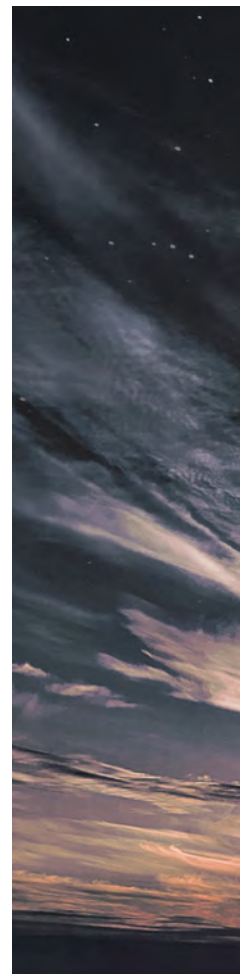




HONEYWELL HUMS | TEST | AVIONICS | SKY CONNECT | ASPIRE



DIAGNOSTIC
SOLUTIONS
INTERNATIONAL LLC



Diagnostic Solutions International LLC (DSI) is the premiere worldwide Master Distributor for Honeywell (formerly Chadwick-Helmuth) HUMS & TEST and authorized distributor for AVIONICS, SKY CONNECT & ASPIRE.

DSI is a veteran owned small business registered with the Small Business Administration and Central Contracting.

With over 350 years combined experience diagnosing and solving complex vibration, rotor track and balance, and engine performance issues, DSI offers an extensive knowledge base and expertise, yielding reduced down time, repair costs, and reactive maintenance. We specialize in providing on-site technical support of more than 1,000 aircraft, training, and health and usage monitoring system data management and analysis.

Our diverse line of Honeywell Chadwick Helmuth aircraft balancing and vibration monitoring products, coupled with our experienced and strategically placed staff, provides a single point of entry for all of our customers'

HUMS needs, to include hardware, software, customer support, engineering and field support, system design and implementation, training, condition based maintenance (CBM), and data management and analysis services.

DSI specializes in Honeywell Chadwick Helmuth HUMS. We offer our experience and specialized aptitudes in helicopter rotor track and balance, propeller balance, aircraft and engine component balance, vibration analysis, engine performance qualification, and HUMS data management and analysis.

We have decades of experience relevant to the usage and operation of the Honeywell Chadwick Helmuth Carry-On VXP, On-Board VXP, EVXP, AIMS, Vibrex 2000 Plus, VMS II, 8500 C Plus, FasTrak™, Strobex, accelerometers, velocimeters, photocells, magnetic pickups, calibrators, tab tools, Smart Chart™ technologies, VibraLog™, VibReview™, etc.



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| HONEYWELL HUMS / TEST CARRY-ON

FOR HELICOPTERS, FIXED WING AIRCRAFT, UNMANNED AIR VEHICLES AND GROUND VEHICLES | ALL OF THE HONEYWELL HUMS / TEST PRODUCTS ARE FOCUSED ON THE COLLECTION, PROCESSING, AND INTERPRETATION OF DATA GENERATED BY THE VARIOUS COMPONENTS WITHIN AN AIRCRAFT'S DRIVE TRAIN, INCLUDING ENGINES, GEARBOXES, SHAFTS, FANS, ROTOR SYSTEMS AND OTHER DYNAMIC COMPONENTS. IN ALL CASES, VIBRATION SPECTRA CAN BE VIEWED IN THE FIELD AT THE ENGINE, WITHIN THE TEST CELL OR ANY OTHER PLATFORM LOCATION TO ALLOW FOR A MORE DETAILED ANALYSIS BY ANY SKILLED TECHNICIAN.

| TEST CARRY-ON VXP

The VXP System consists of the VXP Acquisition Unit (AU), VXP Display Unit (DU), software, and associated carry-on kit and sensors. VXP software is divided into two major systems, the Operational Program which resides permanently in EPROM memory of the VXP AU and the support software that resides on the VXP DU, such as VXP Display Program, Vib Review™ trending software, and the VibraLog™ advanced predictive maintenance software.

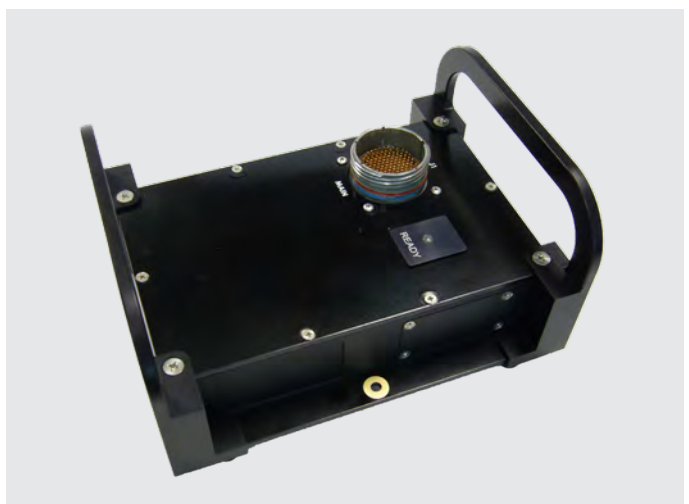
- All data is date time stamped and can be correlated to other aircraft data systems
- Interfaces to a wide range of sensor types
- Interfaces to the optional FasTrak™ Optical Tracker for Main Rotor blade tracking
- Uses the latest signal conditioning, digital signal processing data conversion, and memory technology
- Expansion connector allows quick single cable connection to pre-wired aircraft
- Full-color graphics give excellent Track Trend Plots, Polar Plots and solution/option displays
- Shows all vibration limit exceedances instantly



| ZTE

The ZTE is an easy-to-operate tool for performing helicopter rotor smoothing, engine performance checks, component balancing, vibration analysis. The ZTE's accurate airspeed accelerometer algorithms set it apart from other smoothing solutions.

- Achieve maintenance manual specifications in as few as 3 flights—1 or 2 measuring flights and 1 to verify
- Increases aircraft operational availability and readiness and enhances safety
- Can configure to each specific helicopter type
- Flexible and cost-effective for multi-platform and mixed helicopter and fixed-wing propeller operators
- Easy-to-understand maintenance actions can be displaced on any PC, including the optional Panasonic Toughbook®, using the Zing® Ware Personal Computer - Ground-Based System (PC-GBS) software
- All cables, brackets and sensors from the RADS-AT™/Aviation Vibration Analyzer (AVA) are fully compatible with the new Test Elite



| THE **ENHANCED VIBREX™ 2000 PLUS (EV2K+)** IS A VIBRATION ANALYSIS AND BALANCING TOOL THAT RAPIDLY AND ACCURATELY ACQUIRES AIRCRAFT AND ENGINE VIBRATION DATA. IT USES THAT DATA TO CALCULATE BALANCE SOLUTIONS AND TO ANALYZE AIRCRAFT VIBRATION LEVELS ACROSS A BROAD FREQUENCY RANGE.

| **ENHANCED VIBREX™ 2000 PLUS (EV2K+)**

A cost-effective balancer/analyzer for fixed-wing propeller balancing or helicopter rotor track and balance with superior performance, the EV2K+ is a vibration analysis and balancing tool that rapidly and accurately acquires and analyzes aircraft and engine vibration data. It uses that data to calculate balance solutions and to analyze aircraft vibration levels across a broad frequency range.

- Acquires accurate fixed-wing and helicopter vibration readings
- Allows you to balance the propellers or blades using the integrated display – without the use of paper charts
- Can use any of the 150 available Honeywell or factory paper charts
- Capable of balancing shafts and blowers
- A complete balancing tool.
- Provides an overview of rotor and drive train and engines with component frequencies of 600,000 rpm or less, and balance speeds below 30,000 rpm



The EV2K+ comes with pre-programmed software:

Helicopters

- | | |
|--|--|
| <ul style="list-style-type: none"> ▪ Airbus <ul style="list-style-type: none"> ▸ AS332, AS350B, AS350B1, AS355, AS365, BK117, BO105, EC120, EC130, EC135, EC145 ▪ AgustaWestland <ul style="list-style-type: none"> ▸ A109E Power, A119, AW139 ▪ Bell <ul style="list-style-type: none"> ▸ BL206B, BL206L, BL212, BL222, BL407, BL427, UH1H | <ul style="list-style-type: none"> ▪ Enstrom <ul style="list-style-type: none"> ▸ x80 ▪ MD Helicopters <ul style="list-style-type: none"> ▸ MD-500, MD-520N ▪ Robinson <ul style="list-style-type: none"> ▸ R-22, R-44, R-66 ▪ Sikorsky <ul style="list-style-type: none"> ▸ S-61 ▪ Schweizer <ul style="list-style-type: none"> ▸ SW-300 |
|--|--|

FIXED WING

- | | |
|--|--|
| <ul style="list-style-type: none"> ▪ Aerospatiale <ul style="list-style-type: none"> ▸ ATR42, ATR72 ▪ Antonov <ul style="list-style-type: none"> ▸ AN-32 ▪ Bombardier <ul style="list-style-type: none"> ▸ DASH 4, DASH 5, DASH 6 (Twin Otter), DASH 7, DASH 8 ▪ British Aerospace <ul style="list-style-type: none"> ▸ BAE 146 ▪ Canada Air <ul style="list-style-type: none"> ▸ CL215T, 415 ▪ Casa <ul style="list-style-type: none"> ▸ C212, 295, CN235 ▪ Cessna <ul style="list-style-type: none"> ▸ Caravan 2, Conquest ▪ Dornier <ul style="list-style-type: none"> ▸ DO228, DO328 | <ul style="list-style-type: none"> ▪ Embraer <ul style="list-style-type: none"> ▸ EMB-120, Tucano ▪ Lockheed <ul style="list-style-type: none"> ▸ C-130J ▪ Pilatus <ul style="list-style-type: none"> ▸ PC-6, PC-7, PC-7 MkII, PC-9, PC-12 ▪ Piper <ul style="list-style-type: none"> ▸ CHEYENNE ▪ Raytheon <ul style="list-style-type: none"> ▸ 1900D, KING AIR, BONANZA ▪ Saab <ul style="list-style-type: none"> ▸ 340 ▪ Short <ul style="list-style-type: none"> ▸ 312, Tucano ▪ Swearingen <ul style="list-style-type: none"> ▸ MERLIN, METRO III |
|--|--|



| HONEYWELL HUMS ON-BOARD

ON-BOARD VIBRATION MONITORING SYSTEM/HUMS | Selected by various OEMs, customers and military operators, all of our on-board systems are focused on the collection, processing and interpretation of data generated by the various components within an aircraft's drive train, including engines, gearboxes, shafts, fans, rotor systems, and other dynamic components. Collected data can be viewed at the aircraft, within the test cell or any other platform location by the maintainer. Hardware and software is available for more detailed analysis off-wing.

| HUMS ON-BOARD VXP

Honeywell's HUMS VXP health monitoring system has a firm track record as one of the most advanced HUMS products available. It represents the merging of an onboard system with our industry-proven ground-based carry-on products technology.

- Fully certified and available via both U.S. FAA and Canadian Transport Canada STC's
- Meets the current regulatory requirements
- Designed with provisions to support future HUMS functions
- Interfaces to hardwired vibration and tachometer sensors located throughout the aircraft
- Interfaces to optional carry-on equipment such as the FasTrak™ Optical Tracker for Main Rotor blade tracking
- We provide an application organization that has broad experience in conducting VXP installation support and training on the majority of aircraft types
- Honeywell VXP STC's exist on a wide variety of aircraft types

The Honeywell 1239, VXP and EVXP HUMS option are offered as standard options for S76C+/C++ helicopters used in offshore missions. The Honeywell VXP has been installed and certified on multiple helicopter types and it has been accepted by the customers around the world due to its high level of integration & performance.

| VXP FEATURES

- Crisp, sunlight readable, active-matrix color display
- Easy to use touch screen interface
- Fast six channel simultaneous data acquisition
- Expanded Smart Chart™ capabilities for balancing and analysis procedures
- Comprehensive input capabilities with 48 vibration, 6 photocell/mag, FasTrak™ and accessory channels
- Portable, on-board, commercial and military configurations available
- Performance of 75 kHz frequency range, resolution to 51,200 lines and >90 dB dynamic range
- Instant feedback of maintenance actions with on-aircraft printer
- Clear on-screen help with graphics and troubleshooting procedures.



HUMS ON-BOARD VXP



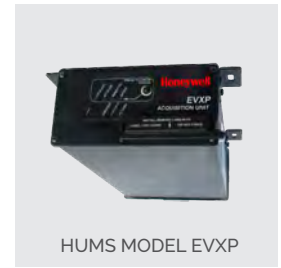
HUMS MODEL 1209



HUMS MODEL 1134



HUMS MODEL 1239



HUMS MODEL EVXP

| HUMS 1209 / 1134 / 1239

The 1209 Modern Signal Processing Unit (MSPU) provides field-proven design and delivers specific OEM-recommended maintenance actions to maintainers for rotor smoothing, engines and the entire drive train. Advanced engine diagnostics and automated engine performance calculations, such as Max Power Check (MPC) and Health Indicator Test (HIT), round out this feature rich system.

The system connects to most commercial off-the-shelf flight data recorders providing operators with crash survivable data storage. Based on the highly successful, combat proven 1209 MSPU, the models 1134/1239 are advanced health and usage monitoring systems (HUMS) featuring field programmable gate arrays (FPGA).

| HUMS/SKY CONNECT INTERFACE

- Provides over-the-air notification of potential HUMS exceedances
- Timely off-load of HUMS data at next destination
- Fully integrated with Model 1239 HUMS system via ARINC 429 bus to Tracker III
- Provides additional exceedance information beyond a simple discrete notification (SW support for Tracker III shipping Q1 2013)
- HUMS systems with a discrete output can be interfaced to a Tracker III
- Interface with VXP



| SKY CONNECT TRACKING SYSTEM

MANAGE YOUR FLEET WITH A COMPLETE IRIIDIUM® SATELLITE TRACKING AND COMMUNICATIONS SOLUTION. THE SINGLE BEST SOLUTION TO MAXIMIZE SAFETY AND EFFICIENCY FOR DEMANDING MISSIONS IS WITH THE INDUSTRY'S ONLY COMPLETE TRACKING AND COMMUNICATIONS SYSTEM THAT HELPS YOU ACTIVELY MANAGE YOUR FLEET.

| TEXT & TALK

Designed for crews with a busy workload, the Sky Connect system easily accommodates any operational scenario with its talk and text capabilities.

Sky Connect text messaging provides the easiest and quickest way for pilots and dispatchers to communicate simple messages to one another.

The prestored messages with data fields and full telephone keypad make text messaging with the MMU-II™ an excellent way to communicate up-to-date, accurate information.

Messages sent to the aircraft by the dispatcher are displayed immediately and all messages received during the flight can be recalled. When equipped with the MMU-II, the Sky Connect system can also include a voice telephone.

The system provides a headset-level interface tied into the aircraft audio panel and supports over 500 prestored phone numbers with names for easy use.

| TOTAL SITUATIONAL AWARENESS

Sky Connect Tracking System enables any equipped aircraft in the world to be tracked in real time via the Iridium satellite network.

The lightweight transceiver LRU sends encrypted GPS-based position reports at automated intervals to authorized control centers using secure data protocols.

The Sky Connect Map web-based software displays the aircraft location, GPS flight plan, crew status and weather overlays on topographical maps for full situational awareness.

Text messages from the aircraft are displayed on the mapping screen so dispatchers can stay organized and fleets can be managed effectively.

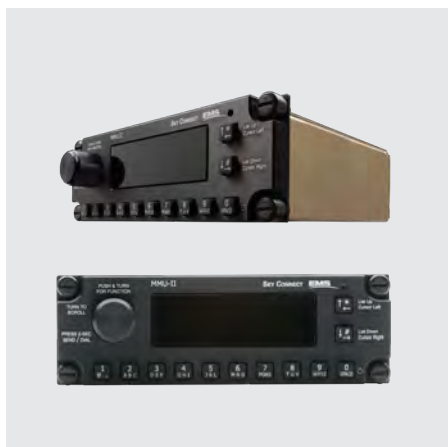
For integrated operations, Sky Connect offers a versatile architecture of interfaces and inputs that work with any aircraft situational display software.

| SYSTEM FUNCTIONALITY

In addition to Iridium® functions (voice/tracking/messaging), Tracker III incorporates the following capabilities:

- Shared antenna signaling for GPS and Iridium
- Integrated dual ARINC429 interfaces
- Web browser-based installation configuration
- POTS and 4-wire audio versions
- Over-the-air configuration
- Internal recording of high-res path data for post-flight review
- Transmission of high-res position data (TrueMiles™)
- Ability to send last position/power-down report after power loss (LPV PowerBank)
- Operation in extreme environments down to -55°C





| MMU-II™ MISSION MANAGEMENT UNIT

SEND/RECEIVE TEXT MESSAGES AND VOICE CALLS USING A FULL TELEPHONE KEYPAD AND A BRIGHT TWO-LINE DISPLAY

The smallest cockpit dialer available, with highly customized options for prestored messages, forms and phone numbers. The keypad adds a great deal of functionality for text messaging, such as direct number and fast letter entry.

MMU-II Capabilities:

- 500 prestored phone numbers with names
- 200 prestored text messages and mini forms
- Two-line, 32-character display
- Full DTMF telephone keypad
- Keypad text entry
- Remote configuration
- WiFi interface
- Optional NVG/NVIS compatibility



| SKY CONNECT TRACKER III & ANTENNA

SMALL & POWERFUL.

New technology has made it possible to increase Tracker III's communications capabilities while also integrating the previously separate ARINC 429 converter unit. Tracker III is an enhancement of its robust predecessor, significantly more capability within virtually the same form factor:

Transceiver:

- Simultaneous tracking and voice capabilities
- Last Position Vector (LPV) PowerBank sends final position reports after power down or interruption
- Installation is quick and easy
- New OLED multipurpose display

Antenna:

- Optimized for Iridium satellites
- Low drag, small and rugged
- FAA TSO authorized



| SKY CONNECT TRACKER MAP

CUSTOMIZABLE & FLEXIBLE MAPS

Sky Connect Tracker Map enables total situational awareness using multi-layer high resolution maps compatible with more software interfaces than any other system of its kind.

Map Capabilities:

- Real-time aircraft position
- GPS flight plan display
- Fixed reporting
- Weather and custom overlays
- 3D Geo-fencing
- Alerts
- Two-way text messaging interface
- Portable device support
- Authorized AFF

| ASPIRE™ 200 INFLIGHT CONNECTIVITY

HONEYWELL ASPIRE™ 200 SATCOM SYSTEM ALLOWS PASSENGERS AND CREW TO BE CONNECTED DURING FLIGHT, REDUCES WORKLOAD & SENDS REAL-TIME DATA QUICKLY TO AND FROM THE AIRCRAFT

The Aspire 200 satellite communications system offers a broad range of connectivity options to suit a wide variety of requirements. These systems operate on the Inmarsat I-4 satellite network, which has worldwide coverage. With the recently certified high data rate (HDR) upgrade, incorporating a long-burst interleaver, it is now ideal for helicopter operations – especially those on critical emergency medical or SAR missions.

The system is designed with common interfaces that provide flexible installation options and ease of upgrade to further increase the system's capabilities.

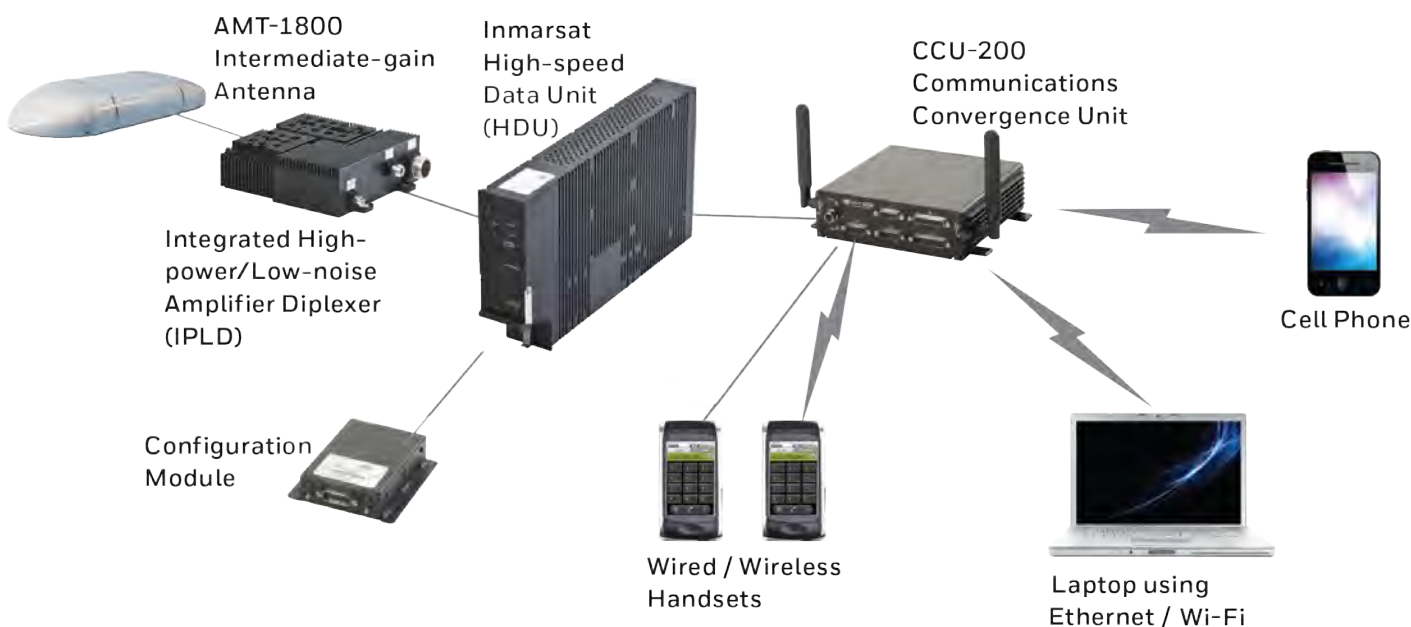
The Aspire 200 System with HDR can transmit more data, faster than any other Lband system. No matter what your mission or the area of your operations, Aspire 200 System provides a high-speed data connection that is always on.

| HIGH DATA RATE (HDR) S/W UPGRADE

The HDR software upgrade is used to enhance Inmarsat Lband services. The upgrade to SwiftBroadband channels provides up to 650 Kbps per channel compared to the previous maximum data rate of 432 Kbps. This low cost solution for increasing cabin performance also reduces the effects of rotor blockage, an ideal solution for adding high speed data to helicopters. The HDR software upgrade may be installed by a qualified user or the terminal can be returned to Honeywell for upgrade at an additional cost.

| ENHANCE SYSTEM PERFORMANCE WITH AN OPTIONAL CNX-250 NETWORK ACCELERATOR

The CNX-250 Cabin Gateway is a multi-port network router with a data accelerator module that acts as the communications hub for all aircraft data links. The appliance increases the number of network users, the strength of encryption and the speed (data acceleration) of a Satcom or ATG system. The CNX-250 provides a single cabin network based on Ethernet that supports high-speed data and VoIP communications and is scalable to support future growth and system expansion.





| ASPIRE™ 200 SATCOM SYSTEMS FOR HELICOPTERS

ALLOWS PASSENGERS AND CREW TO BE CONNECTED DURING FLIGHT, REDUCES WORKLOAD AND SENDS REAL-TIME DATA QUICKLY TO AND FROM THE AIRCRAFT

Helicopter missions require constant connectivity for passengers and crew, both voice and data. When you're beyond line of sight or beyond VHF coverage area, you need dependable, reliable high-speed data connectivity. In challenging environments, low latency voice, real-time data transfer and aircraft tracking empower pilots to complete their missions successfully and safely.

Honeywell is responding to these challenges with our Aspire™ 200 Satcom System for Helicopters. The Aspire 200 satellite communications system offers a broad range of connectivity options to suit a wide variety of requirements. These systems operate on the Inmarsat I-4 satellite network, which has worldwide coverage. With the recently certified high data rate (HDR) upgrade,

incorporating a long—burst interleaver, it is now ideal for helicopter operations—especially those on critical emergency medical or SAR missions.

The system is designed with common interfaces that provide flexible installation options and ease of upgrade to further increase the system's capabilities.

Honeywell's performance is unmatched and unparalleled. The Aspire 200 System with HDR can transmit more data, faster than any other L-band system. No matter what your mission—EMS, Law Enforcement, Oil and Gas, Search and Rescue, VIP—or the area of your operations, Aspire 200 System provides a high-speed data connection that is always on.

| HIGH DATA RATE (HDR) S/W UPGRADE

The HDR software upgrade is used to enhance Inmarsat L-band services. The upgrade to SwiftBroadband channels provides up to 650 Kbps per channel compared to the previous maximum data rate of 432 Kbps. This low cost solution for increasing cabin performance also reduces the effects of rotor blockage making it an ideal solution for adding high speed data to helicopters. The HDR software upgrade may be installed by a qualified user or the terminal can be returned to Honeywell for upgrade at an additional cost.

COCKPIT VOICE & FLIGHT RECORDER PRODUCTS



FLIGHT DATA RECORDER (FDR)

The Sentry Cockpit Voice & Flight Data Recorder (CVFDR) was designed by combining the standard features of existing CVFDRs with a new approach to capturing and protecting flight data creating the foremost CVFDR of the future. Using a patent-pending innovative memory insulation technique Sentry offers small size, lower weight, and less power consumption than traditional CVFDRs in a modular and flexible architecture.

Sentry meets or exceeds all requirements of ED-112A as well as qualification to DO-160G and MIL-STDs-461, 810, and 704 environmental and power requirements. The rugged enclosure is ideal for airborne operational environments including commercial and military fixed-wing and rotary wing aircraft and can be mounted in any attitude.



MODULAR ACQUISITION UNIT (MAU)

The Modular Acquisition Unit (MAU) provides a custom solution to suit aircraft configurations with minimal engineering and is designed to fit general, business and military aircraft which require a standalone flight data acquisition system. The robust machined aluminum enclosure, along with the MIL SPEC D38999 connectors, provides protection for most operational environments making it suitable for both fixed and rotary wing aircraft.

The MAU supports a wide range of signal input types including ARINC 717, ARINC 429, GPS signal, analog inputs such as synchro, pitot/statics and discretes. It provides a standard ARINC 717 and ARINC 429 output data stream compatible with ARINC 717 and ARINC 429 flight data recorders.



REMOTE DATA CONCENTRATOR (RDC)

The Remote Data Concentrator (RDC) is a miniature line replaceable unit designed for data acquisition close to signal sources. The RDC enables a distributed data acquisition architecture collecting as many as 32 sensor inputs from multiple locations on the airframe transmitting data via ARINC-429, Ethernet (including PTP) MIMO WiFi and Bluetooth® to avionics systems such as a Flight Data Recorder (FDR), Health and Usage Monitoring System (HUMS) and other systems requiring critical aircraft data.

The configuration is flexible, such that it can be considered for any application that is able to interface with a high speed ARINC 429 bus.

| COCKPIT VOICE & FLIGHT DATA RECORDER (CVFDR)

THE SENTRY CVFDR WAS DESIGNED BY ENHANCES THE STANDARD FEATURES OF EXISTING CVFDRS WITH A NEW APPROACH TO CAPTURING AND PROTECTING FLIGHT DATA

Sentry offers small size, lower weight, and less power consumption than traditional CVFDRs in a modular and flexible architecture. The "software free" recorder allows for aircraft specific configurations as well as the addition of creative and useful expansion capabilities. Available in stainless steel or titanium, Sentry meets or exceeds all requirements of ED-112A as well as qualification to DO-160G and MIL-STDs-461, 810, and 704 environmental and power requirements. The rugged enclosure is ideal for airborne operational environments including commercial and military fixed-wing and rotary wing aircraft and can be mounted in any attitude.

Sentry Includes a range of aircraft interfaces:

- ARINC-717 and ARINC-429 (auto detection)
- Ethernet
- MIL-STD-1553 • RS-422/485
- Analog and discrete sensor inputs
- Data Link recording
- Four high or low fidelity audio channels (configurable)
- Rotor speed input

Expansion of Sentry's capabilities includes acquisition modules designed for the FDS Modular Acquisition Unit (MAU). The modules convert Sentry into a Data Acquisition and Crash Recorder System and more:

- Expanded Data Acquisition with ARINC 717 and 429 output—ARINC 717, ARINC 429 and MIL-STD-1553 inputs—Analog/Discrete inputs
- Pneumatic (Pitot-Static)
- Quick Access Recorder (QAR)
- GPS Splitter & Receiver Unit
- Emergency Locator Transmitter
- Wireless Data Transfer

| REMOTE DATA CONCENTRATOR (RDC)

DESIGNED FOR EXTREMELY HARSH ENVIRONMENTS

A miniature line replaceable unit designed for data acquisition close to signal sources, the RDC enables a distributed data acquisition architecture collecting as many as 32 sensor inputs from multiple locations on the airframe transmitting data via ARINC-429, Ethernet (including PTP) MIMO WiFi and Bluetooth® to avionics systems such as a Flight Data Recorder (FDR), Health and Usage Monitoring System (HUMS) and other systems requiring critical aircraft data.

The RDC operation is automatic upon application of aircraft or battery power. The low power consumption is ideally suitable for a wide variety of installations enhanced by two auxiliary outputs, 28 VDC for powering accelerometers and a regulated 10 VDC for powering potentiometers and strain gauges, allowing for the addition of extra sensors on the airframe that may provide useful maintenance data. The ability to install the RDC close to the signal source simplifies the installation, improves signal accuracy and reduces overall weight of the system.

The configuration is flexible, considered for any application that is able to interface with a high speed ARINC 429 bus. The RDC can be used in conjunction with a Modular Acquisition Unit (MAU) or as a standalone device. The rugged aluminum flange-mount housing with captive hardware provides an environmentally sealed enclosure ideal for most operational requirements. Field loaded signal interface configurations allows a RDC to be re-programmed to match specific signals at different locations on the aircraft.

The RDC's rugged aluminum flange-mount housing with captive hardware, along with MIL-DTL-38999 connectors, provides an environmentally sealed enclosure ideal for most operational requirements. This includes both commercial and military fixed-wing and rotary-wing aircraft with the housing bonding directly to the airframe.



VIBRATION DATA ANALYSIS SOFTWARE (VIBDAS)

VIBDAS IS DSI'S "IN-HOUSE" DATA MANAGEMENT & ANALYSIS TOOL

The Vibration Data Analysis Software (VibDAS) automates the entire process from data upload to generating event (vibration and parameter exceedance) reports. VibDAS condenses the inherent abundance of data that HUMS systems produce into digestible summaries for the customer.

Some fully automated capabilities & features:

- Data management—file extraction, data validity and "cross-checking," database import and archiving, etc.
- Dynamic Data Structures—enables DSI to segregate aircraft type/model/series data using specific details and relationships
- Event Processing (aircraft advisories, faults, etc.)—event recognition techniques are used to quickly extract aircraft events and exploit valuable information contained in the submitted flight data
- Trending—detailed usage, engine performance, and vibration flight-averaged data is trended and can be used for aircraft/engine health monitoring and diagnostics
- Statistical Limit Generation and Analysis—facilitates a sound means of complementing OEM established limits, as well as derive new limits as applicable
- Gearbox Health Assessments—performed using multiple parameter comparisons to help quickly exploit issues that may be occurring or are imminent
- Unsurpassed Turnaround Time—automated feedback on submitted data in 4 hours or less (from time of post flight download and website uploading until output reports are sent) via email
- Empowers operators with valuable information in order to quickly identify potential problems and allow for improved safety
- Data collector integrity is evaluated and customers alerted to hardware issues which could generate false alarms, miss potential issues and/or degrade system potential - prevents unwarranted maintenance actions thus saving maintenance man-hours and dollars
- Aircraft Configurable—DSI can customize the tool to support new aircraft types, change the look and feel of reports and change the data management support to meet the customer's needs and expectations:
 - Aircraft tailoring for trend reports, usage reports, textual component relationship reports, etc.
 - Supports new aircraft configuration and limitation files that can be used to reconfigure onboard systems such as VXP and EVXP
 - Supports export of setup and limits files to other ground stations such as VibReview
 - Can be used to predict aircraft component failure so that sales and supply systems can be updated – "just in time" parts supply chain
 - Minimizes need for local users to stock pile spare parts for onboard system support
 - Can prepare reports and data documentation to help present issues to OEM's on component problems identified by onboard systems.

Statistical Analysis

- Facilitates a sound means of complementing OEM established limits, as well as derive new limits as applicable
- Statistical limits can be computed based upon individual aircraft or fleet data
- "What if" scenarios are possible by replaying old data against newly created limits
- Different on-board triggering limits and intervals can be simulated

VibDAS Statistics Results Report															Date: 7/6/2012				
Title: BL427 V1192 All VibMon Statistics															Page: 1 of 7				
Aircraft IDs: All															Report Data Range: Entire Database				
Regime: Monitor Eng SH: All																			
Component	Sensor	Status	Severity	Limit	Total Good Samples	Total Reads Over	Min. Levels Over	Avg	Max	StdDev	Aug-10	Aug-11	Q3	Q1	P50	P90	Control Temp	Control Fuel	FT Power
Engine																			
ENG1 - TURB																			
RealTime - VIBR Alert																			
0.128 1661 -- -- 0.027 0.132 0.032 0.040 0.051 0.114 0.021 0.034 0.044 3449 3463 30000																			
ENG2 - TURB																			
RealTime - VIBR Alert																			
0.128 1653 -- -- 0.015 0.071 0.006 0.032 0.040 0.113 0.019 0.032 0.036 3449 3463 30000																			
Eng RB																			
ENG3 - TURB																			
RealTime - VIBR Alert																			
2.126 2889 22 3 0.128 0.403 0.209 0.076 1.208 0.189 0.223 0.403 0.061 10000 10000 10000																			
ENG4 - TURB																			
RealTime - VIBR Alert																			
2.126 2865 -- -- 0.139 0.730 0.171 0.324 0.445 0.241 0.291 0.445 0.061 10000 10000 10000																			

Auto Import & Data Management

- File extraction, data validity and "cross-checking," database import and archiving, etc.
- Auto-emailing report summarizing data processed

REPORT NAME: D2147(BL-427_Event_Report_07_03_2012)					
MODE	TMS	AC_CNT	LOGS	EVENTS	FAULTS
Auto	BL427	6	22	51	256
AC Locations Processed: CABGOC					
AC Ids Processed: 56051, 56037, 56053, 56062, 56046, 56050					
REPORT NAME: D2148(BL-430_Event_Report_07_03_2012)					
MODE	TMS	AC_CNT	LOGS	EVENTS	FAULTS
Auto	BL430	3	7	0	186
AC Locations Processed: CABGOC					
AC Ids Processed: 49109, 49102, 49126					

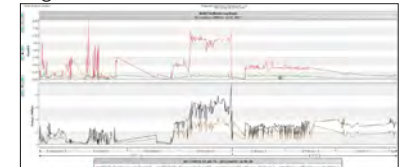
Trending

- Engine performance and vibration data is trended and can be used for aircraft/engine health monitoring and prognosis
 - Engine and flight parameter trending (as supported by on-board collection box, e.g. EVXP)
 - Vibration Data trends—Surrounding exceedance event, Flight-averaged trends, Detailed Vibration Monitor trends over long time periods (Months as apposed to hours)
- Capability of adding Usage trends if supported by collection box.

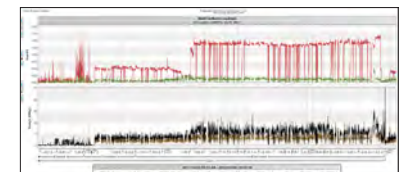
Engine Trend



Flight Trend



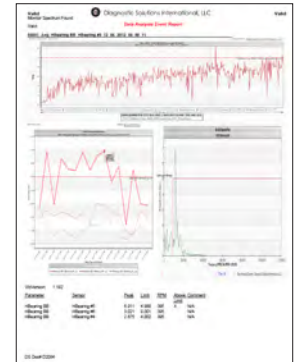
Detailed Monitor Trend



Event Processing (Aircraft Advisories, Faults, Etc.)

Event recognition techniques are used to quickly extract aircraft events and exploit valuable information contained in the submitted flight data.

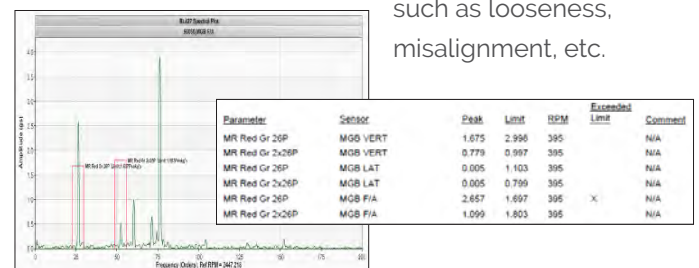
- Flight average plot over time
- In-flight advisories (Alerts) correlated against sensor faults
- Supporting spectral data plotted in report along with event trend
- Supporting component data plotted with event (similar components, locations, etc.)
- Textual advisory analysis (1 per rev versus 2 per rev, high RPM, etc.)



Bearing & Gearbox Health Assessments

- Performs multiple parameter comparisons to help quickly exploit issues that may be occurring or imminent
- Detailed frequency bands around bearing frequencies analyzed and compared (e.g. 1 per rev versus 2 per rev, RMS broadband, etc.)
 - Report comments will indicate potential problems

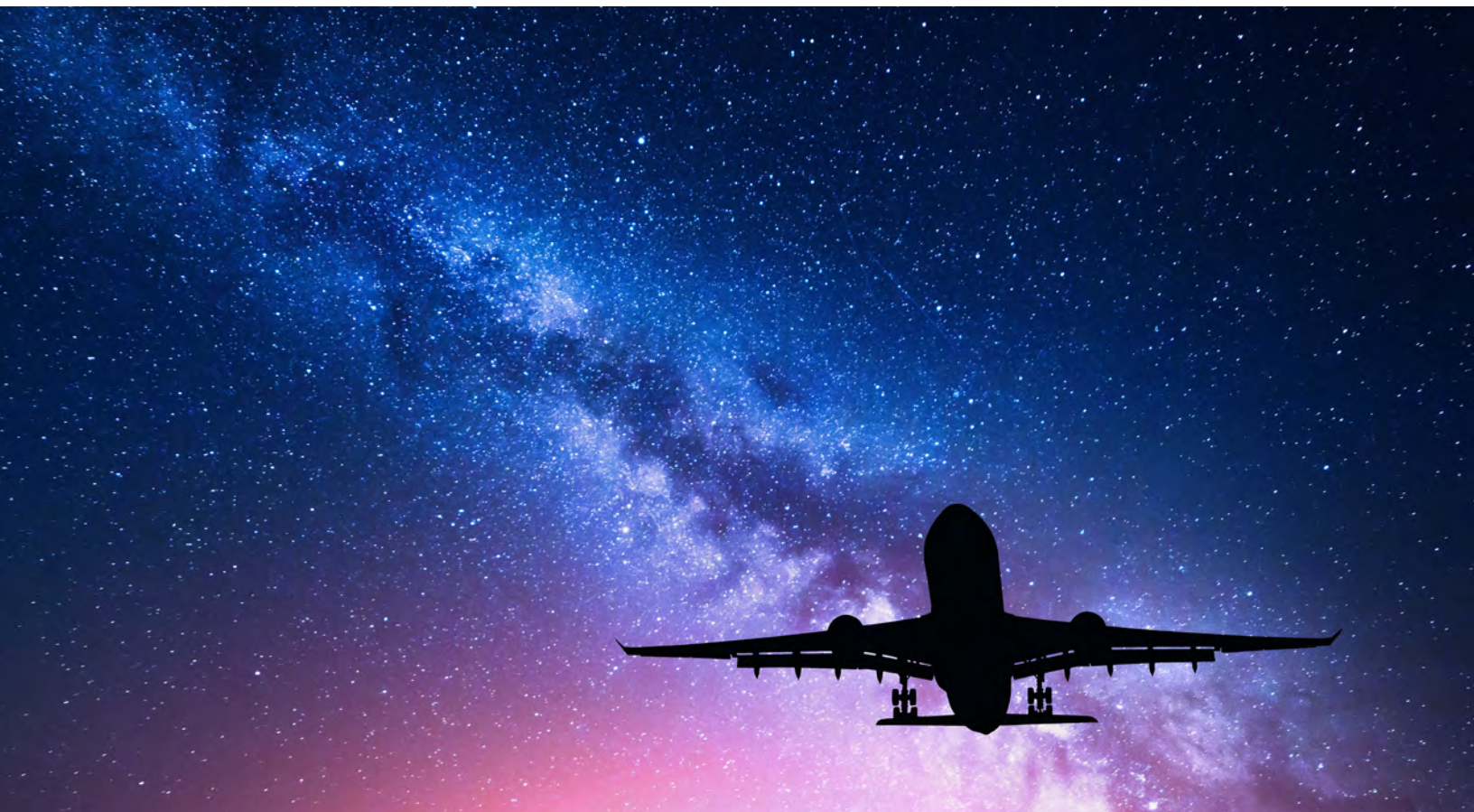
such as looseness, misalignment, etc.



HUMS STC LIST		
HUMS MODEL	MAKE	MODEL
1134	Agusta	AW139
1134	Bell	B429
1209	Bell	212
1209	Bell	B412, B412EP
1239	Sikorsky	S-76C
EVXP	Agusta	A109E
EVXP	Sikorsky	S-76C POST 511v
VMS II	Bombardier	Dash-8 Series 100, 200, 300
VXP	Agusta	A109E
	Agusta Bell	AB139
	Airbus	BK117 C1 & C2 (EC-145 T1)
	Airbus	AS350 B1 & B2/H125
	Airbus	AS-365 N1/N2/N3
	Airbus	EC-135 P2
	Bell	206L-4
	Bell	212
	Bell	407
	Bell	412, 412CF, 412EP
	Bell	427
	Bell	430
	Sikorsky	S-61
	Sikorsky	S-76C POST 511
	Sikorsky	S-76A/C PRE 511



ONBOARD VIBRATION MONITORING SYSTEM/HUMS TECHNICAL SPECIFICATIONS				
	ONBOARD VXP	MODEL 1209	MODEL 1134	MODEL 1239
Accelerometers (Simultaneous Measurement)	26 (6)	36 (6)	24* (6)	48 (8)
Tachometers / Trackers	4 /4	8/2	5*/1	10/2
General Purpose Analog & Discrete In		8	32	48
General Purpose Discrete Out (Low/High)			0/2	16/4
Digital Communication	USB CAN Ethernet RS232 / 422 / 485 1394 Firewire ARINC 429 Transmit/Receive MIL-STD-1553B Dual Redundant Buses	1	1* 2 2 1 1/2 1 (OPTIONAL)	2 1 4 4 1 2/4 4
Internal Storage (Standard /Optional)	512MB	128MB	512MB / 8GB	512MB / 8GB
Quick Access Recorder (Not Crash Survivable)	-	-	OPTIONAL	OPTIONAL
Dimensions:				
L X W X H Inches (With Mounting Plate)	12.2 x 7.1 x 3.0	3.0 x 5.75 x 7.575	7.6 x 6.2 x 1.8	8.8 x 4.7 x 2.5
L X W X H Mm (With Mounting Plate)	304 x 180 x 76	76 x 146 x 192	193 x 158 x 46	224 x 119 x 64
Weight (W/O Mounting Plate)	6.2 lbs / 2.82 kg	4lbs 5oz / 1.95 kg	2.5 lb / 1.13 kg	4.0 lbs / 1.81 kg
Temperature (Degrees C)	-30 to +60	-20 to +55	-40 to +71	-40 to +71
Software: RTCA/DO-178B			LEVEL E	LEVEL D
Regulations:				
CAP-739 (FDM), HOMP/FOQA JAR-OPS3 CAP-753 (VHM)			LIMITED YES YES	YES YES YES



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