程技術在 EFIS 系統的發展上，進而將 EFIS 資料與 GPS 資料計算整合，並將此整合後的資料傳送給 AHRS 系統，AHRS 系統再將其與近地警告系統(GPWS)以三維(3D)的方式顯示以成為趨勢。此一系統架構對於本計畫在日後在輕航機暨航空關鍵系統整合技術的研究發展上，有相當大的幫助。

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參與美國實驗飛機協會(EAA)休閒航空運動展心得報告

壹、目的

本所執行經濟部「輕航機暨航空關鍵系統整合技術」科專案進行複合式儀表資訊匯流排、及電子化飛行資訊系統相關技術之發展，依據年度計畫需求及為加速產品開發，擬派員赴美國參與美國最著名的實驗飛機協會(Experimental Aircraft Association, EAA) 在威斯康辛州的 Oshkosh 所舉辦為期一週的年度休閒航空展，以進一步蒐集航電產品之市場商情、最新航電產品技術發展趨勢之相關資料、最新輕航機發展趨勢、有關電子飛行儀表系統(Electronic Flight Instrument System, EFIS)及姿態方位角參考系統 (Attitude and Heading Reference System, AHRS) 發展趨勢及相關資料、輕航機及航電/儀表市場調查與評估，對本科專計畫產品開發與後續市場爭取等產業效益有絕對之助益。

貳、過程

此次參與美國實驗飛機協會 EAA 所舉辦為期一週的年度休閒航空展，可說是大開眼界。剛到達會場的停車場旁邊就是比停車場更大的停機坪，上面停滿了各式各樣的輕航機及個人小型飛機【圖 1】，這是在台灣看不到的場景，可見得在美國休閒航空業的市場是相當熱絡的，而這些人才是這次展覽所要吸引的買家。



【圖 1】 會場停機坪

第一天主要的行程是在戶外的展示區觀察輕航機、個人小型飛機的發展現況及趨勢。各家廠商展可說是精銳盡出，所展示的有各式的輕航機、個人小型飛機、個人商務客機、運動型飛機等。數量及總類相當的多，外型也日新月異。參觀時不但只是觀看其外表，更可以實際到座艙內試坐感受。在內裝的舒適度上也是許多商家所訴求的重點。在外型的設計上也以輕巧、安全、好收藏、安裝簡便為主要的發展趨勢。而整個發展的重心偏向休閒為主，其中較為特別的是 ICON 這家公司所推出的 A5 水陸兩用個人休閒機【圖 2】。這架飛機完全符合上述所說的發展趨勢，可說是新一代輕航機的先驅。詳細規格如附件一。



【圖 2】ICON 公司 A5 水陸兩用個人休閒機

第二天也是在戶外的展示區觀察飛機裡的航電設備、儀表設備。在實際觀察發現，較舊的機型還是有傳統類比表頭，而新型的機種有些還會留幾個重要的類比表頭，例如油量、引擎轉速...大多數的機型都採用 EFIS，以數位化的方式顯示【圖 3】。



【圖 3】EFIS 數位儀表

第第三天主要參觀室內展示區裡有關 EFIS 的產品。前一天在戶外展示機上所看到的儀電顯示設備在這都可以找的到，但是大部分都是以數位顯示為主，賣類比表頭的只有一家代理商。觀察各廠家所展示的產品發現，在姿態顯示的方式上，較舊的產品只是用兩色來分辨天與地【圖 4】，比較好的做到天與地的顏色是漸層的【圖 5】，最新的例如附件二的 L-3 Smart Deck、附件三的 Garmin G900X、附件四的 Garmin G600、附件五的 Aspen Avionics EFD 1000、附件六 Dynon Avionics、附件七 GRT Avionics、附件八 Aerosonic Corporation...都已將地型資訊整合，做成 3D 的立體畫面【圖 6】。有的姿態顯是獨立一個小畫面，用來取代舊有的類比姿態儀，有的則是與所有的數位儀表整合在同一個畫面上，也可以利用功能鍵切換畫面獨立顯示姿態或是數位儀表。



【圖 4】 雙色天、地顯示



【圖 5】 漸層顯示



【圖 6】 3D 立體顯示

第四天主要是尋找與姿態方位角參考系統 AHRS 相關的產品。在 AHRS 的產品上大致上分成外接式的與內建式。外接式 AHRS 因為精確度與製做方式的不同又可分成傳統機械式【圖 7】與利用微機電（Microelectromechanical systems, MEMS）製程兩種【圖 8】。內建的大都是利用 MEMS 製程技術的陀螺儀與加速儀製成。



【圖 7】 機械式 AHRS



【圖 8】 MEMS 製程 AHRS

第五天主要是參觀 Garmin 公司的攤位，Garmin 是世界有名的 GPS 晶片製造商，許多跟 GPS 相關的產品都是利用 Garmin 的 GPS 晶片設計而成。在 Garmin 的攤位裡，不但看到了有關 GPS 晶片的簡介與應用，也看到了 Garmin 所發展的 EFIS 系統，而在他們的 EFIS 系統中導航上當然就是用他們的 GPS 晶片來修正 AHRS 因為時間上累積的誤差，提高 EFIS 系統的精確度，不過 Garmin 所使用的是將外接式的 AHRS 訊號連接到 EFIS 上，不是 EFIS 上就內建 AHRS。

參、心得

一. EFIS 的系統相關技術與努力方向

電子飛行儀表系統 EFIS 是指安裝在飛機駕駛艙顯示飛行資訊的電子顯示系統，由於液晶顯示器(LCD)技術的進步，目前已由傳統的顯像管（CRT）換成 LCD。和傳統的機械式飛行儀表相比，在操縱電子飛行儀表系統的飛行器時，飛行員可以更容易地擷取資訊。EFIS 也比機械式飛行儀表，更易維修。電子飛行儀表系統，是數位化駕駛艙(又稱為玻璃駕駛艙，英文名稱爲 Glass Cockpit)的一個子系統。一個完整的電子儀表系統除了各種顯示單元外，還包括符號產生器(symbol generators)。符號發生器將各種數據源，如姿態航向基準系統和大氣電腦的數據轉換成可以顯示的格式。這些數據源中也包括導航系統的輸入數據，如全球定位系統(GPS)、測距儀(DME)和慣性導航系統(IRS)。組件電子飛行儀表系統一般由兩部分組成：姿態指示器(ADI)和水準狀態指示器(HSI)。在有些飛機上，它們稱爲主顯示器(PFD)和導航顯示器(ND)。姿態指示器或主顯示器主要顯示飛機的縱向飛行資訊，如高度、速度、飛行指引、模式選擇等。水準狀態顯示器或導航顯示器主要顯示航向、地面軌跡角、測距儀參數等水準飛行資訊。由於機載航空電子設備的種類愈來愈多，現在有的電子飛行儀表系統已經將姿態指示器和水準狀態指示器都合併到主顯示器上，而將另外一種顯示器稱爲多功能顯示器(MFD)，在其上可以顯示來自空中防撞系統(TCAS)或近地警告系統(GPWS)的地形資訊、來自氣象雷達的氣象資訊等。在主顯示器發生故障時，還可以代替主顯示器工作。有時我們甚至將發動機顯示和機組警告系統(EICAS)的電子顯示系統包含在內。這樣飛機上就可能出現 5 個顯示器：主駕駛員側的 PFD 和 MFD，副駕駛員側的 PFD 和 MFD，以及放在中間的一個 EICAS 顯示器。

EFIS 在顯示的方式上在這幾年也有相當大的進展，依姿態指示器(ADI)為例，舊有的顯示方式多為天、地兩色，較進步的會將高度、速度、飛行指引...參數整合在同一畫面，但目前的顯示技術除更加入了近地警告系統(GPWS)的地形資訊，並將原本單調的雙色天、地畫面改成 3D 的動態顯示，如此一來飛行員可以更一目了然的知道目前的飛行狀態。所以將多個儀表整合或切換以減少顯示器的數目，並利用 3D 的方式顯示已經成為 EFIS 在發展上的新趨勢。此一發展趨勢將 EFIS 的運用從動輒數億美元大型民航機如(波音.空中巴士...等)座艙昇級的精密航空工業產品，帶往休閒航空市場的領域，如此一來 EFIS 的市場就更為廣大。在此次的參訪中，主要就是以休閒航空市場領域為主，而到處都可看到的廠商在推廣低價的 EFIS 產品，可見得在美國休閒航空市場的廣大。

二. AHRS 的系統相關技術與努力方向

姿態方位角參考系統 AHRS，主要的組成有三軸陀螺儀與三軸加速儀，為慣性導航系統 (INS) 中的感測元件。透過 AHRS 量測載具運動過程中的加速度以及旋轉之角速度，將量測得的資料進行計算，而推得載具目前之位置及姿態，為一自主性導航系統。依照其安裝的方式來區分，可分為環架式 (Gimballed type) 及固裝式 (Strap down) 兩種，早期由於電腦計算速度太慢又過於笨重，因此環架式的導航系統似乎為唯一選擇。隨著科技的發達，電腦技術的日新月異，不僅計算速度與日俱增，其重量及體積也越來越小，使得固裝式系統逐漸成為主流，加上微機電系統 MEMS 技術的進步，因此透過微機電技術所設計製造的慣性量測元件 (加速儀及陀螺儀) 相較於以往，體積更小，更有利於固裝式導航系統的發展，而且固裝式系統相較於環架式而言，具有重量輕、體積小、架構簡單等優點，因此近年來大多採用固裝式系統。所以在休閒航空市場的領域，固裝式的 AHRS 已成為發展的趨勢，許多 EFIS 的製造商，也利用其輕巧的特性將其內建於 EFIS 系統上，使得 EFIS 不單只是顯示還可以達到真正導航的功能。在此次的參訪過程中也可從各家 EFIS 大廠的產品中，發現此一發展趨勢。

三. 系統整合、校正技術

AHRS 系統為慣性導航系統 (INS) 中的主要元件，利用 AHRS 與全球衛星定位系統 (GPS) 實現整合式導航，在將此整合後的資料送與 EFIS 再與 GPWS 以及其他顯示資訊整合，

在用3D的圖像顯示，也是一個重要趨勢。GPS與EFIS導航在性能上與使用上各有其優缺點，也剛好具互補性，整合後可得非常好的導航功能。AHRS在資料的計算處理上是利用積分來求得數值，所以誤差會隨時間的增加而累積，我們可以利用GPS的位置解來修正AHRS的累積誤差，獲得更精確得導航參數。而GPS的信號量測則有信號遮蔽、衛星故障、或是干擾等造成信號中斷問題則可靠AHRS來補正。此一架構目前也被廣泛的利用在地面的導航系統上，差別在於航空用的系統是3D導航，地面用的則是2D導航。

在硬體系統整合上，AHRS中陀螺儀、姿態儀、電子羅盤與GPS的精確度與靈敏度，在導航的準確度上就相當的重要。由於MEMS的技術日益進步，所以利用MEMS製成的陀螺儀、姿態儀及電子羅盤，精確度也越來越高，價格也越來越便宜。在GPS方面，接收的精確度與靈敏度都越來越高，因此在整合的技術重點上偏向資料的處理與導航軟體的計算。本計畫完成AHRS組件後，下一階段之目標將是進行整合導航軟體之研究。

在整合導航軟體系統上，導航軟體的有效性或成功與否牽涉廣泛，主要包括AHRS量測精度、整合導航運算、GPS導航解、及卡爾曼濾波器。卡曼濾波器的設計為相當重要的一環。卡曼濾波器設計的好與壞會直接影響到導航的準確性，參數選的不好經過時間的累積，還可能造成系統的發散。

在EFIS軟體的整合上，除了上述的導航計算，顯示方式也是重要的一環。在顯示上由於中央處理器(CPU)的計算處理速度限制，舊有的系統大都把飛行姿態、GPWS、航向、速度、高度與其他飛行資訊分別以不同的畫面顯示，用以減少處理器的計算量，使畫面較為順暢。等處理速度更快的CPU出現，則整合其中幾項參數並利用按鍵切換顯示，以現階段CPU的快速發展下，不但可以將上述所有參數整合到同一畫面上，還可以將地形資訊載入利用3D動態方式顯示，使得飛行員可以更容易的讀取資訊，減少讀取資訊上的操作，提高飛航上的安全。要答到上述軟體的整合功能是一個相當大的工程，尤其又包含到3D的動態顯示，在整合上有其困難度。而3D地形資料的取得與如何將舊有的導航圖資與其整合，也是重要的課題。

此次參訪不論是在軟體技術或是硬體技術上所蒐集到的資訊，都是航電技術發展上的趨勢，也是本計畫所需要發展的關鍵技術。這些資訊更可指引本計畫在未來發展上，有更正確更接近市場需求的方向與目標。

肆、建議事項

此次參訪收集到許多 EFIS、AHRS 及航電市場發展趨勢及相關資料，這些資料都是本計畫「輕航機暨航空關鍵系統整合技術三年計畫」目前急需獲得的關鍵技術。以最新航電關鍵技術及航電市場發展趨勢看來，在硬體上利用微機電製程技術開發的 AHRS 與 EFIS 整合的產品已成為發展的主軸。在軟體上，將飛行姿態、近地警告系統(GPWS)的地形資訊整合並利用 3D 顯示以及將其他儀表利用切換的方式一併整合，也成為發展的趨勢。另外 GPS 與 INS 的整合也是在導航技術上的重要關鍵技術。而這也是本計畫接下來所應該積極發展的目標。





ICON A5
Light Sport Aircraft
1,000

Folding Wings

Angleback (No Fly Over Land & Water)

Innovative Sports Car-Like Cockpit

ICON Composite Airframe Panels

High-Performance Wing & Aileron

Propeller Guard

Seawings for Easy Access and Docking

Retractable Landing Gear

Removable Side Windows



A5

Let the adventure begin...

With the creation of the world's revolutionary new Sport Private Jet, we've set a new standard in the Sport Aircraft category. The dream of flying to new places will be your reality.

ICON Aircraft has fused world-class industrial design and aerospace engineering to bring you the ultimate recreational vehicle – the ICON A5 Sport Aircraft. Land, take off – with ICON, the world is now your playground.



Performance

- High-strength, lightweight carbon fiber airframe
- Revolutionary design (Fly Like a Car & Fly)
- Custom high-performance wing and airfoil
- Reliable, quiet, 100hp Rotax 912 ULS Engine
- Simple start or manual gearbox

Design

- Folding wings
- Fixed-base landing gear (optional)
- Decking platforms for easy access & docking
- Custom aircraft towing brake (optional)
- Headlights and taxi lights

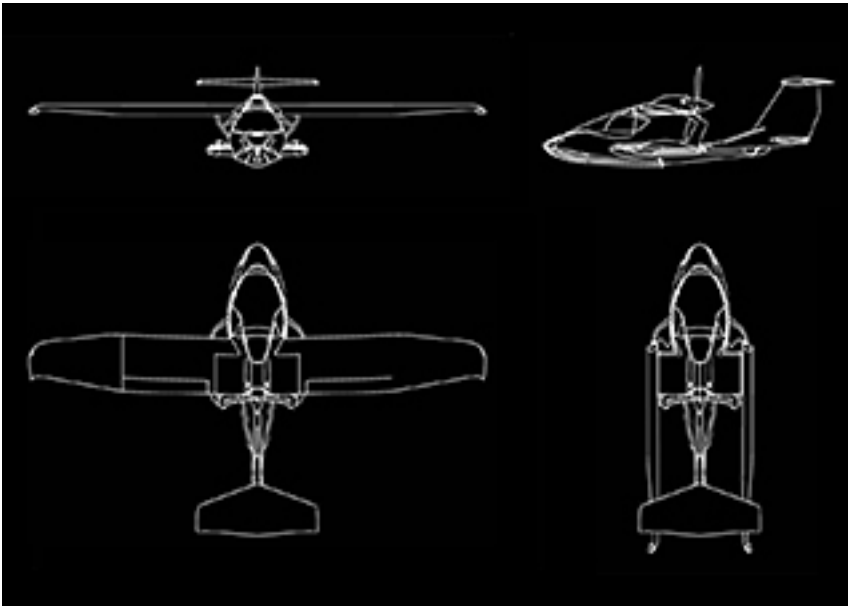
Cockpit

- Intuitive, sports car-like cockpit
- GPS moving map
- High-visibility, wrap-around canopy
- Removable side windows
- Gate panel for night VFR (optional)

Safety

- Low stall speed
- Predictable flying characteristics
- ICON Composite Airframe Passports (optional)
- Patent pending Propeller Guard
- Wing Angle of Attack Indicator (AOI)

A5 Model



- Seats: 2
- Maximum Takeoff Weight: 1430 lbs
- Useful Load: 430 - 530 lbs (option dependent)
- Baggage: 60 lbs (maximum)
- Fuel (Auto Gas or Av Gas): 20 gal.
- Maximum Speed (Vh): 105 kts (120 mph)
- Range: 300 nm
- Takeoff & Landing Distance: 750 ft
- Engine (Rotax 912 ULS): 100 hp

Performance specifications are estimates only.

DIMENSIONS

- Interior Cockpit Width: 46 in
- Wing Span: 34 ft
- Aircraft Length: 22 ft
- Aircraft Height: 7.1 ft
- Trailered Width: 8.5 ft
- Trailered Length: 28 ft
- Trailered Height: 8.3 ft

DESIGN FEATURES

- Folding wings (manual or automatic)
- Retractable Landing Gear (gear can be deleted entirely to make a pure seaplane)
- Seawing platforms for easy access and docking
- Custom aircraft towing trailer (optional)
- Headlights and flood lights

PERFORMANCE FEATURES

- High-strength, lightweight carbon fiber airframe
- Amphibious design (flies off land and water)
- High-performance wing and airfoil
- Reliable 100-hp Rotax 912 ULS Engine
- Runs on auto gasoline or aviation gasoline

COCKPIT FEATURES

- Intuitive, sports car-like cockpit
- GPS moving map
- MP3 in-flight music port
- High-visibility, wrap-around canopy
- Flight with removable side windows
- Multiple storage compartments
- Glass (LCD) multifunction display optional

SAFETY FEATURES

- Predictable flying characteristics
- Low stall speed
- ICON Complete Airplane Parachute (optional)
- Patent-pending propeller guard
- Wing Angle of Attack Indicator (AoA)

STANDARD EQUIPMENT

- Retractable landing gear
- Folding wings (manual)
- GPS moving map
- Analog flight instrumentation (per ASTM LSA standards)

附件二



IMAGINE AN AVIONICS SYSTEM SO INTUITIVE AND INTEGRATED THAT IT HELPS THE PILOT FLY SMARTER.

That's what we did as we envisioned an integrated flight control and display system that would give pilots unprecedented situational awareness to make flying safer and easier. We also looked toward the future and visualized a system that would grow with technology and allow for enhancements that would make

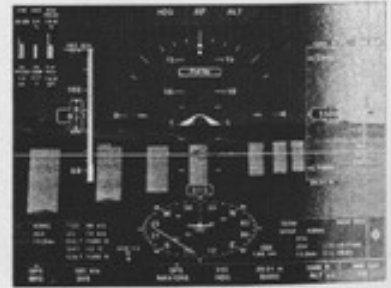
this system the smartest choice, both now and in the future. These visions have been brought to life by a team of dedicated engineers, pilots and safety specialists who have created an integrated, intuitive and sophisticated full cockpit system: The SmartDeck® Integrated Flight Controls & Display System.



PICTURE PERFECT
The SmartDeck Synthetic Vision (SynVis) feature helps augment the pilot's situational awareness by providing critical flight details and helpful navigation aids.



UNMATCHED CLARITY
The level of detail and planning that has gone into SmartDeck SynVis is unmatched. Geographic features are intuitive, clear and logical.

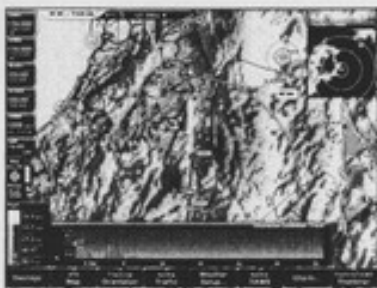
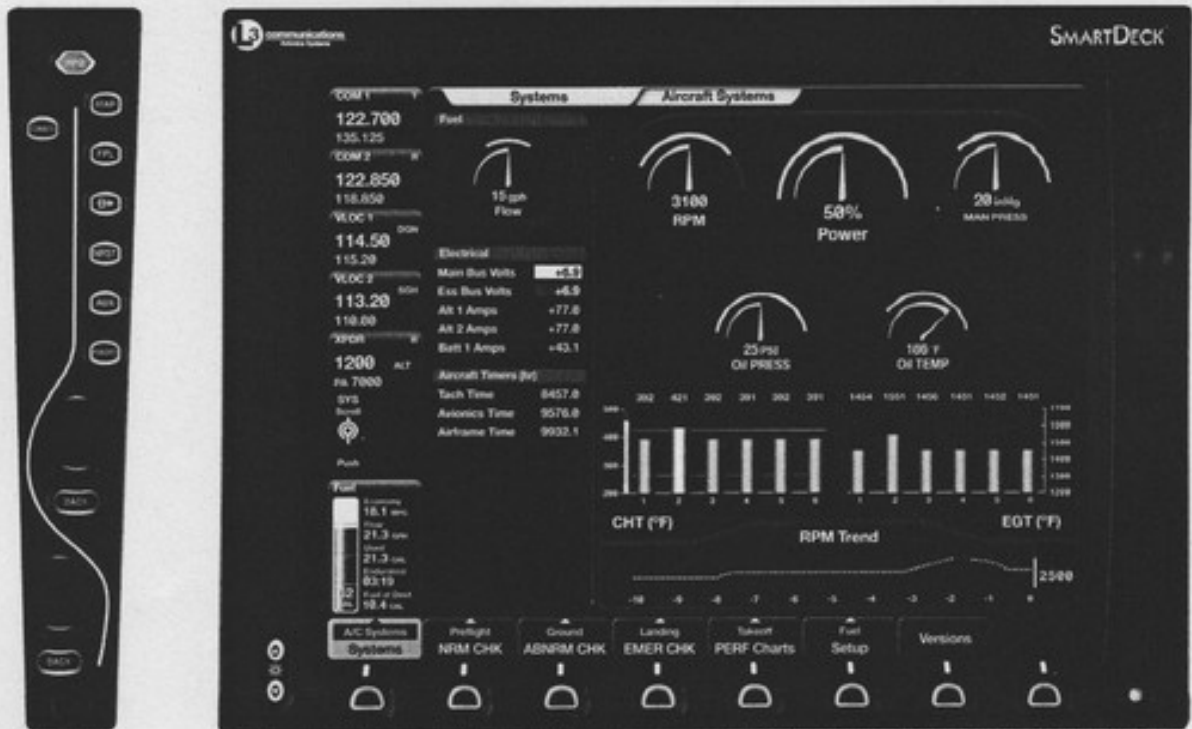


OBSTACLES
True to the purpose of Synthetic SmartDeck's depiction of obstacles and terrain is represented as realistic 3D images on

SMARTER BY DESIGN - BETTER BY EXPERIENCE.

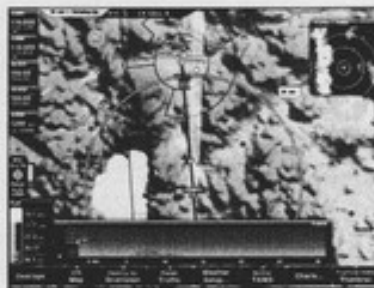
Throughout the design process, our design team continually tested form and function with active pilots and a team of human factors specialists. The control buttons, display settings and visual cues were all carefully developed as part of our intuitive design philosophy. Human factors testing put pilots in front of the system

throughout the process to ensure the finished product remained consistent to the vision of a smarter, friendlier, more intuitive flight deck. The SmartDeck system presents a wealth of information, without overwhelming the pilot. The SmartDeck cockpit is well organized and considerate of ergonomics as well as economics.



AIRSPACE DEFINED

Remove the uncertainty of restricted flight zones by populating the MFD with up-to-date airspace information. Updates are easily uploaded through the data card as they are published.



CUSTOMIZED VIEWS

Preferences for the SmartDeck system are easily controlled on both displays with minimal input. The declutter knob also aids in quickly removing or adding data according to pilot preference.

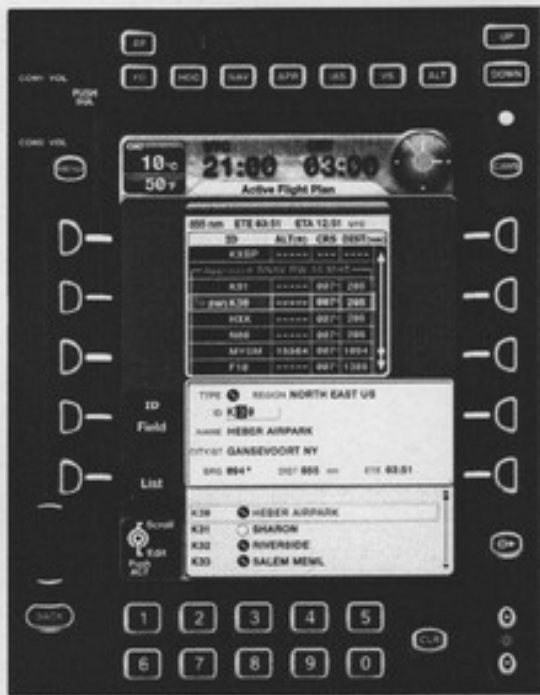


MOVING MAP CUE CARDS

Access information about navoids, airports and map symbols using the Crosshair Cursor. It's just another step toward making flying safer and boosting pilot confidence.

SMARTDECK[®]

Integrated Flight Controls & Display System



FLIGHT PLANNING MODE

A simple push of the flight planning button accesses a worldwide database of airports, navoids, waypoints and other vital flight planning data. The flight planning page consists of 1) Active Flight Plan, 2) Flight Plan Catalog and 3) Vertical Advisory. Pilots are able to create, edit and copy flight plans through the CCU and load the information directly onto the SmartDeck MFD. Procedures can be inserted for approaches, holds, arrivals and departures.



COMMUNICATIONS MODE

The active frequency currently tuned on each comm and nav radio is shown near the top of the COM1, COM2, VLOC1 and VLOC2 radio windows. For the comm radios, the station ID and name are displayed if selected from the database. The nav radios receive the Morse code IDs from the tuned VLOC stations and decodes them into alphanumeric station IDs. An integrated transponder (XPDR) rounds out the communications suite by displaying transponder code, reply symbol and mode of operation. Inputs to any of the communications windows can be made quickly via knob or numeric keypad.



AUDIO PANEL

The audio panel functions as a selector for the two VHF coms, a dedicated cellular telephone interface, a 6-place stereo intercom with dual independent music inputs and an internal marker beacon receiver. The patented PS Engineering IntelliVox[®] automatic intercom squelch system eliminates all of the traditional knobs or push buttons. Using digital processing, the system separates voice from airplane noise, making conversations seamless.



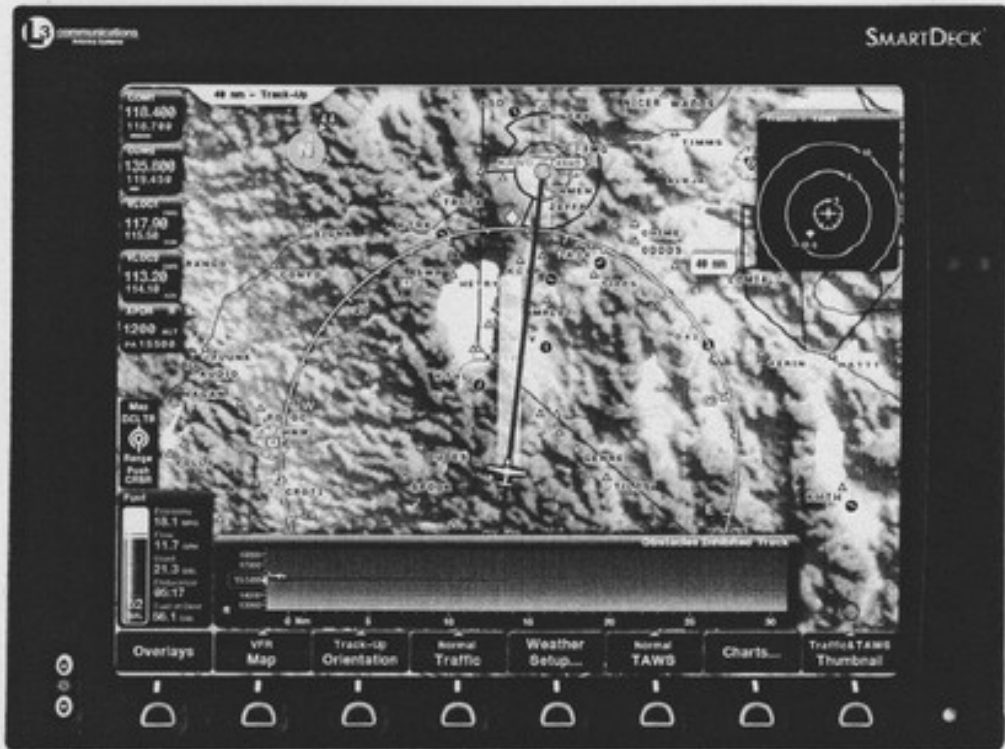
INTEGRATED AUTOPILOT

SmartDeck integrates seamlessly with the S-TEC IntelliFlight[™] 1950 Digital Flight Control System through all phases of flight and includes fully coupled approaches and automatic altitude captures. Once you choose AP, FD, or AP and FD modes, use the other mode select buttons to choose what kind of guidance you want the autopilot to provide.

THE SYSTEM YOU ASKED FOR IS FINALLY HERE

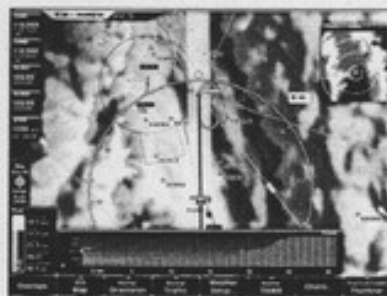
The integrated flight deck that pilots worldwide have been asking for is finally here. SmartDeck's user interface increases the speed and accuracy of flight management and significantly streamlines the flying process. While other systems may offer similar features, SmartDeck delivers all the information in

a clearer and more intuitive manner. Our 3-click-or-less philosophy remains faithful throughout the design of the system. From moving map functions to communications to Synthetic Vision, SmartDeck makes flying safer, easier and more enjoyable.



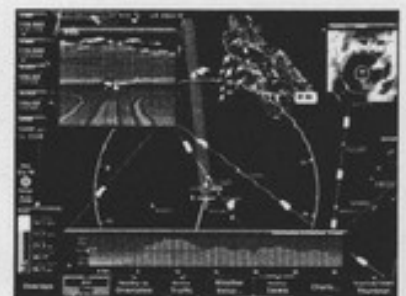
JEPPESSEN CHARTVIEW

Paper charts are a thing of the past with the integration of Chartview and SmartDeck. Every detail of almost any destination is just a click away on your MFD.



YOU FLY, WE'LL NAVIGATE

The WAAS capable GPS and digital S-TEC autopilot provides automated lateral and vertical guidance and maintains precise holds - freeing the pilot to focus on primary flight functions.



SEE THE UNSEEN

Regardless of conditions outside the cockpit, datalink weather and Stormscope lightning provide the complete weather picture as the IRIS Infrared Imaging System turns night into day.

PASSION AND COMMITMENT

Aviation is not just our business, it's our passion. In fact, many of us are active pilots. We are committed to bringing cost-effective and advanced technologies to the industry and to making flying safer and easier for both current and new pilots. The SmartDeck Integrated Flight Controls and Display System is part of that commitment. We're proud to stand behind the industry's smartest system and excited to play a part in advancing the future of aviation.



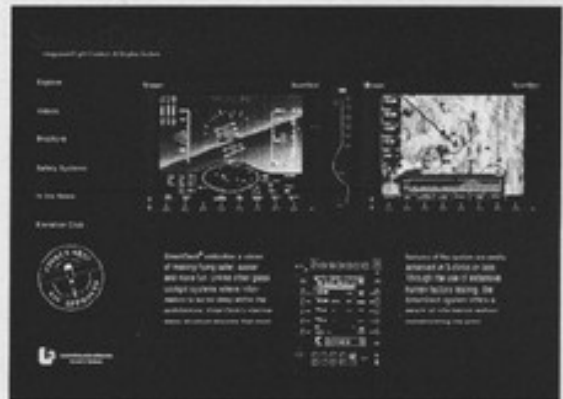
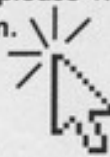
EXPERTS IN FLIGHT SAFETY AVIONICS AND INTEGRATED SYSTEMS

L-3 Avionics Systems has been manufacturing flight safety avionics since 1962, when it was founded as the avionics division of Learjet. Since then, the company has operated under a few different owners and names, including Jet Electronics & Technology (J.E.T.) and BF Goodrich Avionics Systems. In 2003, Avionics Systems was purchased by L-3, a prime contractor in aircraft modernization and maintenance, C³ISR (Command, Control, Communications, Intelligence, Surveillance and Reconnaissance) systems and government services. L-3 is also a leading provider of high technology products, subsystems and systems.

Within the Aircraft Modernization, Operations and Maintenance and Products Segment of L-3, Avionics Systems and several other divisions produce high technology products that are forerunners in the aviation and aerospace industries. This network of industry leaders provides valuable resources for developing and integrating new and future products.

Today, L-3 Avionics Systems provides a wide array of integrated avionics systems, including weather, traffic and terrain avoidance systems, solid state systems, electro-mechanical gyros, autopilot products, navigation products and display systems, in addition to the smartest flight system available - SmartDeck.

For the latest system developments
and screen images, please visit
www.SmartDeck.com.



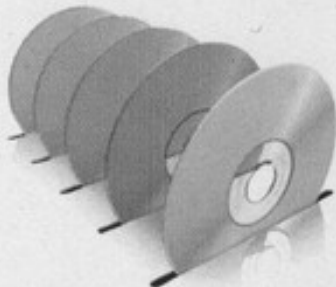
communications
Avionics Systems

5353 52nd Street, S.E. - Grand Rapids, MI 49512 - Phone: 1.800.253.9525 (U.S.) or 616.949.6600 (Int'l)

This material describing L-3 Avionics Systems' general capabilities has been released in the Public Domain through unlimited distribution at conferences, meetings, seminars, trade shows or exhibitions and is generally accessible to the public in the United States.



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616-285-4239

L-3 Adds Synthetic Vision to SmartDeck® New Features Improve Situational Awareness with 3-D Terrain and Obstacles

EAA, Oshkosh, Wis., July 28, 2008 - L-3 Avionics Systems announced today the addition of Synthetic Vision to its SmartDeck Integrated Flight Controls and Display System, an integrated avionics suite with a revolutionary, easy user interface. Synthetic Vision will be available as an option on new SmartDeck systems or as an add-on for existing models after certification, which is expected later this year. SmartDeck with Synthetic Vision is on display at Hangar C, Booth 3100.

"Synthetic Vision elevates SmartDeck's sophistication to the next level," said Adrienne Stevens, president of L-3 Avionics Systems. "Even with zero visibility, the pilot has sharp graphics of the ground below right on the display. It makes the cockpit even safer and more manageable, and it looks fantastic. We invite pilots to fly SmartDeck and compare it to the other systems. When pilots fly it, they love it. The graphics are unparalleled."

L-3's Synthetic Vision uses GPS location and altitude data in conjunction with SmartDeck's terrain database to depict realistic-looking, 3-D images of land, mountains, obstacles, water and runways on the primary flight display (PFD). This image moves in real time with the aircraft, and presents a clear view of the outside environment, which is especially beneficial during limited visibility conditions.

In addition to terrain and obstacles, SmartDeck's PFD will now display airports and grid lines as part of the 3-D environment as well as Class B Terrain Awareness and Warning System (TAWS) alerts. Distant airports will be flagged with airport identifier signposts and grid lines will assist pilots in judging distances within the 40-nautical-mile perceived sight range.

This upcoming version of SmartDeck will also include GPS Localizer Performance with Vertical Guidance (LPV). With the WAAS capabilities of the system, pilots can easily shoot LPV vertically guided instrument approaches to more than 600 airports that are not equipped with instrument landing systems (ILS).

SmartDeck is a next-generation avionics suite created with a "three-clicks-or-less" design philosophy that makes flying easier and puts important flight information in a readily accessible location. It integrates a number of advanced situational awareness technologies, including L-3's SkyWatch® collision avoidance system, LandMark™ terrain awareness warning system (TAWS) and Stormscope® lightning detection system, as well as communication, flight controls and engine parameters. These resources, combined with the S-TEC IntelliFlight™ 1950 integrated Digital Flight Control System (DFCS), make SmartDeck a standout system that packages all of the avionics a pilot desires into one integrated system. The system's intuitiveness builds pilot confidence and drives safety.

L-3 Avionics Systems has been helping pilots fly for more than 45 years and provides completely integrated cockpit solutions. The company's SmartDeck® Integrated Flight Controls and Display System is a glass panel suite that features a revolutionary user interface designed to make flying safer, easier and more enjoyable. In addition to customizing SmartDeck for upcoming aircraft programs, L-3 Avionics continues to provide a wide array of avionics safety technologies, such as the GH-3000 electronic and J.E.T.® standby instruments, SkyWatch® collision avoidance system and Stormscope® lightning detection system, among others.

For more information, please visit the company's Web site at www.L-3Avionics.com.

Headquartered in New York City, L-3 Communications employs over 64,000 people worldwide and is a prime contractor in aircraft modernization and maintenance, C³ISR (Command, Control, Communications, Intelligence, Surveillance and Reconnaissance) systems and government services. L-3 is also a leading provider of high technology products, subsystems and systems. The company reported 2007 sales of \$14 billion.

To learn more about L-3, please visit the company's Web site at www.L-3Com.com.

[Click here to return to the News page.](#)



Kitplane builders:
It's a bright new day
in cockpit displays.

For kitplane builders who see the "big picture," this is where it all comes together: With Garmin's new G900X™ integrated glass cockpit package. Suddenly, a whole new level of technology is open to flyers and builders of experimental aircraft. It's clearly more than a glass replacement for the old-style gyromechanical instruments in your panel. Fact is, by consolidating all primary flight, navigation, radio tuning and engine data with the latest

**[Introducing the Garmin G900X™
kitplane installation program:]**

in weather, terrain and traffic alerting inputs, the G900X brings unprecedented flight progress monitoring and situational awareness to the high-end kitplane cockpit. There's never been a more capable option. Or a smarter-looking installation. Garmin G900X: Crossing the glass threshold just became your obvious next step.



The plot's Primary Flight Display (or PFD) seamlessly integrates all situational information regarding the aircraft's position, speed, attitude, vertical rate, altitude, steering and flight progress.



Garmin FliteCharts™ electronic approach plates and terminal procedures charts come preloaded on the G900X. Optional ChartView™ is also supported via JeppView™ subscription service.



A comprehensive full-page display of engine, fuel and systems data can be accessed and monitored on the G900X MFD.



Built-in Garmin SafeTaxi™ airport diagrams in the G900X basemap help pilots identify runways, taxiways, hangars and aircraft location on over 680 U.S. airports.

Between the displays, most installations feature Garmin's slimline vertical audio panel. This all-digital unit features high-quality sound, plus a unique record/playback function to help ensure accurate readback of ATC clearances.

Seamlessly integrating control and display of virtually all avionics and instrument functions, Garmin's big, bright XGA-quality (1024 x 768 pixel) flat-panel displays offer brilliant color, wide side-to-side viewing angles, advanced backlighting and crisp readability, even in bright sunlight. As typically configured, two of these 10.4-inch diagonal displays are placed side-by-side on the panel to put all essential flight situation, navigation and sensor data right in front of the pilot. The left hand glass panel contains an EFIS-like Primary Flight Display (or PFD) for attitude, airspeed, climb rate, altitude and course/heading information – while the right hand screen serves as a Multi-Function Display (MFD), providing engine and fuel systems monitoring plus detailed moving-map graphics of the aircraft's current position in relation to ground features, chart data, nav aids, flight plan routings, and more. Onscreen navigation and mapping depictions are supported by a detailed Jeppesen® flight database, which may be

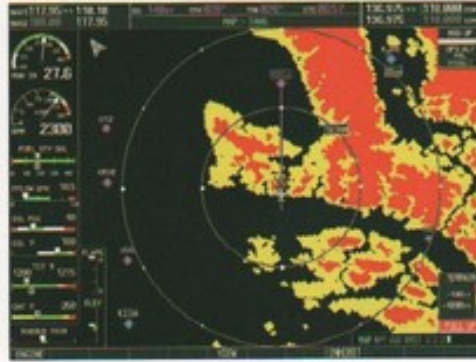
easily updated by means of standard front-loading SD data cards.

The map display is designed to interface with a growing array of remote sensors and tracking systems, so pilots can overlay graphical weather, lightning, traffic, terrain and other avoidance system advisories. Sensor functions are selectable, allowing the pilot to add or deselect overlays to "build at will" the map view he or she prefers for any given phase of flight. For MFD navigation, Garmin FliteCharts™ electronic terminal procedures charts and approach plates come pre-loaded on the system. Airways, approaches, departure and arrival routes – FliteCharts™ put the full IFR spectrum at your fingertips. Likewise, on the ground, built-in SafeTaxi™ airport diagrams for over 680 U.S. locations help pilots navigate unfamiliar airfields with confidence – by graphically pinpointing the aircraft's current location and direction of travel on ramps, taxiways and runways.

For system redundancy, the G900X's PFD and MFD screens are designed to enter a reversionary mode should failure or shutdown of either display occur. Fault monitoring and reversion are automatic; however, the pilot can also manually select reversion mode by pressing a dedicated red button on the audio



Weather datalink capability, via XM Satellite Radio and its XM WX Satellite Weather service, provides the G900X with color NEXRAD, METARs, TAFs, lightning, and other U.S. data displays.



Built-in terrain elevation and obstacles databases can be augmented with optional TAWS-B alerting functionality for an extra margin of safety in avoiding potential flight hazards.

panel. In reversionary mode the remaining operable control/display unit is reconfigured to show the PFD symbology with engine and fuel parameters on the left-hand side of the display. Pop-up windows allow additional mapping, flight plan data or other desired inputs to remain visible on the PFD.

Optional satellite weather.

To see what's brewing on the weather front, builder/pilots can opt to combine their G900X system with Garmin's GDL 69A data link receiver for the latest in XM WX Satellite Weather information (subscription required). With this option, graphical depictions of NEXRAD radar summaries, METARs, TAFs, TFRs, winds aloft, echo tops, surface precipitation, lightning strikes, storm cell data, freezing levels and more can be accessed anywhere in the U.S., regardless of altitude. Users can zoom the NEXRAD screen range out to 2500 nm for nationwide monitoring of weather patterns. And for cabin entertainment enroute, the G900X also provides a user interface offering more than 170 channels of digital-quality audio programming, when installed with Garmin's GDL 69A version XM receiver.

Putting it all together.

With your Garmin G900X distributor's kitplane installation package, you get everything but guesswork. From wiring harness and detailed drawings to customized brackets for AHRS and magnetometer mounts – whatever it takes to assure a straightforward, by-the-numbers installation, your authorized distributor is equipped to provide. You can count on their one-on-one advice and support through the process – including an on-site final systems checkout. Just add the finishing touches, and your state-of-the-art glass cockpit is ready to fly.

To find out more about the program – and to check out the growing list of factory-approved G900X distributors – please visit our website: www.garmin.com

G900X FEATURES AT A GLANCE

- Dual 10.4-inch AMLCD displays – interchangeable for use as PFD or MFD
- Fully integrated CNI suite with dual WAAS-certified GPS and digital HSI standard
- Moving-map MFD with full Engine Indicating System, checklist capability
- Dual 16-watt VHF comm transceivers with 8.33-kHz channel spacing
- Digital audio panel with auto-squelch and "instant replay" clearance recorder
- Mode-S transponders with Traffic Information Service (TIS)
- Integrated solid-state AHRS, referencing comparative inputs from GPS, magnetometer and digital air data computer
- Supports standard FliteCharts and optional Jeppesen® ChartView electronic charting
- Standard SafeTaxi™ airport diagram functionality
- Worldwide terrain and U.S. obstacle database
- Optional Flight Management System (FMS) controller for simplified data entry
- Modular rack-mounted LRUs
- Interfaces for terrain, traffic and weather sensors
- XM WX satellite weather and XM Radio (optional)
- Full reversionary display capability
- Interface support for most popular kitbuilder autopilots

This changes everything.

Until recently, the only way to fly with an all-Garmin glass cockpit was to buy a factory-new OEM aircraft. But, as so many builders kept reminding us: Kitbuilts are new aircraft too. Responding to numerous customer requests for this cutting-edge technology in a version customized for experimental aircraft, Garmin developed the G900X.

As a result, builders of the popular Epic aircraft, Lancair and Van's RV series aircraft can now step up to the most proven, most capable, most fully integrated glass solution ever to fly in any kitbuilt airframe. To further simplify the process, a growing network of Garmin-trained Aviation Distributors has been selected and equipped to provide G900X installation support at key locations across the U.S. With this core team of authorized technicians providing panel design, fabrication, wiring harness, test equipment and direct one-on-one customer field assistance, Garmin gives builders the "total package" for successful completion of their new glass cockpit kitplane.

Guidance under glass.

The dealer-supplied G900X kit system comes with everything needed to equip your 4-place Lancair model, Van's RV series (configured for 2-across seating) or Epic aircraft with a fully integrated Garmin avionics suite and dual electronic flight displays. The system can be interfaced with most popular autopilots currently used on experimental aircraft – serving as a selection hub for available nav inputs onboard, as well as providing course deviation and vertical descent indicators, plus heading bug and GPS roll steering information.

Leveraging technology from Garmin's highly successful G1000™ OEM-installed system, the G900X puts a wealth of graphical flight information at the kitplane pilot's fingertips.

Design highlights include display of attitude, heading, air data, engine and fuel status; plus situational reference via a detailed moving map display, with position derived by a Class 3 WAAS-certified GPS system. In addition, complete 16 watt VHF comm, VOR/ILS and digital transponder inputs are provided – with frequency and code selection controlled by tuning knobs and function keys on the dual "big screen" LCD cockpit displays.



Dual LCD screens mounted side-by-side put Primary Flight Display (PFD) and Multi-Function Display (MFD) capabilities right in front of the pilot – bringing a whole new level of capability and situational awareness to the kitplane aircraft market.

G900X™ kitplane avionics suite

Standard Features

Dual high resolution 10.4 inch 1024x768 XGA displays
Dual integrated avionics units including:

- Precision approach (Class 3) WAAS-certified GPS
- ILS/VOR navigation receiver
- 16-watt VHF communication transceiver with 25 kHz or 8.33 kHz channel spacing

Mode-S transponder with Traffic Information Service (TIS)
Solid-state Attitude and Heading Reference Systems (AHRS) with remote Magnetometer
Digital air-data computer
Digital audio panel with auto-squelch and "instant replay" clearance recorder
Complete engine-monitoring display with crew-alerting advisories (CAS) system
Built-in Worldwide terrain and U.S. obstacle database with terrain proximity display
Modular rack-mounted LRUs
Interface support for most popular kitbuilder autoplots
Built-in Safetax™ functionality with over 680 airport diagrams
Pre-loaded Garmin FiteChart electronic charting
Display of victorjet airways
User-programmable checklist functionality
Fully automated revisionary display capability
Field-updatable SW with automated airframe/engine configuration

Optional Features

Jeppesen ChartView electronic charting
TAWS-B Terrain Awareness and Warning System
GDL 69A XM satellite weather and radio receiver
GCU 476 alphanumeric FMS controller
GA 36 WAAS GPS antenna
GA 37 WAAS GPS / XM antenna

Engine Indicating System

Engine sensors not included
Displayed information includes:

- Manifold pressure
- RPM
- Fuel – qty (left and right), flow, pressure, mpg, and totalizer
- Oil – temperature, pressure
- Engine Temperature – 4/6 CHT, 4/6 EGT, TIT (TSIO engines), carb temp (D-XXX engines)
- Trim – elevator, aileron, rudder, flap position
- Electrical – main bus volts, essential bus volts, battery ammeter, alternator ammeter, auxiliary ammeter (if installed)
- Engine hours

Optional no-ES configuration

Supported Aircraft (additional may be added)

Lancar

- NIV-P
- ES/ES-P
- Legacy

Varis

- RV-10
- RV-7/7A
- RV-9/9A

Epic

- IT
- Victory
- Escape

Electrical

14V or 28V support (*COM must be run at 28V)
Estimated standard system current draw at 14 V

- 16.83 amps continuous
- 28.43 amps max intermittent

60, 70, or 80 amp alternator support (additional may be added)
Optional airframe discrete annunciators for such things as door/canopy open, landing gear down, pitot heat active, etc.
Optional standby alternator status annunciation
Optional auxiliary ammeter display (if installed)

Physical

Display:

- 7.7 inches high
- 11.8 inches wide
- 1.739 inches deep (instrument panel to back of connector)
- 6.3 lbs. (unit only)

Audio Panel:

- 7.7 inches high
- 1.35 inches wide
- 7.79 inches deep (instrument panel to back of connector backshell)
- 1.74 lbs. (unit only)

Remote LRUs:

- Refer to G900X Installation Manual for complete dimensions and weights for all remote LRUs

Certification

Over 50 different TSO authorizations achieved for the complete G900X system
Refer to the G900X Installation Manual for a complete listing of all TSO authorizations.

Price, features and specifications subject to change without notice.



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附件四

GARMIN

G 600

Now, flying with a Garmin glass cockpit doesn't have to mean buying a new aircraft.





The "glass cockpit" revolution is fully underway. And it's reaching into all areas – and all levels – of modern flight technology. Virtually overnight, it seems, general aviation's leading airframe manufacturers have switched from old-style mechanical instruments to the sleek, integrated look of large-format glass displays. Consolidating all primary flight, navigation and sensor data in a "big picture" suite of multi-tasking color LCDs, these new systems represent a major advance in pilot workload reduction, safety and situational awareness.

**[Introducing the Garmin G600™ system:
Retrofit glass is now within your grasp.]**

And now, with the introduction of Garmin's new G600™ system, most of the advantages and features of this revolutionary glass technology are made available (and affordable) for easy aftermarket retrofit.

So, if you love the idea of flying a glass cockpit – but hate to think of parting with your current aircraft – this is clearly the option you've been waiting for. Garmin G600: Retrofit glass is, at last, within your grasp.



The pilot's Primary Flight Display (or PFD) seamlessly integrates all situational information regarding the aircraft's attitude, altitude, speed, heading, vertical rate, and flight progress.



Powerful features like FliteCharts™ (shown above) or optional ChartView™ in Jeppesen format, enable the pilot to fly approaches with all necessary information right where it's needed during this busy phase of flight.

More to go on.

On the flight instrument side of the G600 layout, sensitive gyro mechanics are replaced by Garmin's proven GRS 77 Attitude and Heading Reference System (AHRS). The GRS 77 is the same AHRS installed in thousands of G1000-equipped aircraft, with accumulated flight hours in the millions. Using additional comparative inputs from GPS, magnetometer and air data computer, the Garmin AHRS achieves unprecedented levels of spatial-sensing precision and dependability. What's more, unlike some other high-tech sensors, it's even able to restart and properly reference itself while the aircraft is moving. For autopilot interface, the G600 functions as a selection hub for available navigation sensors on the aircraft. The G600 will provide course deviation, vertical deviation, heading bug, course pointer and ARINC 429 GPS roll-steering information to the autopilot, as appropriate. In addition, if the autopilot does not support ARINC 429 roll steering, the G600 can act like a converter via the heading input. Flight directors will be supported for selected autopilots.

Also, to simplify the G600 system interface for retrofit, the aircraft's existing fuel gauges and engine monitoring displays are retained — along with such other panel displays as marker beacons, altitude alerts and DME indicator, if installed. Navigation inputs are provided by WAAS-enabled versions of Garmin's popular GNS 430/530 or 480 systems on the panel, with VOR/Localizer/Glideslope inputs also usable from the Slimline SL30 TSO'd nav/comm transceiver.

Databases, datalinks, data-everything.

By referencing built-in terrain and mapping databases, the Garmin G600 MFD provides a clear, concise picture of where you are and where you're heading.

At a glance the Garmin Base Map helps identify cities, roads, rivers, lakes, and other ground features along your flight path. Added safety is provided by a built-

in terrain elevation database that uses color coding to alert you as you approach rising terrain. (Class B TAWS alerting will also be available as a future option.) On the ground, built-in Garmin SafeTaxi™ airport diagrams help pilots navigate over 850 U.S. airports with confidence — as their aircraft's exact location is graphically highlighted on the field. Garmin FliteCharts™, which feature electronic versions of NACO terminal procedures charts for U.S. airports, come standard with the G600. While enroute, an aviation database featuring Jeppesen® NavData™ is used to depict airways, navaids, airspace, airports and more. As an alternative, pilots can select optional Jeppesen-style ChartView™ instrument approach plates and airport surface charts for the G600 (JeppView™ subscription required). ChartView is unique in its ability to overlay a geo-referenced aircraft symbol on the electronic approach chart, providing a visual crosscheck of your progress inbound. Then, when you land, ChartView will automatically display the destination airport's surface diagram — a real help at unfamiliar airports.

Front-loading SD card slots on the G600 bezel allow for future memory expansion and make updating of charts and software a simple plug-in procedure.

What's more, for data access beyond the cockpit itself, it's easy to combine the G600 with Garmin's GDL 69™ data link receiver for up-to-the-minute weather alerting via XM Satellite Radio. (XM subscription required.) With this option, graphical depictions of NEXRAD weather, METARS, TAFs, TFRs, winds aloft, echo tops, surface precipitation, lightning strikes, storm cell data, and more, can be received and displayed anywhere in the U.S., regardless of altitude. You can zoom the NEXRAD screen range out to 2,000 nm for nationwide monitoring of current weather. And for the best in enroute entertainment, the G600 also provides a user interface offering more than 170 channels of XM digital audio programming, when installed with the GDL 69A receiver.



Weather datalink capability, via XM Satellite Radio and its XM WX Satellite Weather service, can provide the G600 with color NDWRAD, METARs, TAFs, lightning, and other U.S. data display.



With its built-in elevation database, the G600 system provides an extra margin of safety in recognizing terrain/obstacle conflict situations.

It all makes sense.

With Supplemental Type Certification provided under an Approved Model List (AML) format*, standardized retrofit installation of the G600 in your aircraft is simple and straightforward. The unit neatly fits into the "six-pack" slot in your instrument panel – and connects through your plane's existing electrical system. So, you could be flying behind that great-looking Garmin glassware sooner than you expected. Better still, you'll be flying with the confidence and peace-of-mind that comes with our award-winning Garmin Product Support. To find out more about the futuristic flight capabilities available now with a G600 retrofit, just give your Garmin dealer a call. Or visit our website at www.garmin.com.



Helpful Garmin SafeTaxi™ airport diagrams identify runways, taxiways and hangars, as well as your aircraft location on field.



Traffic can be displayed on the moving map (as depicted), or on a stand-alone traffic page.

G600 FEATURES AT A GLANCE

- Dual 6.5-inch diagonal color AMLCD displays; portrait orientation
- Large and clear display fonts
- 4.8-inch diagonal attitude indicator
- Tactile feedback buttons and knobs
- Proven solid-state Attitude and Heading Reference System (AHRS) and Air Data Computer (ADC)
- Feature-rich moving map display
- XM WX Satellite Weather and XM Radio (optional)
- Built-in terrain elevation and towers/obstacles databases
- Standard FliteCharts® and SafeTaxi® databases
- Optional ChartView™ shows the aircraft position on the Jeppesen approach charts and airport surface diagrams
- Offers control/display for available airborne weather radar (future upgrade)
- Flexible I/O support for RS232, ARINC 429, RS-485, analog and discrete interfaces
- Flight director for selected autopilots
- 14/28 VDC power capability
- Hardware design is positioned for future upgrade

* Ask your dealer for current AML list.

Upgrading made simple.

Using robust technology derived from Garmin's highly successful G1000™ integrated avionics system, the new G600 package brings a wealth of graphical flight capabilities to the retrofit market.

Two 6.5-inch diagonal flat-panel LCDs are vertically positioned, side-by-side, in one 10-inch wide bezel that fits neatly into the panel space vacated by the standard "six-pack" of mechanical 3-inch flight instruments. (In many cases, the existing airspeed indicator, artificial horizon and altimeter can be relocated to serve as standby instruments, adjacent to the G600 flight display. Also, two trim rings provided with the installation kit allow the existing instrument panel to be re-cut and re-used, thus saving significant time and cost over major panel redesign or replacement.)

Within the display bezel itself, the G600's large VGA-quality (640 x 480 pixel) screens offer brilliant color and crisp readability, even in direct sunlight, thanks to Garmin's advanced RGB backlight design. The left-hand glass panel contains an EFIS-like Primary Flight Display (or PFD) for attitude, airspeed, climb rate, altitude

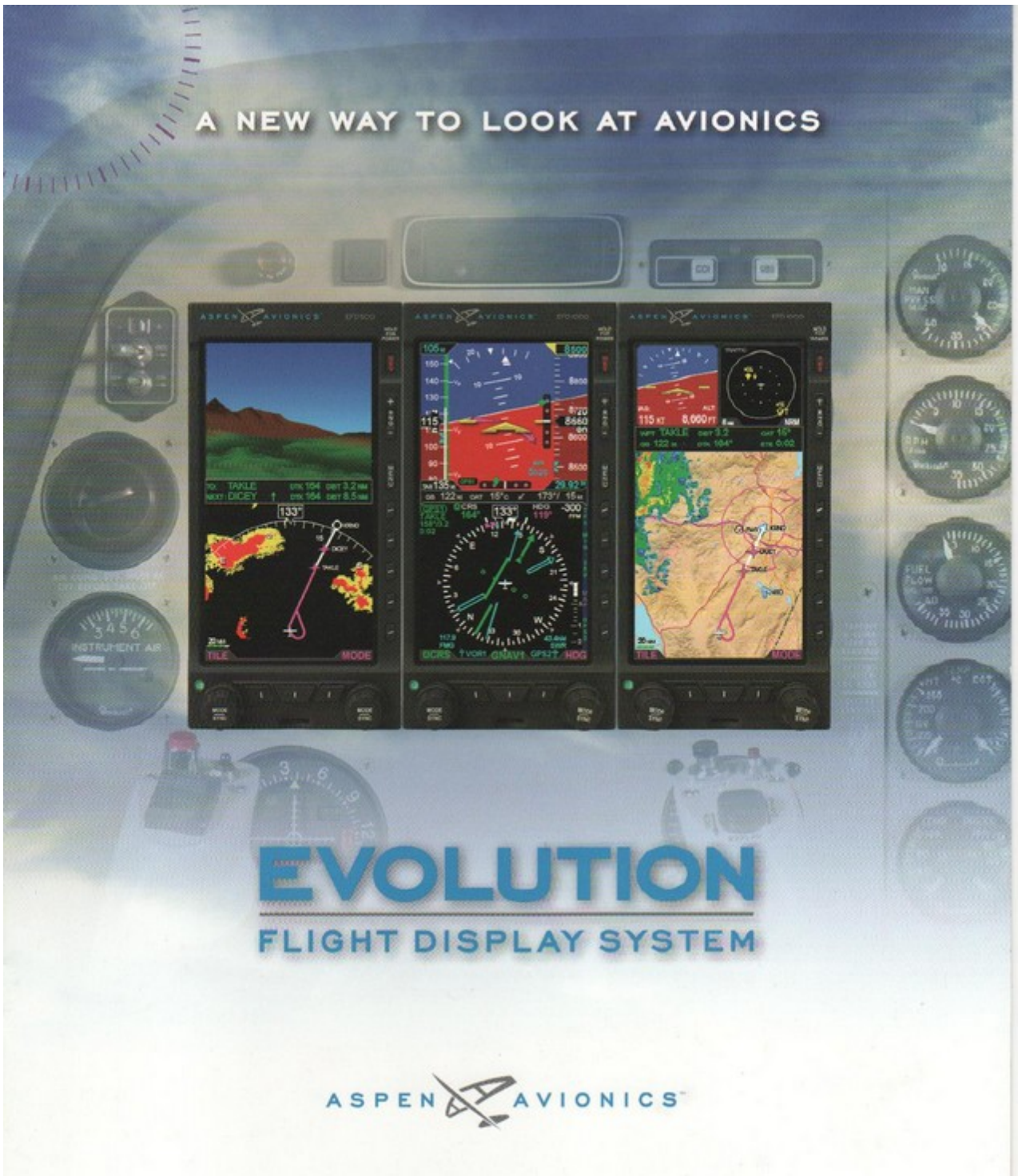
and course/heading information – while the right side serves as a Multi-Function Display (MFD), providing detailed moving-map graphics of the aircraft's current position in relation to ground features, chart data, nav aids, flight plan routings, and more.

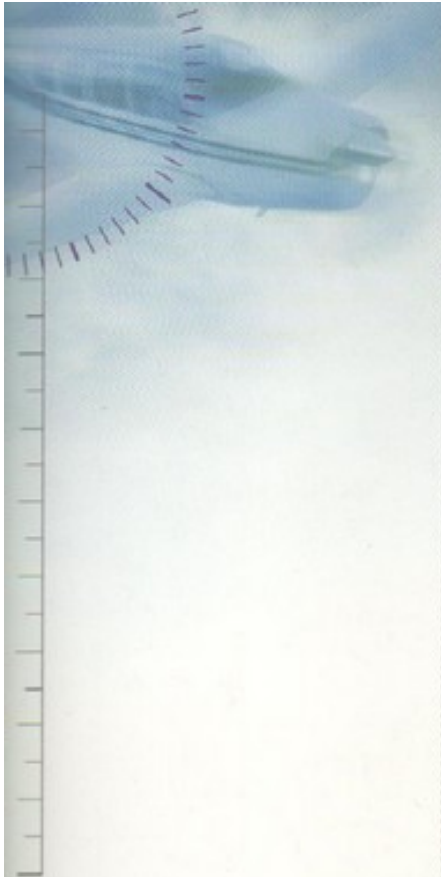
By overlaying inputs from various optional sensors and tracking systems, the MFD side also allows pilots to see and avoid hazards from threatening weather, lightning, terrain, towers, obstacles or other aircraft traffic in the vicinity. Sensor displays are selectable, allowing the pilot to easily add or remove overlays, and thus "build at will" the map depiction he or she prefers for each phase of the flight. Efficient integration of multiple data sources enables G600 pilots to see at a glance the data they need – without sequencing through page after page of individual sensor readouts or navigation screens. Powered by a robust X-scale microprocessor, supported by a high-performance 3-D graphics accelerator, the G600 suite offers exceptional mapping detail (even at the lower zoom scales) with super-fast redraw rates. There's also plenty of excess processor power available for future system enhancements.

Dual LCD screens mounted side-by-side in a single bezel put Primary Flight Display (PFD) and Multi-Function Display (MFD) capabilities right in front of the pilot – bringing a whole new level of capability and situational awareness to the avionics retrofit market.



附件五





FINALLY, AN AFFORDABLE ELECTRONIC FLIGHT INSTRUMENT SYSTEM FOR CERTIFIED GA AIRCRAFT

Aspen Avionics introduces the Evolution Flight Display system, the most innovative — and affordable — glass cockpit system ever for certified general aviation aircraft.

Glass cockpits, long proven on commercial and business aircraft, bring added functionality and reduced pilot workload by consolidating primary flight data on easy-to-view electronic displays — reducing scan across multiple instruments. Yet they have remained beyond the reach of many general aviation pilots, available only in the newest aircraft or at enormous expense.

Now, Aspen Avionics' Evolution Flight Display system, based on the latest digital electronics and LCD technologies, allows you to quickly and easily upgrade the vertical pairs of instruments in your six-pack; from one to three pairs, all at once or one at a time, as your needs and budget require.

Not only is the system designed to work with whatever is currently in your panel — extending the life of your existing avionics — the Evolution system evolves with you via future software upgrades, maximizing your investment.

Modular Technology Makes It Easy

Aspen Avionics uses a stunningly innovative, patent pending approach to make this flexibility possible. The EFD1000 is a common hardware platform — a completely self-contained module including gyro, pitot and static sensors — that slides into the existing 3-inch instrument holes in your panel. Different versions of software turn an EFD1000 into a Primary Flight Display (PFD) or a Multi-Function Display (MFD).

Aspen offers a range of PFDs and MFDs to allow you to configure your system for your requirements. Remarkably, upgrading from one model of display to another is as easy as loading new software — so you can build on your original investment, and upgrade as your needs grow. No more tearing out the old to start anew.



Redundancy and Safety are Built Right In

The Evolution system delivers a level of redundancy and safety previously unavailable in piston aircraft — at any price. In the unlikely event that your aircraft should ever lose electrical power, each display includes a built-in backup battery designed to keep your Evolution system running for at least 30 minutes, with an emergency GPS for continued situational awareness.

Plus, should you choose to expand your Evolution system with an MFD display, you'll be adding fully redundant ADAHRS sensors along with your second display. With the push of a button, your MFD can assume the duties of your PFD: no more struggling with partial-panel when your vacuum or electrical systems fail. And your backup instruments will be identical to — and right next to — your primaries, eliminating stressful searching for rarely-used analog gauges.

Easy to Afford, Easy to Install

Advances in electronics and display technologies enable Aspen Avionics to consolidate the functionality found in bulky remote boxes of older glass cockpit systems into a small, uniquely designed form factor. This highly integrated design brings you the same great features of existing glass cockpit systems at a fraction of the price. And, since the EFD1000 can be installed individually or as a multi-tube system, your transition from steam gauges to glass can happen in stages or all at once — it's up to you.

But hardware cost is just the beginning. What really counts is the installed cost. Currently available glass cockpit solutions require the installation of several large, remote boxes, heavy wiring from nose to tail, and often the rebuild of the entire instrument panel. Evolution's innovative and patent pending design allows display units to slide right into your panel's existing instrument cutouts and contain all its major sensors — *so installation time and cost are cut at least in half.*



THE EVOLUTION FLIGHT DISPLAY SYSTEM BRINGS TECHNOLOGY AND CAPABILITY — FORMERLY AVAILABLE ONLY IN THE LATEST AIRCRAFT OR AT ENORMOUS EXPENSE — TO YOUR AIRCRAFT, WITH LITTLE MORE DOWN-TIME AND COST THAN OVERHAULING YOUR ANTIQUATED MECHANICAL GYROS



AN ELEGANT ONE, TWO, OR THREE TUBE SOLUTION

The Evolution Flight Display system allows you to upgrade your cockpit all at once, or at your own pace.



1 TUBE

Three levels of Primary Flight Displays (PFD) to choose from...

2 TUBE

Add a Multi-Function Display (MFD) for enhanced capability...

3 TUBE

The Ultimate GA cockpit solution — a PFD enhanced by two MFDs...

All panel photos in this brochure are for illustrative purposes only. Please consult the Installation Manual, AMI, SIC and other technical documents for specific installation requirements.

PILOT PFD



Modern EFIS at a breakthrough price

- Basic attitude
- Slaved DG
- Airspeed, altitude tapes
- Altitude alerter
- GPS flight plan map
- Internal backup battery
- Emergency GPS

PRO PFD



Professional-grade navigation & integration

- All Pilot features, plus...
- Full ADI
- EHSI with dual bearing pointers
- Flight director and autopilot integration
- Base map with curved flight paths
- GPS Steering
- Optional traffic, weather, terrain

ATP PFD



Ultimate PFD with many MFD capabilities

- All Pro features, plus...
- Sectional type moving maps
- Standard traffic, weather, terrain

PFD OF YOUR CHOICE



AND

EFD1000 MFD



MFD plus sensor redundancy for PFD backup/reversion

- Sectional-style moving maps
- Traffic, weather and terrain hazard awareness
- 3D terrain visualization
- Customizable screen layouts
- Duplicate ADAHRs, and integrity cross-checking with PFD
- Emergency reversion to PFD functions if PFD fails

EFD500 MFD



Lower-cost MFD without redundant sensors

- Same MFD features as the EFD1000 MFD
- But no duplicate sensors, no reversionary capability
- Most affordable price

EFD500 MFD



Double your MFD screen real estate, affordably

- Fills out your six-pack replacement with glass
- Same MFD features as EFD1000 MFD
- Can be used with EFD1000 MFD for quick and simple installation

OR

EFD1000 MFD



The ultimate in backup

- Triple sensor redundancy
- Fills out your six-pack replacement with glass

AND

PFD AND FIRST MFD OF YOUR CHOICE



EVOLUTION PRIMARY FLIGHT DISPLAY SYSTEMS

Aspen Avionics offers three levels of PFD, to allow you to customize your glass cockpit to meet your requirements. The PFD can be easily upgraded with minimal downtime through simple software updates. The Evolution PFD delivers an integrated solid-state air data, attitude, heading reference system (ADAHRS), combined with advanced navigation, moving map and hazard awareness capabilities.

Crisp 400x760 LCD display (145 pixels per inch) with ultra bright LED backlight for great visibility even in direct sunlight

Approach mode:
all key information on your
ADI for tighter scan

- Airspeed, altitude, attitude
- Lateral & vertical deviation
- Approach minimums

Full support for most
GA autopilots and flight
directors

Air data computer for
real-time winds and
temperatures aloft with
true airspeed

Active waypoint information
from your GPS flight plan

Slaved horizontal situation
indicator (HSI) with dual RMI
bearing pointers

Supports modern and
legacy GPS navigators and
VHF navigation radios

Automatic or
manual dimming



Built-in altitude alerter

Simple menu system

Flexible "hot keys"

Toggle airspeed and altitude tapes
on/off to suit your preference
(single tube installations only)

Base map underlays of GPS
flight plan and nearby nav aids

Built-in GPS Steering flies
curved flight paths (with
compatible GPS navigators)

SD card slot for easy software and database updates

EVOLUTION MULTI-FUNCTION DISPLAY SYSTEMS

Aspen Avionics offers two MFD models, which can be used as part of a 2-tube or 3-tube system with your Evolution PFD. The EFD1000 MFD takes your cockpit to the next level, combining moving maps, hazard awareness and more with a duplicate set of air data, attitude and heading sensors. So, in the unlikely event your PFD should fail, the MFD can seamlessly revert to deliver all the basic capabilities of your PFD so you can safely conclude your flight.

Aspen Avionics also offers the EFD500 MFD, a lower-cost version that provides moving maps, hazard awareness displays, and flight plan information—without the added expense of an additional ADAHRS set.

Choose the solution that best suits your needs and your budget, with the confidence of knowing that it's an easy, affordable upgrade to move up to the next level any time you want.

EFD1000 MFD

Add moving maps, datalink weather and traffic interfaces, a built-in terrain awareness database, flight information pages and more. Built using the same hardware as your PFD, this EFD1000 MFD gives you a full duplicate set of ADAHRS sensors, works with your PFD to continually monitor its health, and can automatically become a backup PFD if your primary should deteriorate or fail.



EFD500 MFD

The EFD500 provides the same great MFD features as the EFD1000 MFD at a lower price, by eliminating the ADAHRS sensor set (and the ability to serve as a PFD backup). It is ideal as a third tube to round out your glass cockpit six-pack replacement, and can be installed as a slave display to your EFD1000 MFD to make installation a snap.

COMING SPRING 2008

MODULAR, EXPANDABLE, AND UPGRADABLE FOR MAXIMUM FLEXIBILITY

PFD/MFD Features

	EFD1000 Pilot	EFD1000 Pro	EFD1000 ATP	EFD1000 MFD	EFD500 MFD
Integral ADARHS, backup battery and emergency GPS	•	•	•	•	•
Integral altitude alerter/pre-select	•	•	•	•	•
GPS flight plan map views: 360° & Arc	•	•	•	•	•
Slaved directional gyro with heading bug	•				
Full EHSI with dual bearing pointers		•	•		
Dual GPS, dual VHF nav support		•	•		
Autopilot & flight director integration		•	•		
Integral GPS Steering		•	•		
Base map with curved flight paths		•	•	•	•
Sectional-style map			•	•	•
Terrain, traffic, weather overlays		OPTIONAL	•	•	•
Full-screen, 2-up, 3-up layouts				•	•
Reversionary PFD (emergency use only)				•	

Pilot and Pro products available Fall 2007. MFD products available Spring 2008. ATP available Fall 2008.

SPECIFICATIONS

GENERAL SPECIFICATIONS:

Width	3.50 in. (measured at bezel)
Height	7.00 in. (measured at bezel)
Can Depth	4.11 in. (rear of bezel to rear of can)
Overall Depth	6.21 in. (knob to rear pressure fitting)
Weight	2.2 lbs
Display Type	6.0" Diagonal TFT Active Matrix LCD (400x760)
Display Colors	262,144
Face	Anti-Reflective Coated Glass
Backlight	High Intensity White LED
Rotary Knobs	Optical Encoder with Momentary Push
Dimming	Manual & Automatic (front bezel mounted sensor)

OPERATIONAL SPECIFICATIONS:

Operating Temp.	-20°C to +55°C
Storage Temp.	-55°C to +65°C
Max Operating Altitude (Ambient)	35,000
Cooling	Integral Fan
Max Humidity	95% at 50°C
Input Voltage	+8 to +32 Volts DC
Max Current	3.5 Amps

INTEGRATION SPECIFICATIONS:

Navigation Sources:	
Dual ARINC 429 GPS	
Dual RS-232 GPS	
Dual VHF navigation radios	
Radar altimeter Decision Height (DH) annunciation	

Autopilot/Flight Director Support

Bendix/King KAP 140/150; KRC 150/200/225/250/300/325; RCP 520
Century 8/8/10/11/2000
Cessna ARC 400/800/1000 series
S-TEC 20/30/40/50/55/55X/60/60-2/65

CERTIFICATION CANDIDATES:

Technical Standard Orders

TSD-C3d Airspeed Instruments
TSD-C3d Turn and Slip Instrument
TSD-C4e Bank and Pitch Instruments
TSD-C6d Direction Instrument Magnetic (Gyroscopically Stabilized)
TSD-C8d Vertical Velocity Instrument (Rate-of-Climb)
TSD-C10c Altitude Pressure Activated Sensitive Type
TSD-C 106 Air Data Computer
TSD-C113 Airborne Multipurpose Electronic Displays

Software

RTCA DO-178B Level C

Environmental

RTCA DO-160C

Supplemental Type Certificate (STC)

Approved Model List (AML) for Over 800 Aircraft Models

Specifications subject to change without notice

CONTACT

Aspen Avionics, Inc.
5001 Indian School Road NE
Albuquerque, NM 87110
Phone: 888-99ASPEN (888-992-7736)
Fax: (505) 314-5440
info@aspenavionics.com
www.aspenavionics.com

ASPEN AVIONICS™
A NEW WAY TO LOOK AT AVIONICS

ABOUT ASPEN AVIONICS

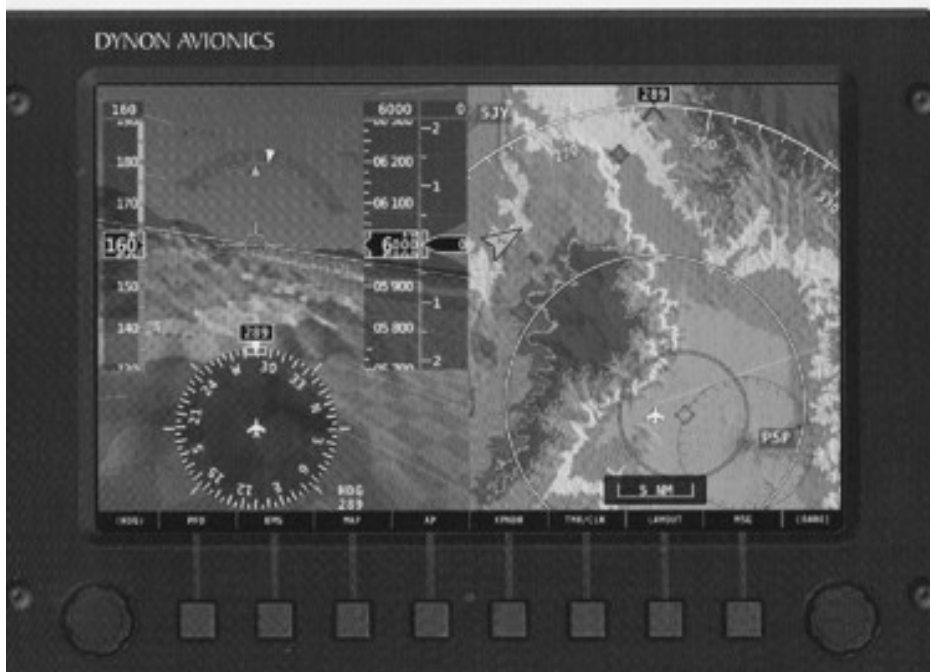
Aspen Avionics specializes in bringing the most advanced technology and capability from the commercial and business aviation markets into general aviation cockpits — and budgets. Our products increase situational awareness and reduce pilot workload, making it even easier and safer to fly in both VFR and IFR conditions. The way we look at it, getting the latest avionics technology shouldn't always mean spending a lot of money — on equipment or installation. At Aspen Avionics, we design products to be affordable, easy to install, and easy to own.

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DYNON AVIONICS

Next Generation Technology Preview

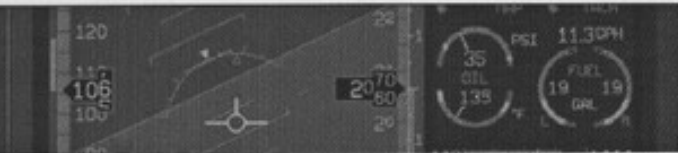


Yes, it will have a moving map. But that's not all. Our next generation integrated system will feature...

- PFD
- Synthetic Vision
- Moving Map
- Terrain
- Engine Monitor
- Autopilot
- Radio / Transponder Interface
- LRU (Line Replaceable Unit) Architecture
- Redundant, Simplified Wiring
- Incredibly Thin (less than 3"), High-Resolution Screens, in Both 7" and 10" Versions; Our Brightest Screens Yet!
- Dual Joystick Knobs
- Future Expandability

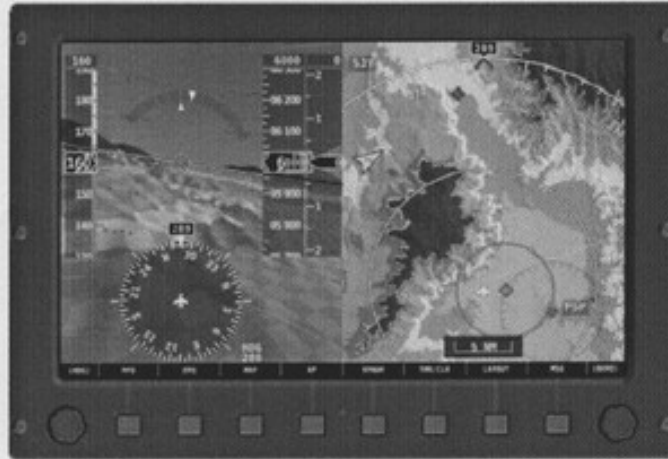
Arriving in 2009 – at a Dynon price. Trade-in credit for current Dynon customers.

For more information, visit www.dynonavionics.com



Dynon Avionics Previews its Next Generation EFIS Technology at AirVenture 2008

July 28, 2008



Dynon Avionics – the leading provider of “glass cockpit” avionics for homebuilt and Light Sport Aircraft – is excited to provide an early glimpse of its next generation glass-cockpit EFIS technology at AirVenture 2008. This new system is slated to be released in phases starting next year. It will offer the complete, full-panel integration that has formerly only been found in the most expensive “glass cockpit” solutions.

“From the start, our vision has been to provide an integrated avionics solution that can do it all. There are high-end solutions that exist today, but they are simply out of reach for most homebuilders and Light Sport Aircraft customers. This new product line will make fully-integrated glass cockpit technology affordable,” says John Torode, President of Dynon Avionics.

This next generation platform leverages the avionics design expertise Dynon has gained through thousands of its field-proven EFIS and EMS systems. From there, Dynon took a fresh look at what today’s homebuilders and sport pilots are looking for and is building a next generation platform that is powerful, comprehensive, expandable, and affordable.

Modular Design

In contrast to its current line of self-contained products, Dynon’s next generation system will be modular in design. Separating the displays from the other components of the system will allow customers to start with the number of screens of their choosing. From there, they can build a custom system by adding the modules that are right for their aircraft and budget.

For example, different sized screens can be mixed and matched. Other possibilities include using multiple ADAHRS (Air Data, Attitude, and Heading Reference System) modules for flight instrument redundancy. Similarly, multiple engine monitoring modules will eventually be supported for use in twin-engine aircraft.

Configurations similar to Dynon Avionics’ current product line will of course continue to be possible. Stand-alone primary flight displays, engine monitors, and moving maps are all products which can be configured with this modular system. Additionally, this distributed architecture will improve field-serviceability of Dynon Avionics products by allowing modules to be replaced and serviced individually.

Incredibly Thin and Bright LED-backlit Screens, Available in 7” and 10”

Another advantage of a modular design is the ability for Dynon to offer screens that will be less than 3” deep (final dimensions to be determined). This will improve installation options for customers with tandem-seat aircraft,

as well as for customers that have minimal space behind their instrument panels.

LED-backlit screens will be available in both 7" and 10" versions. They will be the brightest screens that Dynon has ever offered, improving on the superbright, sunlight-readable screens available in its current best-selling product line.

Just like Dynon's current line of products, these new displays will offer class-leading resolution. The 10" screen is 1024x640, while the 7" version is 800x480.

Moving Map

Dynon Avionics has always sought to offer a GPS-based moving map, but realized that a viable product needed to compete with the graphics and usability of the various portable handheld GPS units on the market.

In the next generation system, a dedicated 3D graphics processor built into each screen will provide the horsepower needed to draw a large map smoothly at a high frame rate. Dual joystick knobs will let pilots pan and zoom the map, a key feature which is cumbersome or missing in many other panel-mounted maps.

The map will initially feature terrain, aviation, and obstruction data. Further down the road, the moving map will be expanded to include other data sources such as traffic and weather.

Synthetic Vision with Highway-in-the-Sky (HITS)

The dedicated 3D graphics processor will also enable forward-looking synthetic vision at a high frame rate. This will allow pilots to see the terrain and obstructions in front of them. When using the Dynon moving map to navigate, a "highway-in-the-sky" depiction of the desired path will guide pilots visually through the air.

Redundant, Simplified Wiring

All modules and screens will interconnect using a single cable design that features dual data and power connections. This will allow the system to detect and notify the pilot of many wiring and electrical problems without product interruption.

Autopilot

The next generation system will be an autopilot too. This capability will use the same Dynon servos as the upcoming autopilot addition to Dynon's current line of products. This will ensure that customers already planning on adding Dynon's autopilot to their existing products can upgrade to the next generation seamlessly.

Engine Monitoring

The engine monitoring module will receive all of the various engine inputs to a dedicated, external module. This will allow it to be mounted in an area that is most convenient for the aircraft builder.

Radio / Transponder Interface

The next generation Dynon Avionics system will be able to send frequencies to radios and will set discrete transponder codes. Initially, this will require compatible third-party radios and transponders. Further down the product roadmap, Dynon plans on producing its own radio and transponder modules.

Battery Backup

With the EFIS-D10, Dynon Avionics pioneered the availability of on-board backup battery power to protect against aircraft electrical failure. Naturally, Li-Ion backup battery options will continue to be a featured option in Dynon's next generation system.

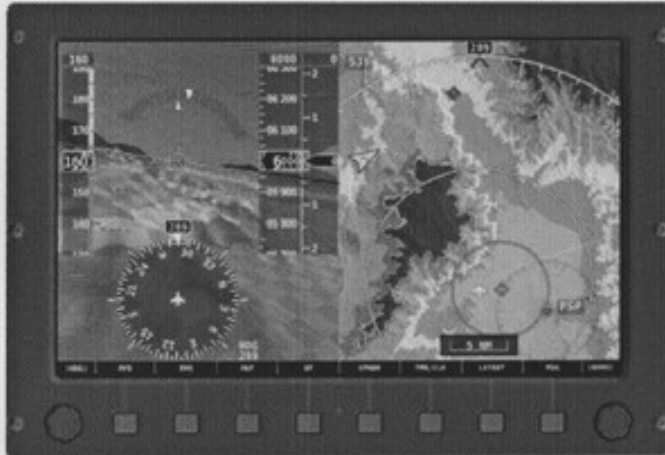
Availability and Rollout

The displays being shown at AirVenture are early prototypes, and so naturally details are subject to change. Starting in 2009, different elements of the system will come to market progressively. Initially, Dynon expects to have both the 7" and 10" screens available, along with the ADAHRS module that provides all of the primary flight instruments. This will enable a system that has a complete PFD with synthetic vision and moving map. Engine monitor, autopilot, radio, and transponder integration will follow after the initial release.

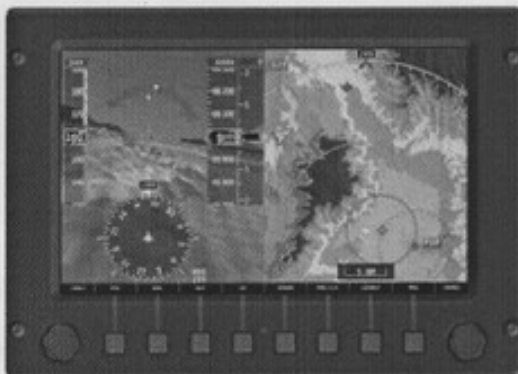
Trade-in Credit for Current Dynon Avionics Customers

Dynon Avionics knows that many of its current customers will want to upgrade to this system as it is made available. To thank them for their business, Dynon will be implementing a factory-direct program that will provide trade-in credit for current products. Details of this program have yet to be determined, and some limitations will apply.

Images



10" Screen



7" Screen

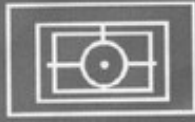
More Info

Not making it to Oshkosh? Download a copy of the [next generation cards](#) being given handed out! As always, it has real size cut-outs (exact dimensions subject to change) that you can use to plan your next generation Dynon Avionics panel.

We also have set up a new [forum](#) to answer questions about the upcoming system.

Also, be sure to check out (and contribute!) to our [Frequently Asked Questions](#).

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GRT Avionics

Grand Rapids Technologies, Inc.



(Horizon HX shown center)

System Features:

- Primary Flight Data, Moving Map, and Graphical Engine Data
- Sunlight-Readable, Wide-Temperature Range Display
- High Resolution (HS) (shown) or Standard Res. Wide Format (WS) Display
- XM Satellite Weather/Radio*
- Traffic Display for Garmin GTX330 Transponder or Zaon PCAS*
- Interfaces to all popular Navigation and Communication Radios
- HSI, Arc View, and Weather Maps
- Highway-in-the-Sky Integrated Navigation/Attitude Display
- Expandable - Multiple Display Units provide Redundancy and Functionality
- Simple USB Memory Stick for Software Loading, Database Updates and Data Logging
- Multiple Power Inputs
- (* Additional equipment required)

High Res/Accelerated Processor (HX) Options:

- 640 x 480 Sunlight-Readable Screen
- 3-D Synthetic Vision on PFD Page
- Shaded Relief Terrain Map
- Additional Interfaces

Attitude Sensor Package (AHRS) Features:

- Dedicated Processor for Reliability
- No GPS Aiding or Pilot/Static Dependence
- Continuous Self-Test
- Fully Functional During Aerobatics
- Gyro-Stabilized Slaved Magnetic Heading
- Suitable for IFR Primary Attitude Reference



From the manufacturers
of the award winning
Engine Information System (EIS)

Grand Rapids Technologies, Inc.

Automated instrumentation for aircraft
(616) 245-7700 fax (616) 245-7707 www.grtavionics.com



From the makers
of the Award Winning
Engine Information
System



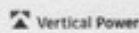
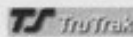
[Click to Learn More](#)

NEWS

HX-Synthetic Vision
for Experimentals

Website Update 8-22-08

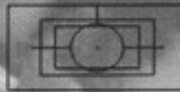
Integrated Systems



and more...

New 8.4" Display





Flight Instruments

[Horizon](#)
[Sport](#)
[Screenshots](#)
[Comparison Chart](#)
[What sets GRT apart...](#)
[Frequently Asked Questions](#)
[Horizon Pricing](#)
[Sport Pricing](#)
[Warranty](#)

EFIS Differences

Consider these basic questions when you shop for an EFIS.

The AHRS. Remember that this is the part of the system that senses attitude data. Without high integrity attitude data, an EFIS is unsafe, and useless. While this is the most critical aspect of the system, we have noticed that customers often fail to question the integrity of this data.

Does the AHRS provide attitude data without requiring pitot/static or GPS data aiding? ...our AHRS does not require pitot/static or GPS data aiding to provide high integrity attitude data.

Does the AHRS incorporate a processor dedicated to these calculations? ...our does. These calculations are time-critical. An interruption in this processing can compromise or destroy the integrity of this data. A dedicated processor is required.

Does the AHRS include power-up and continuous built-in test functions? ...ours continuously performs tests on all sensors, the processor, memory, and a/d converter.

What ability do the AHRS have to detect bad attitude data? ...ours uses GPS data to perform a mathematical consistency check against the attitude data.

General Considerations

Is the hardware specifically designed for use in an aircraft, and is it tolerant of the electrical environment, especially with respect to tolerance of EMI/RMI (electromagnetic interference due to radio transmissions and noise generated by the ignition system). Is the hardware tolerant of wiring errors? ...our is. We have over 12 years of experience producing aircraft instrumentation. Over 25,000 EIS engine monitors have demonstrated our expertise. Don't under-estimate the importance of this criteria. After all, you want hardware that works in your airplane, not just on the bench!

Is display readable in direct sunlight? ...ours is. Over what temperature range? ... our wide temperature range won't pose a limitation to your flying.

What impact does loss of the EFIS have on the operation of the airplane? ...our system is designed not only to allow redundancy in its configuration (with multiple display screens and/or AHRS/Air data units), but also so that the GPS and autopilot are not dependent on the EFIS...after all, do you really want to lose your GPS and your autopilot with loss of the EFIS?

What provision does the EFIS have for growth? Our Horizon EFIS includes six serial inputs, six serial outputs, 14 discrete outputs, 5 analog inputs, inputs for localizer deviation and validity, glide slope deviation and validity, and ARINC 429. The GRT Sport has 4 serial ports and ARINC 420 and similar design qualities as the Horizon.

How does the GRT EFIS compare with the other EFIS?

There are 3 "levels" of differences.

The First Level

The obvious differences are the size and functionality.

This size of the display unit is large enough to allow the artificial horizon to look "natural", that is, like a synthetic view of the outside world (complete with airports and obstructions), and still have room for both tapes and large digital displays of airspeed and altitude.

At the same time, the size is small enough to allow multiple displays on small instrument panels. Since each Horizon display unit can display any data (primary flight data, moving map, graphical engine data, or a split screen of any 2), the use of 2 display units provide twice as much viewable data, while at the same time, adding redundancy. This also allows for a simple means to expand your system to meet future avionics needs.

Our EFIS has an extensive set of features, including integrated navigation/attitude displays on the wide-format primary flight display, graphical engine monitoring, moving map, and also include interfaces to the autopilot, localizer and glideslope inputs, weather and traffic.

The difference in architecture, that is, the ability to use multiple display units independently, vastly distinguishes us from single screen EFIS concepts. Those familiar with commercial jets will notice similarities in architecture (and functionality) with our equipment, and this is no accident.

This first level; the built-in functionality that makes the automated cockpit a safe, effective, and efficient environment.

The Second Level

These differences are more subtle. Our specification includes a wide operational temperature range, direct sunlight readability, and hardware designed specifically for aircraft use. The hardware design is based on the design principles and lessons learned developing our industries premier Engine Information System (EIS), and more than 20 years of aerospace experience. Our design is robust, tolerant, and ready for real-world exposure to wiring errors, radio and electromagnetic fields, etc.

This second level; quality is designed in.

The Third Level

These details are usually unseen, but are what distinguishes aviation equipment from non-aviation equipment. It includes the selection of components suitable for use in an aircraft environment, and also relies on a failure modes and effects analysis. This analysis results in features and functionality (built-in diagnostics and self interrogation) that add integrity. High integrity means a low probability of an undetected failure of any of the flight critical data provided to the pilot.

This third level; safety is designed in.

Conclusion

What sets our systems apart is engineering and experience. The GRT Sport and Horizon Series I EFIS provide aerospace grade design, quality, and functionality at affordable prices.

Grand Rapids Technologies, Inc.
1117 Madison Ave.
Warren, MI 48090-1515
616-295-7700 fax: 616-295-7797



Flight Instruments

Horizon

Sport

Screenshots

Comparison Chart

What sets GRT apart...

Frequently Asked Questions

Horizon Pricing

Sport Pricing

Warranty

Horizon EFIS Pricing

To configure an EFIS system:

1. Choose type and number of displays and AHRS
2. Choose EFIS options
3. Choose engine package

PART #	Displays and AHRS	
MFD-WS	Horizon/WS MFD Wide Format 6.5", StdRes	\$2,000
MFD-HS	Horizon/HS MFD 6.5", HiRes	\$2,000
MFD-HX	Horizon MFD, HiRes, Synthetic Vision, Ethernet, ARINC-429, Accelerated Processor with 3D Graphics, 8 High Speed RS-232 Serial Ports, 1 Serial port configurable for RS-422, Voice Alerts	\$4,000
AHRS-2-PKG	Dual AHRS/MAG, OAT-03, WIRING HARNESS. Standard with 2 or more Horizon displays. (Single AHRS with single display purchase)	\$3,000

PART #	Options	
HS-8.4	8.4" Display, 600 x 480	\$600 (\$800 upgrade)
ARINC-429/P	Plug-in ARINC-429 module available for HS and WS only.	\$475
GPS-HS/INT	Internal GPS available for HS and WS only.	\$400
GPS-H/EXT	External GPS available for HS, WS and HX.	\$400
GPS-RAIM-HS/INT	Internal RAIM GPS available for HS and WS only.	\$750
GPS-RAIM-H/EXT	External RAIM GPS available for HS, WS and HX.	\$750
XM-WEATHER/CPU	XM Weather processor and WxWorx XM Weather Receiver for the Sport, Horizon/HS and Horizon/WS	\$950
XM-WEATHER/USB	XM Weather processor and WxWorx XM Weather Receiver for the Horizon/HX	\$550
USB-EXT	USB Extension Cable (one per display)	\$14
Terrain Card/Adapter	Storage for terrain data (one per WS or HS display)	\$35

PART #	Engine Packages	
H/ENG-LYC-4	Lycoming 4 cylinder engine: EIS-4000, 4 EGT, 4 CHT, OT, OP, MAP, FP, FF, CS, HARNESS	\$1,350
H/ENG-LYC-6	Lycoming 6 cylinder engine: EIS-6000, 6 EGT, 6 CHT, OT, OP, MAP, FP, FF, CS, WIRING HARNESS	\$1,550
H/ENG-CONT-4	Continental 4 cylinder engine: EIS-4000, 4 EGT, 4 CHT, OT, OP, MAP, FP, FF, CS, HARNESS	\$1,350
H/ENG-CONT-6	Continental 6 cylinder engine: EIS-6000, 6 EGT, 6 CHT, OT, OP, MAP, FP, FF, CS, HARNESS	\$1,550
H/ENG-912	ROTAX 912: EIS-4000, 4 EGT, 2 CHT, FF, HARNESS	\$975
H/ENG-J4	Jabiru 2200: EIS-4000, 4 EGT, 4 12MM CHT, FF, HARNESS	\$995
H/ENG-J6	Jabiru 3300: EIS-6000, 6 EGT, 6 12MM CHT, FF, HARNESS	\$1,195
ENG-FF/CREDIT	Excluding Fuel Flow from engine package	-\$200

PART #	Existing Display / AHRS Upgrades	
MFD-HS-UPG	Upgrade Horizon MFD from a WS to HS	\$600
MFD-HX-UPG	Upgrade Horizon MFD from a WS or HS to HX	\$2,400
AHRS-2-UPG	Upgrade a single AHRS to dual AHRS	\$1,000

PART #	AHRS Only	
AHRS-1	AHRS ONLY- Single External AHRS and Magnetometer	\$5,000
AHRS-2	AHRS ONLY - Dual External AHRS and Magnetometer	\$9,000



Flight Instruments

- Horizon
- Sport
- Screenshots
- Comparison Chart
- What sets GRT apart...
- Frequently Asked Questions
- Horizon Pricing
- Sport Pricing
- Warranty

Sport EFIS Pricing

To configure an EFIS system:

1. Choose type and number of displays (up to two in a Sport system) and AHRS
2. Choose EFIS options
3. Choose engine package

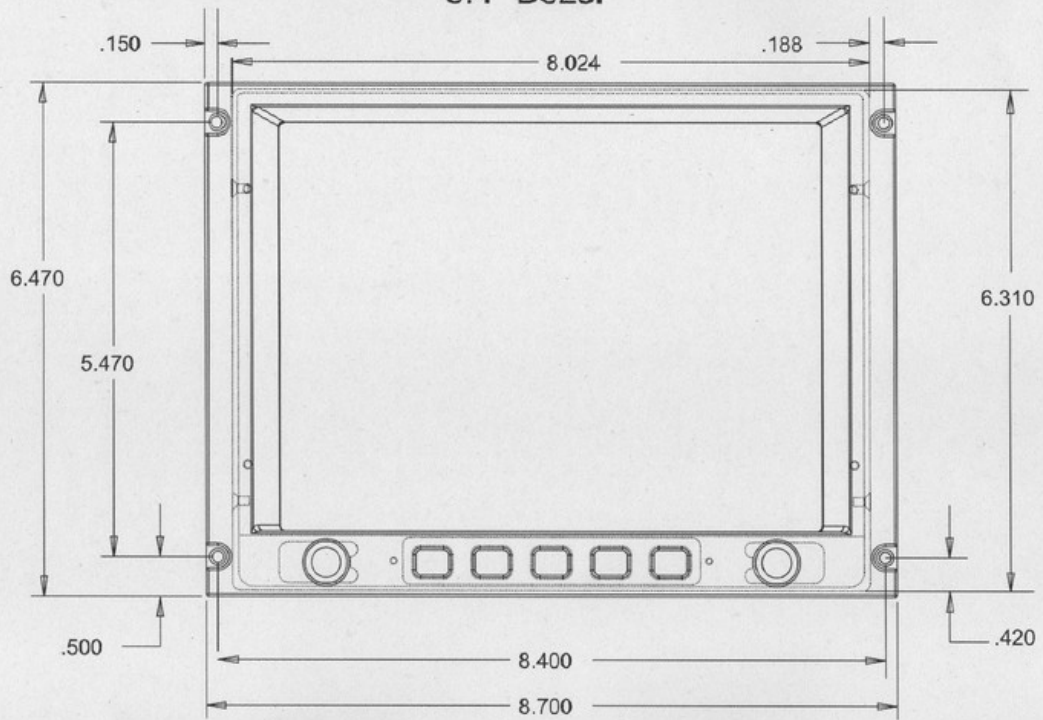
PART #	Displays and AHRS	
S200-HS	Sport EFIS/MFD with Internal AHRS, HiRes 6.5" Display	\$2,000
S200-WS	Sport EFIS/MFD with Internal AHRS, Wide Format StdRes 6.5" Display	\$2,000
S100-HS	Sport MFD HiRes 6.5" Display	\$1,800
S100-WS	Sport MFD Wide Format StdRes 6.5" Display	\$1,800

PART #	Sport Options	
HS-8.4	8.4" Display, 600x 480.	\$600 (\$800 upgrade)
GPS-S/INT	Sport Internal GPS Option	\$400
ARINC-429/E	External ARINC-429 Module	\$450
XM-WEATHER/CPU	XM Weather processor and WxWorx XM Weather/Radio Receiver	\$950
USB-EXT	USB Extension Cable (one per display)	\$14

PART #	Existing Display and AHRS Upgrade	
S100-HS-UPG	Upgrade S100 to S200, Adds AHRS to MFD	\$1,000
S-MFD-HS-UPG	Upgrade S100 or S200 from a WS to HS	\$600

PART #	Engine Packages	
S/ENG-LYC-4	Lycoming 4 cylinder engine: EIS-4000, 4 EGT, 4 CHT, OT, OP, MAP, FP, FF, CS, HARNESS	\$1,200
S/ENG-LYC-6	Lycoming 6 cylinder engine: EIS-6000, 6 EGT, 6 CHT, OT, OP, MAP, FP, FF, CS, HARNESS	\$1,400
S/ENG-CONT-4	Continental 4 cylinder engine: EIS-4000, 4 EGT, 4 CHT, OT, OP, MAP, FP, FF, CS, HARNESS	\$1,200
S/ENG-CONT-6	Continental 6 cylinder engine: EIS-6000, 6 EGT, 6 CHT, OT, OP, MAP, FP, FF, CS, HARNESS	\$1,400
S/ENG-912	ROTAX 912: EIS-4000, 4 EGT, 2 CHT, FF, HARNESS	\$000
S/ENG-J4	Jabiru 2200: EIS-4000, 4 EGT, 4 12MM CHT, FF, HARNESS	\$030
S/ENG-J6	Jabiru 3300: EIS-6000, 6 EGT, 6 12MM CHT, FF, HARNESS	\$1030
ENG-FF/CREDIT	Excluding Fuel Flow from engine package	-\$200

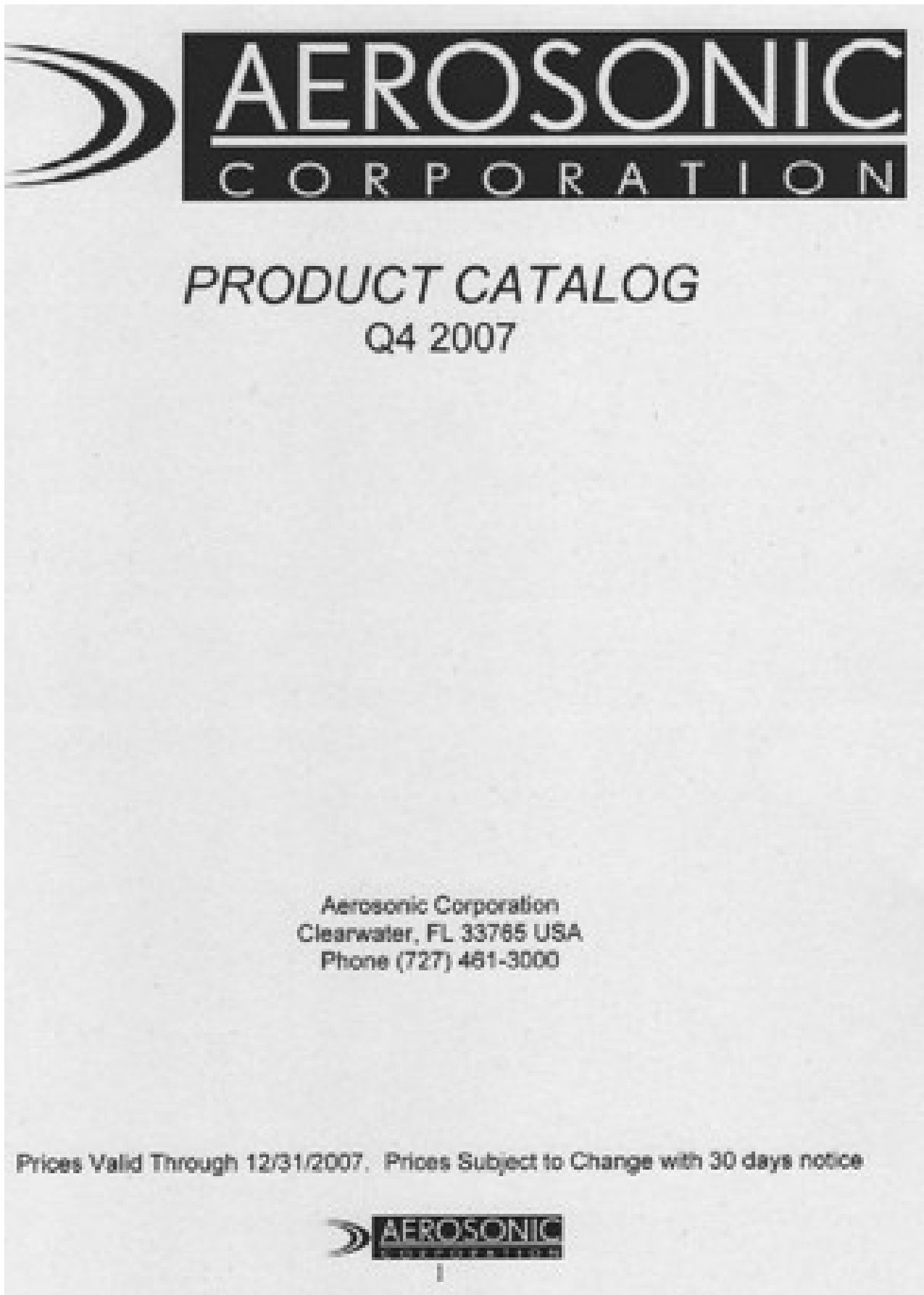
Grand Rapids Technologies, Inc.
8.4" Bezel



Panel cutout 8.064 x 6.33

(this allows for 0.020" clearance per side) No. 6 screws for mounting

Scale 0.750



Sport EFIS

The Sport EFIS is designed to provide all the features available in the Standard system in a cost-effective package for builders with limited panel space and a limited budget, but with a desire for leading edge avionics. The Sport EFIS features WAAS/GPS, AHRS, ADC and display units with 8.4" (diagonal) screens that maximize readability while keeping the display unit dimensions down to a size that allow installation in almost any experimental aircraft. The display units are available in either portrait (shown) or landscape orientation to accommodate a variety of instrument panels.



8.4" Sport EFIS Screen



8.4" Sport MFD, Approach Plate View



8.4" Sport MFD, Engine Monitoring View

Sport EFIS EFIS Package (8.4" Portrait display - shown)

Sport EFIS EFIS Package (8.4" Landscape display)

The Sport EFIS Package includes: a single 8.4" Display Unit, one AHRS with a built-in WAAS/GPS receiver, and one Air Data Computer. An Engine interface unit and engine probes are additional. The EFIS features synthetic vision with terrain warning, traffic displays and highway-in-the-sky in the attitude indicator, a full color moving map, flight planning and engine instrumentation.

Flight Op Dual Screen Sport Package (8.4" Portrait display)

Flight Op Dual Screen Sport Package (8.4" Landscape display)

Part Number	MSRP
F2220	\$19,990
F2420	\$19,990

Part Number	MSRP
F2220D	\$29,800
F2420D	\$29,800

The Dual Screen Sport Package includes: two 8.4" Display Units, one AHRS with a built-in WAAS/GPS receiver and one Air Data Computer. Engine interface unit and probes are additional. The second display unit can operate as either a second EFIS or a powerful MFD, capable of displaying a full-color moving map with traffic, terrain and weather overlays, a full-screen engine monitoring page, or an approach view showing both lateral and vertical approach views. MFD Display Units can be upgraded to add a FLIR/Video interface card, enabling them to operate as a video monitor for up to two external video sources.

FLIR/Video Interface Upgrade for a Single Display Unit

Part Number	MSRP
FLIR	\$1,426



Aerosonic EFIS

The Aerosonic EFIS is the most advanced EFIS available for experimental aircraft. It features advanced functionality such as WAAS/GPS, 3D synthetic vision with integrated terrain warning and traffic, highway-in-the-sky in the attitude indicator, a full color moving map, flight planning and engine monitoring all displayed on large, sunlight-readable 10.4" (diagonal) screens with 1024x768 resolution. The display units are available in either portrait or landscape orientation to accommodate a variety of instrument panels.



10.4" Landscape EFIS Screen

10.4" Portrait MFD
Approach Plate View

10.4" Portrait MFD
Engine Monitoring View

Aerosonic Primary EFIS (10.4" Portrait display)

Aerosonic Primary EFIS (10.4" Landscape display)

Part Number	MSRP
F2120	\$21,900
F2320	\$21,900

The EFIS package includes: a single 10.4" Display Unit, one AHRS with built-in WAAS/GPS receiver, and one Air Data Computer. Engine interface unit and engine probes are additional. The EFIS features synthetic vision with terrain warning, traffic displays and highway-in-the sky in the attitude indicator, a full color moving map, flight planning and engine instrumentation.

Aerosonic Dual Screen EFIS (10.4" Portrait display)

Aerosonic Dual Screen EFIS (10.4" Landscape display)

Part Number	MSRP
F2120D	\$33,300
F2320D	\$33,300

The Dual Screen EFIS Package includes: two 10.4" Display Units, one AHRS with a built-in WAAS/GPS receiver, and one Air Data Computer. Engine probes are additional. The second display unit can operate as either a second EFIS or a powerful MFD, capable of displaying a full-color moving map with traffic, terrain and weather overlays, a full-screen engine monitoring page, or an approach view showing both lateral and vertical approach views. The MFD Display Units can be upgraded to add a FLIR/Video interface card, enabling them to act as a video monitor for up to two external video sources.

FLIR/Video Interface Upgrade for a Single Display Unit

Part Number	MSRP
FLIR	\$1,426



Aerosonic Integrated

Aerosonic Integrated is the evolution of experimental avionics. The normal cluster of radios, GPS receiver, and transponder are removed and replaced with remotely mounted components. Radio frequencies are tuned and transponder codes are set in the Integrated EFIS and MFD display units. Aerosonic Integrated is offered in four standard packages or custom packages may be specified by choosing individual components to suit specific needs. Regardless of which package you choose, Aerosonic Integrated is the only completely integrated avionics solution for experimental aircraft that enables you to purchase all of your avionics, including a wiring harness from one vendor.



Custom Aerosonic Integrated IFR Package Featuring Single 10.4" Portrait Integrated EFIS, WAAS/GPS Receiver, AHRS, Dual Communication Transceivers, Dual VOR/LOC/GS Receivers and Air Data Computer (ADC)

8.4" Integrated Display Unit Packages

These packages feature Integrated display units with 8.4" diagonal screens. Additional display units can be added to the Sport IFR Dual package. Aerosonic Integrated can support up to 4 display units (see Integrated Components on page 7 for the price of additional display units).

Aerosonic Integrated Sport IFR Single	
Component	Model
8.4" Portrait Display Unit	F6240
-or-	-or-
8.4" Landscape Display Unit	F6440
AHRS w/ WAAS/GPS	NAV420
ADC	705548-00
Audio Panel	AP100
Mode C Transponder with Altitude Encoding	ATC4401 SAE5
Dual Communication Transceiver	RT3209 (2)
VOR/LOC/ILS Navigation Receiver with NIU	RN3320 NI1000
Wiring Harness ¹	WH100
Retail Price:	\$39,400

Aerosonic Integrated Sport IFR Dual	
Component	Model
8.4" Portrait Display Unit	F6240
-or-	-or-
8.4" Landscape Display Unit	F6440
8.4" Portrait Display Unit	F6240
-or-	-or-
8.4" Landscape Display Unit	F6440
AHRS w/ WAAS/GPS	NAV420
ADC	705548-00
Audio Panel	AP100
Mode C Transponder with Altitude Encoding	ATC4401 SAE5
Dual Communication Transceiver	RT3209 (2)
VOR/LOC/ILS Navigation Receiver with NIU	RN3320 NI1000
Wiring Harness ¹	WH100
Retail Price:	\$50,900

To Add a (NAV/COM) Radio Control Panel (RCP) Add:

<i>Part Number</i>	<i>MSRP</i>
RC100	\$1,859

For Sport IFR Dual packages, the 2nd display can be upgraded to add a FLIR/Video interface card, enabling it to act as a video monitor for up to two external video sources.

<i>Part Number</i>	<i>MSRP</i>
FLIR	\$1,426

1 – Customer specifies cable lengths for wiring harness but any other modifications to the wiring harness design are at additional cost

10.4" Integrated Display Unit Packages

These packages feature Integrated display units with 10.4" diagonal screens. Additional display units can be added to the IFR Dual package. Aerosonic Integrated can support up to 4 display units (see Integrated Components on page 7 for the price of additional display units).

Aerosonic Integrated IFR Single	
Component	Model
10.4" Portrait Display Unit -or- 10.4" Landscape Display Unit	F6140 -or- F6340
AHRS with WAAS/GPS Receiver	NAV420
Air Data Computer	705548-00
Mode C Transponder with Altitude Encoding	ATC4401 SAE5
Dual Communication Transceiver	RT3209 (2)
VOR/LOC/ILS Navigation Receiver with NIU	RN3320 NI1000
Audio Panel	AP100
Wiring Harness ¹	WH100
Retail Price:	\$41,600

Aerosonic Integrated IFR Dual	
Component	Model
10.4" Portrait Display Unit -or- 10.4" Landscape Display Unit	F6140 -or- F6340
10.4" Portrait Display Unit -or- 10.4" Landscape Display Unit	F6140 -or- F6340
Air Data Computer	705548-00
AHRS with WAAS/GPS Receiver	NAV420
Mode C Transponder with Altitude Encoding	ATC4401 SAE5
Dual Communication Transceiver	RT3209 (2)
VOR/LOC/ILS Navigation Receiver with NIU	RN3320 NI1000
Audio Panel	AP100
Wiring Harness ¹	WH100
Retail Price:	\$54,900

To Add a (NAV/COM) Radio Control Panel (RCP) Add:

<i>Part Number</i>	<i>MSRP</i>
RC100	\$1,859

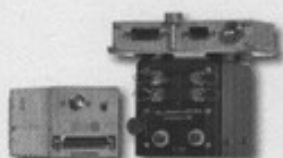
For IFR Dual packages, the 2nd display can be upgraded to add a FLIR/Video interface card, enabling it to act as a video monitor for up to two external video sources.

<i>Part Number</i>	<i>MSRP</i>
FLIR	\$1,426

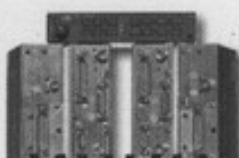
FLIR/Video Interface Upgrade for a Single Display Unit

1 – Customer specifies cable lengths for wiring harness but any other modifications to the wiring harness design are at additional cost

Individual Aerosonic Integrated Components



Transponder, Encoder
and Air Data Computer



VOR/LOC/GS Radios
and Audio Panel



GPS Receiver



WAAS/GPS
Receiver

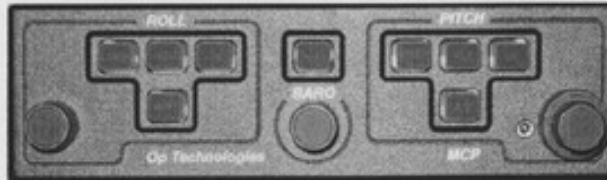
You can choose from the components below to build your own Integrated Package.

COMPONENT	Part Number	MSRP
Integrated 8.4" Portrait Display Unit	F6240	\$11,475
Integrated 8.4" Landscape Display Unit	F6440	\$11,475
Integrated 10.4" Landscape Display Unit	F6140	\$13,427
Integrated 10.4" Portrait Display Unit	F6340	\$13,427
AHRS420CX with WAAS/GPS and Antenna	NAV420	\$ 7,410
AHRS500	AHRS500	\$14,138
ADC 705548-00 (non-TSO'd)	705548-00	\$2,995
ADC22100 (High Performance – Required for Viper Installations)	22100	\$18,239
Engine Interface Unit (EIU) – Turbine	EIU	\$3,120
Engine Interface Unit (EIU) – Piston	EDM950	\$2,325
External WAAS/GPS Receiver (non-TSO'd)	GP200	\$2,214
External WAAS/GPS Receiver (TSO'd)	1201	\$6,669
AP100 Audio Panel	AP100	\$1,908
ATC4401 Mode C Transponder with altitude encoding	ATC4401 SAE5	\$3,175
RN3320 VOR/LOC/GS Receiver	RN3320	\$3,876
Navigation radio Interface Unit (NIU) ¹	NU100	\$1,280
RT3209 Communication Transceiver	RT3209	\$2,582
RCP – Radio Control Panel for COM/NAV Radios	RC100	\$1,859
1-Screen Wiring Harness ²	WH300-1	\$2,625
2-Screen Wiring Harness ²	WH300-2	\$2,788
3-Screen Wiring Harness ²	WH300-3	\$2,961

1 – NIU is required for VOR/LOC navigation with the VOR/LOC/GS receiver

2 – Customer specifies cable lengths for wiring harness but any other modifications to the wiring harness design are at additional cost

Other Components



Aerosonic is the only experimental EFIS manufacturer to offer a Mode Control Panel (MCP) commonly found on commercial jet flight decks. The MCP reduces pilot workload by allowing the flight control mode or baro setting to be adjusted with the push of a button or turn of a single knob.

Mode Control Panel (MCP)

Part Number
M1000

MSRP
\$1,727



The RCP reduces workload by allowing the pilot to set radio frequencies without the use of the OP Integrated soft keys. The RCP is available in a portrait (vertical) or landscape (horizontal) orientation to allow for a variety of mounting locations in the instrument panel or anywhere it is convenient.

(NAV/COM) Radio Control Panel (RCP)

Part Number
RC100

MSRP
\$1,859



Engine/Fuel Sensors

The Engine Interface Unit, engine interface wiring harness and engine probes are not included with the Aerosonic EFIS or Aerosonic Integrated Packages and must be purchased separately. The following tables list the sensors that are available to measure engine and fuel parameters. An Engine Interface Unit must be purchased to use engine monitoring and engine data recording on Aerosonic display units.

TURBINE		
	Part Num	MSRP
Turbine Engine Interface Unit	EIU	\$3,120
EIU Harness	HarnTUR	\$350
Oil Temp	P-120	\$64
Oil Press 100psi	PT-100GA	\$165
Fuel Pres 100psi	PT-100GA	\$165
Torque 300psi	PT-300GA	\$165
AMPS 300amps	S-300	\$43
Fuel Quantity - 2 to 15ft (each)	P-300C	\$264
Fuel Flow (120gph)	FT-180	\$660

PISTON		
	Part Num	MSRP
Piston Engine Interface Unit	EDM950	\$2,325
6 Cyl Harness	Harn6C	\$775
4 Cyl Harness	Harn4C	\$623
EGT (each)	M-111	\$104
CHT (each) bayonet	5050	\$104
CHT (ea) spark plug	M113	\$104
Oil Temp 1/8 NPT & Adapter	400505 400503	\$205
RPM pressurized mag (Bendix 20)	420806	\$395
RPM pressurized mag (Bendix 1200)	420807	\$395
RPM pressurized mag (Slick 4000,6000)	420809	\$395
RPM vent plug Bendix	420815-2	\$395
RPM vent plug Slick	420815-1	\$395
Man Press 0-60in Hg 1/8 NPT	604010	\$245
Fuel Quantity - 2 to 15ft (each)	P-300C	\$264
Fuel Press, 1/2 to 20 psi, 1/8 NPT	790775	\$350
Fuel Flow (pressure)	201	\$395
Fuel Flow (gravity)	231	\$395
High Fuel Flow (120gph)	F4-8	\$980
AMPS 100amps	AMP-100	\$100
Oil Press 0-160psi	3060-18	\$158
TIT	M111T	\$165
IAT, 1/8 pipe or clamp	M111IAT	\$165
CDT (carb), 1/8 pipe or clamp	M111CDT	\$165
RPM (tach gen)	1A3	\$299

IAS-E

Complete Instrumentation, Communication and Navigation Solution
FLIR/VIDEO INTERFACE INCLUDED
 Prices Effective through 9/30/2007



The Integrated Avionics System (IAS) represents the state-of-the art in EFIS for the experimental market. This is the only truly integrated glass panel system available that includes WAAS/GPS, all radios and transponder, synthetic vision and HITS and a FLIR/Video interface in a single package. The IAS-E features 10.4" landscape display units with integrated controls for controlling remotely mounted communication and navigation radios.

IAS-E IFR Package	
Component	Model
10.4" IAS Non-Cert PFD Display Unit	F4340
10.4" IAS Non-Cert MFD Display Unit with FLIR/Video Interface	F534V
AHRS	NAV420
TSO'd WAAS/GPS Receiver	1201
Air Data Computer	705548-00
Dual VOR/LOC/ILS Receivers	RN3320 (2)
Navigation Interface Unit	NU100
Dual Communication Transceivers	RT3209 (2)
Mode C Transponder	ATC4401
Audio Panel	AP100
Wiring Harness ¹	WH300
Retail Price:	\$67,000

1 – Customer specifies cable lengths for wiring harness but any other modifications to the wiring harness design are at additional.





Flight Op



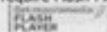
Portrait Model Display



Landscape Model Display

View Additional Screen Images
View In Flight Demo Movie

These pages require Flash Player 7 or later.



The Flight Op EFIS is the most advanced EFIS available for experimental aircraft. Featuring superior functionality, the Flight Op is an integrated display system that combines a Primary Flight Display (PFD) and a Multifunction Display (MFD) on a single screen, with easy-to-use menus. To accommodate your aircraft's instrument panel, the Flight Op is available in portrait or landscape display orientation, and you can choose between a 10.4" or 8.4" (diagonal) sunlight-readable screen.

Op Technologies sets the standard for EFIS technology. Using a WAAS/GPS navigation system, the Flight Op PFD features the following:

- Airspeed Indicator
- Altitude Indicator with Synthetic Vision*
- Altitude Indicator
- Vertical Speed Indicator
- Glidescope Deviation Indicator
- Localizer Deviation Indicator
- Highway in the Sky (HITS) flight path display system
- Standard Rate of Turn Indicator
- Slip Indicator

*The Flight Op Synthetic Vision includes not only real-time synthetic vision with HITS, but also displays airports with runway detail in the altitude indicator. For additional situational awareness, even unusable runway and the center line are shown to help you line up the approach.

Lowering pilot workload and increasing safety is our first priority. The Flight Op's Horizontal Situation Indicator (HSI) features:

- Color-coded Airspace
- Course Pointer
- Two Bearing Pointers
- Course Deviation Indicator
- Full-color Moving Map
- Graphical Terrain Warning
- Traffic Display
- Weather and Lightning Display
- Map De-clutter Functions

When flying in crowded airspace, the Flight Op EFIS has you covered. Our display units easily interface with the following optional equipment to build a powerful flight deck solution with functionality previously unseen in general aviation:

- Flight Op MFD
- NAV/COMM radios
- L-3 FLIR camera—allows you to "visually" identify all traffic
- Mode S transponder**
- Ryan TCAD **
- WSI InFlight
- XM Weather
- TruTrak autopilot

** Real-time traffic information appears in both the altitude indicator and the full-color moving map. Traffic symbols are color-coded to allow you to quickly recognize any traffic at your altitude or on a possible collision course and take action.

These capabilities provide you with unparalleled situational awareness in day, night, and in any weather condition. The Flight Op also boasts state of the art flight management, flight planning and destination information, and engine monitoring systems:

Flight Management Systems (FMS):

- Automatic Waypoint Sequencing
- Bearing, Distance, and ETA to Active Waypoint
- Nearest Airport Search
- "Direct-To" Navigation
- Fuel Totalizer
- Clock
- Timer

Destination Page:

- Distance and ETA to Destination
- Projected Fuel Quantity upon Arrival
- Approach and Airport Radio Frequencies

Engine Indicator and Crew Alerting System (EICAS):

- Displays up to 12 engine instruments for a single or twin engine, piston, or turbine aircraft.
 - Piston aircraft displays individual EGT and CHT for up to 6 cylinders.
 - Turbine aircraft displays all engine parameters.
- Monitors up to 27 engine parameters on Pistons and Turbines

The EFIS is designed for easy installation in a wide variety of aircraft by a builder or professional installer. Intuitive set-up menus walk the installer through a number of configuration options to customize the display. The ranges, limits, and units on the instrumentation and the aircraft's engine probes are identified during this process. The flexibility of the system allows for installation in a piston or turbine aircraft and the entire process is accomplished in the cockpit without the use of an external keyboard.

The Flight Op EFIS is the obvious choice for your experimental aircraft.

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