

AIRCRAFT FLIGHT DATA USERS GUIDE



Prepared by
US COAST GUARD
AVIATION LOGISTICS CENTER
FLIGHT SAFETY OFFICE

FLIGHT DATA ACCESS AND USE

Coast guard aviation has reached a new level in the capability of using Flight Data on a routine basis for cost saving, engineering troubleshooting, and safety determinations. This proposed use of Flight Data illustrates a departure from the traditional practices where Flight Data is used primarily to support mishap investigations with occasional downloads conducted to support aeronautical engineering analysis. It is imperative that the non punitive nature of the aviation safety standard be applied to all aspects of the potential use of this new capability until a final policy is developed. Failure to do so will jeopardize the entire program, delay the advancement of an invaluable trend analysis tool, and result in loss of unit level access to the data. All Flight Data requests shall be submitted by the unit Flight Safety Officer (FSO). The FSO will validate the requests legitimacy and forward the request to ALC for processing.

Safety investigations: the FSO may have full access to all available Flight Data (with the exception of voice) to assist in unit level safety investigations. If the scope of an investigation warrants the activation of the unit's permanent Mishap Board, then all members assigned to that investigation may also have access to the data.

Maintenance troubleshooting: the FSO shall disseminate the flight data as appropriate. EO may have full access to all required flight data (with the exception of voice) for troubleshooting purposes and may delegate the same authority to an appropriate number of maintenance supervisors to ensure timely access to the data when needed. The intent is not to restrict junior maintenance personnel, but to ensure that the designated maintenance supervisor is aware of what data is being examined and that specific authority has been granted.

Event trend analysis: may be used for safety, maintenance, operations, or training purposes, but must be confined to aggregate data analysis and not the re-creation of any single event.

CG-1131 requests that all queries of the Flight Data be logged for tracking purposes stating the reason, approval authority and usefulness of the data. This is to accurately account for how often it is used, for what specific purpose, and its usefulness. Use the Voice Flight Data Request form on the CG-1131 website to request data.

Removing the data can be done in one of two ways. The primary means of extracting flight data is directly from the Flight Data Recorder (FDR). Another, more expeditious means is by getting it from the Data Storage Unit (DSU). The DSU records a mirror copy of the flight data. Each of the USCG aircraft has a DSU or is having one installed. The H65 all have external DSUs located in the Forward Avionics Tower (FAT) behind the Copilot's seat. The MH60T have a DSU located on the Extended Avionics Rack (EAR) behind the pilot's seat. The HC-130H and the HU-25 are outfitted with a Flight Data Acquisition Unit (FDAU) that has a DSU built into the FDAU. The HC-144 is in the process of having a DSU added to its FDAU system.

These DSUs record the Flight Data onto a Type II PCMCIA card. This data can be copied from the card and uploaded to the ALC Flight Safety Office for analysis in several ways. The following procedures discuss how to capture the data and upload it through a File Transport Protocol (FTP) site.

DATA STORAGE UNIT (DSU) DATA EXTRACTION

1. Rotary Aircraft PCMCIA Card Download Procedures
 - a. Removed PCMCIA card from DSU by sliding thumb switch on the face of the unit. Depress the release button within the DSU to eject the PCMCIA card from the unit.
 - b. Insert the PCMCIA card into computer (see NOTE bottom of page).
 - c. Navigate to applicable drive for the PCMCIA card and open.
 - d. Select all files and save to specified folder. Load all files into zip folder to shorten upload time. Name the zip file with aircraft tail number, data and Air Station.

NOTE:

Do not change the names of the DSU files.

- e. Return PCMCIA card to Data Storage Unit. Close cover and ensure Circuit Breaker is depressed.
2. Fixed Wing PCMCIA Card Download Procedures
 - a. Access Flight Data Acquisition Unit (FDAU) and slide PCMCIA card access door down.
 - b. Depress card eject button and remove card.
 - c. Insert the PCMCIA card into computer (see NOTE bottom of page).
 - d. Navigate to applicable drive for the PCMCIA card and open.
 - e. Select all files and save to specified folder. Load all files into zip folder to shorten upload time. Name the zip file with aircraft tail number, data and Air Station.

UPLOADING FILES USING AMRDEC WEBSITE

NOTE:

The following website can only be used between individuals with “.mil” email addresses.

1. Once files has been saved, log on to the following website:
<https://safe.amrdec.army.mil/SAFE/>
2. Follow prompts by entering name, email address (must be “.mil” account), file information.
3. Select number of files to upload.
4. Browse to file.
5. Enter “To” email address (must be “.mil” account) and click “Add” (more than one person can me added).
6. Once all fields have been filled, click on the “Upload” button and wait until a prompt appears notifying of upload success.

NOTE:

Use of K3 VADR data on the PCMCIA flash card with the CG Standard Workstation has been approved by CG-6 in accordance with the following references:

Per COMDT (CG-9335) MEMO 2000 of Sep 22 2009: Use of DSU Flash media between Standard Workstation III (SWIII) and the Coast Guard H-65 assets’ Flight Data Recorder is approved.

Per COMDT (CG-9335) MEMO 2000 of Jan 8 2010: Use of DSU Flash media between Standard Workstation III (SWIII) and the Coast Guard H-60T assets’ Flight Data Recorder is approved.

Per COMDT (CG-9335) MEMO 2000 of Jan 6 2010: Use of DSU Flash media between Standard Workstation III (SWIII) and the Coast Guard HC-130H assets’ Flight Data Recorder is approved.

Appendix A

HH60J System Description

Location

The VFDR in the HH-60J is located in the extended avionics rack behind the pilot's seat.

Power

The VFDR is powered by 28 volts DC from the pilot's essential DC bus. A circuit breaker, located on the extended avionics rack panel, provides circuit protection.

System Indicator

A VFDR control panel, located on the extended avionics rack, provides the means to conduct a self-test of the VFDR. Initiating a self-test will result in the illumination of an amber light on the control panel, followed by illumination of a green light indicating proper operation. Illumination of the amber light alone during the self-test or while in flight indicates a recorder malfunction.

Parameters

As configured in the HH-60J, the VFDR is a bus monitor. The VFDR's operation is seamless and automatic and will record data whenever power is supplied to the pilot's DC essential bus.

The data parameters recorded include:

- Approximately 6 hours (25 hours for K3 VADR) of flight data consisting of 46 flight parameters (from the MIL-STD-1553 data bus)
- A discrete main rotor speed (Nr) parameter
- Approximately 30 minutes (120 minutes for K3 VADR) of audio (from the three crew ICS stations and a cabin area microphone located on the VFDR control panel on the extended avionics rack).

The table below depicts the recorded parameters monitored on the HH-60J:

PARAMETER	PARAMETER	PARAMETER
Message Valid	AHRS Number	True Airspeed Valid
Nav source (status word)	AHRS Mode	Ground Speed
AHRS Pitch Valid	Active AHRS Heading Valid	Pressure Altitude
AHRS Roll Valid	Active AHRS Pitch	Outside Air Temp
Pressure Altitude Valid	Active AHRS Roll	Indicated Airspeed
Indicated Airspeed Valid	Aircraft Ground Speed Valid	Fly-to-point Bearing
Outside Air Temp Valid	Flight Mode	GPS Valid

PARAMETER	PARAMETER	PARAMETER
Altitude Rate Valid	Guidance Mode	Fly-to-point-Range
Radar Altitude Valid	Altitude Rate	System Day
Fly-to-point Bearing Valid	Altitude Rate Valid	System Month
Doppler Memory Mode	Radar Altitude	System Year
Doppler Heading Velocity Valid	Doppler Heading Velocity	System Time
Doppler Drift Velocity Valid	Doppler Drift Velocity	Aircraft Latitude
Doppler Vertical Velocity Valid	Doppler Vertical Velocity	Aircraft Longitude
Active AHRS Heading	True Airspeed	Rotor Speed
Message Valid	AHRS Number	True Airspeed Valid
Nav source (status word)	AHRS Mode	Ground Speed
AHRS Pitch Valid	Active AHRS Heading Valid	Pressure Altitude
AHRS Roll Valid	Active AHRS Pitch	Outside Air Temp
Pressure Altitude Valid	Active AHRS Roll	Indicated Airspeed
Indicated Airspeed Valid	Aircraft Ground Speed Valid	Fly-to-point Bearing
Outside Air Temp Valid	Flight Mode	GPS Valid
Altitude Rate Valid	Guidance Mode	Fly-to-point-Range
Radar Altitude Valid	Altitude Rate	System Day
Fly-to-point Bearing Valid	Altitude Rate Valid	System Month
Doppler Memory Mode	Radar Altitude	System Year
Doppler Heading Velocity Valid	Doppler Heading Velocity	System Time
Doppler Drift Velocity Valid	Doppler Drift Velocity	Aircraft Latitude
Doppler Vertical Velocity Valid	Doppler Vertical Velocity	Aircraft Longitude
Active AHRS Heading	True Airspeed	Rotor Speed

Appendix B

MH60T System Description

Location

The VFDR in the MH-60T is located in the extended avionics rack behind the pilot's seat.

Power

The VFDR is powered by 28 volts DC from the pilot's essential DC bus. A circuit breaker, located on the extended avionics rack panel, provides circuit protection.

System Indicator

VFDR system operation is monitored by the CDU-7000 via the 1553 Data Bus System and responds with bits of information for GO/ NO-GO. As configured in the MH-60T, the VFDR is a Remote Terminal.

Parameters

The VFDR's operation is seamless and automatic and will record data whenever power is supplied to the pilot's DC essential bus. The VFDR is capturing over 250 parameters. Some of the parameters are redundant. They are captured from several systems to ensure validity.

The data parameters recorded include:

- Approximately 25 hours of data on flight parameters (from the MIL-STD-1553 data bus)
- Approximately 4 hours of audio (from the three crew ICS stations and a cabin area microphone located on the VFDR control panel on the extended avionics rack).

The table below depicts the recorded parameters monitored on the HH-60T:

PARAMETER	UNIT
MASTER CAUTION OUTPUT- COPILOT/PILOT	
UTC DAY/Month/Year	
UTC MONTH	MONTH
LOCAL TIME OFFSET FROM UTC	SECONDS
TIME SOURCE	
COLLECTIVE STICK POSITION	COUNTS
COLLECTIVE STEERING COMMAND	INCHES
ENG CONT POWER	V DC
GAS GENERATOR SPEED	%
POWER TURBINE SPEED	%
ENG TORQUE	%
ROTOR SPEED	%
TURBINE GAS TEMP	DEG C

PARAMETER	UNIT
ENG OIL PRESS	PSI
ENG OIL TEMP	DEG C
XMSN OIL TEMPERATURE-MAIN	DEG C
ENG OUT	
ENG ANTI-ICE ON	
CHIP ENG	
GENERATOR	
GENERATOR BEARING	
CONVERTOR	
FUEL QUANTITY MAIN	LBS
AUX FUEL TANK 1/2/3 QTY	LBS
FUEL FILTER BYPASS	
FUEL LOW	
FUEL PRESS LOW	
ENG INLET ANTI-ICE ON	
ENG STARTER	
ENG INLET 2 ANTI-ICE ON	
TAIL ROTOR QUADRANT	
ROTOR DE-ICE FAIL-TAIL	
LOW ROTOR RPM	
OIL FILTER BYPASS	
CHIP IN/OUT MODULE-LH/RH	
CHIP ACCESS MODULE-LH/RH	
CHIP INTERMEDIATE XMSN	
CHIP MAIN MODULE SUMP	
CHIP TAIL XMSN	
XMSN OIL PRESS MAIN	PSI
XMSN OIL TEMP HI-MAIN	
XMSN OIL PRESS LOW-MAIN	
XMSN OIL TEMP HI-INTERMEDIATE	
XMSN OIL TEMP HI-TAIL	
AUX FUEL XFER FAULT	
APU ACCUMULATOR LOW	
APU FAIL	
APU GEN	
APU OIL TEMP HI	
APU GEN ON	
A/C BASIC WEIGHT	POUNDS
A/C GROSS WEIGHT	POUNDS
ADC PRESS ALTITUDE	FT

PARAMETER	UNIT
ADC IAS	KNOTS
ADC ALT RATE	FT/MIN
RESERVED BAROMETRIC ALT	
RAD ALT ALTITUDE TRANSMIT	FT
WEIGHT ON WHEELS	
ADC OAT	DEG C
PNAV LAT	Degrees,min,sec
PNAV LONG	Degrees,min,sec
PNAV SOURCE	
PNAV CEP	FT
PNAV TRUE A/S	KNOTS
PNAV GND SPD	KNOTS
PNAV TRUE HDG	1-360 degrees
PNAV GND TRACK	1-360 degrees
FLY TO BEARING	1-360 degrees
FLY TO DISTANCE	NAUTICAL MILES
LATERAL STEERING COMMAND	DEGREES
Embedded GPS/INS #1 or 2	1=selected
EGI Blended Solution Protected Status	1=Protected
EGI Degraded	1=Degraded
EGI Figure of Merit	Meters
EGI Sensor/Reference Fail	1=Fail
Acceleration X/Y/Z (Blended Solution)	Ft/Sec ²
EGI Velocity X/Y/Z (Blended Solution)	Ft/Sec
EGI Pitch Rate	Deg/Sec
EGI Roll Rate (Blended Solution)	Deg/Sec
EGI Yaw Rate (Blended Solution)	Deg/Sec
EGI Pitch (Blended Solution)	Deg
EGI Roll Angle (Blended Solution)	Deg
EGI Magnetic Heading (Blended Solution)	Deg
EGI True Heading (Blended Solution)	Deg
EGI Latitude	Deg
EGI Longitude (Blended Solution)	Deg
EGI MSL Altitude	Feet
EGI Platform Azimuth	Deg
EGI Time Tag	Microseconds
STABILATOR	
STAB-001 STABILATOR	DEGREES
ROTOR BRAKE ON	
ROTOR DE-ICE FAIL-MAIN	

PARAMETER	UNIT
ROTOR DE-ICE FAULT-MAIN	
TAIL ROTOR SERVO	
PRIME BOOST PUMP ON	
BOOST PUMP ON	
HYDRAULIC PUMP	
BACK UP RESERVOIR LOW	
PRIMARY SERVO PRESS	
RESERVOIR LOW	
PUMP/VALVE FAIL	
BOOST SERVO OFF	
BACK UP PUMP ON	
AC ESSENTIAL BUS OFF	
DC ESSENTIAL BUS OFF	
EXTERNAL POWER CONNECTED	
BATTERY LOW CHARGE	
BATTERY FAULT	
AFCS DEGRADED	
SAS FAIL	
HEADING SELECT MODE	
TRACK SELECT MODE	
AIRSPEED SELECT MODE	
GROUNDSPEED SELECT MODE	
VERTICAL SELECT MODE	
BAROMETRIC SELECT MODE	
RAD ALT SELECT MODE	
ILSBC MODE	
TACAN MODE	
TCNP MODE	
VOR MODE	
VORTAC MODE	
ILS MODE LAT	
ILS MODE LONG	
ILS MODE VERT	
FPLN MODE LAT	
FPLN MODE LONG	
FPLN MODE VERT	
THOV MODE LAT	
THOV MODE LONG	
THOV MODE VERT	
HOV MODE LAT	

PARAMETER	UNIT
HOV MODE LONG	
HOV MODE VERT	
PILOT GUIDANCE SOURCE	
COPILOT GUIDANCE SOURCE	
FD NAV XFER	
FLIGHT MODE	
PITOT HEAT-LH	
PITOT HEAT-RH	
ICE DETECTION	
ICE DETECT FAIL	
ECS HI PRESS	
ECS SHUTDOWN	
CCXP-001 IFF EMERGENCY	
COMMUNICATIONS EMCON CONTL	
RAD ALT EMCON	
MODE 4 CODE HOLD	
IFF	
TCAS MUTE	
ARMAMENT ARMED	
CARGO HOOK OPEN	
FLOTATION ARMED	
HOOK ARMED	
PARKING BRAKE ON	
SEARCH LIGHT ON	
SPREAD COMPLETE	
TAIL WHEEL UNLOCKED	

Appendix C

H65C/D System Description

Location

The VFDR in the H-65C/D is located in the avionics rack in the same place as the original VADR on the B Model Aircraft.

Power

The VFDR receives 28 volts DC from the number one battery bus contactor. Circuit protection is provided by the VFDR circuit breaker located on the avionics rack circuit breaker panel. VFDR operation in the H-65C is automatic and will operate whenever the aircraft battery is switched on. However, flight data will only be captured when the Avionics Bus is energized and the 1553 is active.

System Indicator

VFDR system operation is monitored by the CDU via the 1553 Data Bus System and responds with bits of information for GO/ NO-GO.

Parameters

The VFDR on the H-65C/D is an *active* component of the 1553 Data Bus System. The data parameters recorded include:

- Approximately 25 hours of data on over 160 flight parameters (from the MIL-STD-1553 data bus and ARINC 429)
- Approximately 4 hours of audio (from the pilot's headset audio, flight mechanic headset audio and an area microphone located on the 4630 bulkhead in the baggage compartment)
- A discrete parameter to indicate right pedal travel* of 95% or more (signal is via a sensor installed on the T/R servo control assy)
- Engine data captured straight from the Digital Engine Control Unit (DECU), as well as the 1553
- This data is provided via ARINC 429 and will capture the engine data from battery turn on

The next table depicts the recorded parameters monitored on the HH-65C:

PARAMETER	UNIT
Engine Collective Pitch	%
Engine Fuel Flow	lbs/hr
Engine T4 (MGT)	C
Engine Helicopter Outside Pressure	Mbars
Engine Gas Generator Speed	%
PARAMETER	UNIT
Engine N1 Difference	%
Engine Power Turbine Speed	%
Engine Outside Pressure	Psi
Engine Bleed Air Pressure	psi
Engine Outside Temp	deg C
Engine Total Temp	deg C
Engine Torque	%
Engine Chip Detector	1=detected
Engine Fuel Flow	lbs/hr
Fuel Reserve	lbs
Engine Main Gearbox Temp	deg C
Engine Gas Generator Speed	%
Engine Power Turbine Speed	%
Engine Oil Pressure	PSIG
Engine Oil Temp	deg C
CDU Calculated Total Torque	%
Main Rotor Speed	%
Main Gearbox Oil Pressure	PSIG
Main Gearbox Oil Temp	deg C
Main Gearbox Chip Detector	1=detected
Tail Rotor Chip Detector	1=detected
Total Fuel Quantity	lbs
DECU LOGIC PARAMETERS	
Channel A in Control State	
FCS Position (Neutral/Stop/Idle/Flight/Backup)	
OEI Stop Selected	
OEI Stop	
High N2 Datum Input	
Bleed Valve Position	
Training Input (Idle/Flight/Manual)	
Self Test/Stepper Motor Test	
Engine Control Status (Init/Stop/Start/N1 Idle/ Freezing/Run-Up/Flight/Flameout)	
Twin Engine Stop Increased	
Overspeed Detected	

Proportional Mode	
Trim Inhibited	
N1 Zone Time	
Degraded Operation	
Loss of Automatic Control Function	
Automatic Mode	
N1 Difference	
HIPSARM TIME (5-27:30/27:30-30/>30min)	
DECU FAILURE PARAMETERS	
Watchdog Trip/Clock Failure	
Training Selector Failure	
T0 Consistency Failure	
Collective Pitch Failure	
Raw T4 Failure	
T0 Failure	
P3 Failure	
Raw TQ Failure	
TQ Conformation Failure	
FADEC Internal Failure	
Engine Flame out/P3 Drift	
Engine P0 Failure	
FMU Revolver Failure	
Stepper Motor Failure	
Bleed Valve Failure	
ARINC Cross Talk Failure	
N1 Failure	
N2 Failure	
Helicopter P0 Failure	
Alternator Failure	
Stop Solenoid Valve Failure	
Overspeed System Failure	
Limit Light On	1=on
Right Rudder Pedal Max	1=true
CDU System Time	seconds
Date-Month	
Date-Day	
Date-Year	
Tail Number	
Weight On Wheels	1=ground
Landing Gear Down	1=true
Aircraft Gross Weight	lbs

Basic Aircraft Weight	lbs
Crew Weight	lbs
Computed Wind Direction	degrees
Computed Wind Speed	knots
Wind Data Valid (Beaufort)	1=valid
Barometric Altitude	ft
Radar Altitude	ft
Vertical Velocity	ft/min
Pitot Static Airspeed	knots
True Airspeed	kts
PARAMETER	UNIT
Ground Speed	Knots
Present Position Latitude	degrees
Present Position Longitude	degrees
Pitch (ADI)	degrees
Roll Attitude	degrees
Compass Data	degrees
Magnetic Variation	degs
Selected Course	degrees
Lateral OADS Airspeed	knots
Longitude OADS Airspeed	knots
OADS Temperature	deg C
TACAN Bearing	degrees
TACAN Distance	nautical miles
FLPN to Waypoint Latitude	deg
FLPN to Waypoint Longitude	deg
Flight Plan Offset Discrete	1=offset
Lateral Deviation	ft
Vertical Deviation	ft
Cross Track Deviation	ft
Track	degrees
LNAV Leg Alert	1=on
VNAV Deviation Enable	1=enabled
VNAV Leg Alert	1=on
Time To Go (To Waypoint)	seconds
Vertical Command	ft
VOR Bearing	degrees
Air Data/Dead Reckoning	1=selected
Approach Flight Mode	1=selected
Video Mode (FLIR or Camera)	1=disp md

Hover Mode	1=disp md
Display Mode	1=disp md
RMAP Mode	1=disp md
MFD Fail	1=fail
PFD Mode	1=disp md
RADAR Mode	1=disp md
RMAP Mode	1=disp md
RNAV Selected	1=selected
T-Hover Capture	1=true
VOR Selected (NAV Source)	1=selected
TACAN Range Selection	1=selected
TACAN Selected (NAV Source)	1=selected
PARAMETER	UNIT
Enroute Flight Mode Discrete	1=selected
RNAV To or From	1=to
Roll Command	degrees
Terminal Flight Mode	1=selected

The table below depicts the Recorded Parameters monitored on the MH-65D:

PARAMETER	UNIT
Engine Collective Pitch	%
Engine Fuel Flow	lbs/hr
Engine T4 (MGT)	C
Engine Helicopter Outside Pressure	Mbars
Engine Gas Generator Speed	%
Engine N1 Difference	%
Engine Power Turbine Speed	%
Engine Outside Pressure	psi
Engine Bleed Air Pressure	psi
Engine Outside Temp	deg C
Engine Total Temp	deg C
Engine Torque	%
Engine Chip Detector	1=detected
Engine Fuel Flow	lbs/hr
Fuel Reserve	lbs
Engine Main Gearbox Temp	deg C
Engine Gas Generator Speed	%
Engine Power Turbine Speed	%
Engine Oil Pressure	PSIG

Engine Oil Temp	deg C
CDU Calculated Total Torque	%
Main Rotor Speed	%
Main Gearbox Oil Pressure	PSIG
Main Gearbox Oil Temp	deg C
Main Gearbox Chip Detector	1=detected
PARAMETER	UNIT
Tail Rotor Chip Detector	1=detected
Total Fuel Quantity	lbs
DECU LOGIC PARAMETERS	
Channel A in Control State	
FCS Position (Neutral/Stop/Idle/Flight/Backup)	
OEI Stop Selected	
OEI Stop	
High N2 Datum Input	
Bleed Valve Position	
Training Input (Idle/Flight/Manual)	
Self Test/Stepper Motor Test	
Engine Control Status (Init/Stop/Start/N1 Idle/ Freezing/Run-Up/Flight/Flameout)	
Twin Engine Stop Increased	
Overspeed Detected	
Proportional Mode	
Trim Inhibited	
N1 Zone Time	
Degraded Operation	
Loss of Automatic Control Function	
Automatic Mode	
N1 Difference	
HIPSARM TIME (5-27:30/27:30-30/>30min)	
DECU FAILURE PARAMETERS	
Watchdog Trip/Clock Failure	
Training Selector Failure	
T0 Consistency Failure	
Collective Pitch Failure	
Raw T4 Failure	
T0 Failure	
P3 Failure	
Raw TQ Failure	
TQ Conformation Failure	
FADEC Internal Failure	
Engine Flame out/P3 Drift	

Engine P0 Failure	
FMU Revolver Failure	
Stepper Motor Failure	
Bleed Valve Failure	
ARINC Cross Talk Failure	
N1 Failure	
N2 Failure	
PARAMETER	UNIT
Helicopter P0 Failure	
Alternator Failure	
Stop Solenoid Valve Failure	
Overspeed System Failure	
Limit Light On	1=on
Right Rudder Pedal Max	1=true
CDU System Time	seconds
Date-Month	
Date-Day	
Date-Year	
Tail Number	
Weight On Wheels	1=ground
Landing Gear Down	1=true
Aircraft Gross Weight	lbs
Basic Aircraft Weight	lbs
Crew Weight	lbs
Computed Wind Direction	degrees
Computed Wind Speed	knots
Wind Data Valid (Beaufort)	1=valid
Barometric Altitude	ft
Radar Altitude	ft
Vertical Velocity	ft/min
Pitot Static Airspeed	knots
True Airspeed	kts
Ground Speed	Knots
Present Position Latitude	degrees
Present Position Longitude	degrees
Pitch (ADI)	degrees
Roll Attitude	degrees
Compass Data	degrees
Magnetic Variation	degs
Selected Course	degrees
Lateral OADS Airspeed	knots

Longitude OADS Airspeed	knots
OADS Temperature	deg C
TACAN Bearing	degrees
TACAN Distance	nautical miles
FLPN to Waypoint Latitude	deg
FLPN to Waypoint Longitude	deg
Flight Plan Offset Discrete	1=offset
Lateral Deviation	ft
PARAMETER	UNIT
Vertical Deviation	ft
Cross Track Deviation	ft
Track	degrees
LNAV Leg Alert	1=on
VNAV Deviation Enable	1=enabled
VNAV Leg Alert	1=on
Time To Go (To Waypoint)	seconds
Vertical Command	ft
VOR Bearing	degrees
Air Data/Dead Reckoning	1=selected
Approach Flight Mode	1=selected
Video Mode (FLIR or Camera)	1=disp md
Hover Mode	1=disp md
Display Mode	1=disp md
RMAP Mode	1=disp md
MFD Fail	1=fail
PFD Mode	1=disp md
RADAR Mode	1=disp md
RMAP Mode	1=disp md
RNAV Selected	1=selected
T-Hover Capture	1=true
VOR Selected (NAV Source)	1=selected
TACAN Range Selection	1=selected
TACAN Selected (NAV Source)	1=selected
Enroute Flight Mode Discrete	1=selected
RNAV To or From	1=to
Roll Command	degrees
Terminal Flight Mode	1=selected

Appendix D

HU-25 System Description

Location

The VFDR in the HU-25 is located in the tail cone section of the airframe.

Power

The VFDR receives 115 volts AC from the Copilot Instrument Bus. Circuit protection is provided by the VFDR circuit breaker located on the Main circuit breaker panel. VFDR operation in the HU-25 is automatic and will operate whenever the Copilot Instrument Bus is switched on.

System Indicator

A VFDR control panel, located on the pilot's side control panel, provides the means to conduct a self-test of the VFDR. Initiating a self-test will result in the illumination of an amber light on the control panel, followed by illumination of a green light indicating proper operation. Illumination of the amber light alone during the self-test or while in flight indicates a recorder malfunction.

Parameters

The VFDR on the HU-25 acts as a bus monitor on the 1553 Data Bus System. The data parameters recorded include:

- Approximately 25 hours of data on over 100 flight parameters
- Approximately 2 hours of audio (from the ICS, VHF, UHF transmissions as well as an area microphone located in the flight deck overhead)

The table below depicts the recorded parameters monitored on the HU-25:

PARAMETER	UNIT
UTC Time	HR:MIN:SEC
Fuel Metering Valve	Mamps
Computed Fuel Ratio	Ru
AUX Tank Transfer Lt	DISCRETE
Engine Fire Left/Right	DISCRETE
Fuel Flow Engine	PPH
Fuel Flow Indicated	PPH
Fuel On Board	LBS
Fueling System	DISCRETE
Nacelle Over Heat	DISCRETE

PARAMETER	UNIT
Ignition Sw ON	DISCRETE
IGV Current Eng	Mamps
Inlet Guide Angle	DEG
Inlet Pressure	PSI
Inlet Temp	DEG C
ITT Engine 2	DEG C
Bleed Control	DISCRETE
Transfer Failure Lt	DISCRETE
N1 Actual	% RPM
N2 Actual	% RPM
N3 Compressor	% RPM
Oil Pressure Engine	PSI
Oil Temperature Engine	DEG C
Throttle Lever Position	%
Turbine Inlet Temp	DEG C
APU AC Gen Ready	DISCRETE
APU DC Amps	AMPS
APU EGT	DEG F
APU Fire	DISCRETE
APU Low Oil Press Lt	DISCRETE
APU RPM	%RPM
WOW	DISCRETE
Gear Up	DISCRETE
Hydraulic Pressure 1/2	PSI
Hydraulic Pressure AUX	PSI
Anti-Ice Flow On	DISCRETE
Anti-Ice Hot	DISCRETE
Anti-Ice Sw Pos	DISCRETE
Nose Gear Down	DISCRETE
Manual Mode Com On	DISCRETE
Master Caution Reset	DISCRETE
AC Gen Fault Reset	DISCRETE
AC Amps	AMPS
AC EXT Power On	DISCRETE
Avionics Bus On	DISCRETE
Batt Amps	AMPS
Batt Input Voltage	VDC
Invertor On	DISCRETE
GEN Amps	AMPS
Main AC Gen On	DISCRETE

PARAMETER	UNIT
RADAR Bus On/Off	DISCRETE
Sensor Bus On	DISCRETE
Aileron Position	DEG
Elevator Position	DEG
Rudder Position	DEG
Squat Switch	DISCRETE
Wheel Well Fire	DISCRETE
Wing Anti-Ice Fail Lf/Rt	DISCRETE
Rear Compartment Fire	DISCRETE
Barometric Corrected Altitude	FT
PressureAltitude	FT
Radio Height	FT
Vertical Speed	FT/MIN
ComputedAirspeed	KT
Calibrated Airspeed	KT
True Airspeed	KT
Ground Speed	KT
Indicated Airspeed	KT
True Heading	DEG
Magnetic Heading	DEG
Bearing	DEG
Course	DEG
Pitch Angle Right	DEG
Roll Angle	DEG
Initial Long/Lat	DEG
Long/Lat	DEG
Wind Angle	KT
Wind Direction	DEG
Wind Speed	KT
Acceleration X/Y/Z	G
Cabin Pressure	PSI
Static Air Temperature	DEG
AP Engaged	DISCRETE
ADF Bearing	DEG
ALT SEL Engaged	DISCRETE
A/P Altitude	DISCRETE
A/P Approach	DISCRETE
A/P Heading	DISCRETE
NAV Mode	DISCRETE
RNAV Mode	DISCRETE

PARAMETER	UNIT
TACAN Mode	DISCRETE
V/L Mode	DISCRETE
VNAV Mode	DISCRETE
Distance To Go	NM
DME Distance	NM
Drift Angle	DEG
Figure Of Merit	METERS
Ground Track	DEG
Glideslope Deviation	DOTS
GPS Altitude	FT
GPS Long/Lat	DEG
GPS Status (AE/RPU/Batt/CDU Fail)	DISCRETE
GPS Velocity X/Y/Z	FT/SEC
Heading Engaged	DISCRETE
IAS Engaged	DISCRETE
Lateral Deviation	DOTS
Localizer Deviation Dots	DOTS
Selected Course/Heading	DEG
Track	DEG
TACAN Bearing/Distance	DEG
TACAN Engaged	DISCRETE
VL Engaged	DISCRETE
VNAV Engaged	DISCRETE
VOR Bearing	DEG
VS Engaged	DISCRETE
Yaw Dampener Engaged	DISCRETE
Mach Engaged	DISCRETE

Appendix E

HC-130H System Description

Location

The VFDR in the HC-130H is located in the aft overhead section of the fuselage on the right side.

Power

The VFDR receives 115 volts AC from the Essential AC Bus. Circuit protection is provided by the VFDR circuit breaker located on the Copilot's upper circuit breaker panel. VFDR operation in the HC-130H is automatic and will operate whenever the Essential AC Bus is switched on.

System Indicator

A VFDR control panel, located on the Navigator's station control panel, provides the means to conduct a self-test of the VFDR. Initiating a self-test will result in the illumination of an amber light on the control panel, followed by illumination of a green light indicating proper operation. Illumination of the amber light alone during the self-test or while in flight indicates a recorder malfunction.

Parameters

The VFDR on the HC-130H acquires data from the Flight Data Acquisition Unit (FDAU). The FDAU acquires data from discrete, analog and digital signals throughout the aircraft. The data parameters recorded include:

- Approximately 25 hours of data on over 100 flight parameters
- Approximately 2 hours of audio (from the Pilot, Copilot, Flight Engineer's headsets as well as an area microphone located in the flight deck overhead

The table below depicts the recorded parameters monitored on the HC-130H:

PARAMETER	UNIT
UTC	HR:MIN:SEC
Baro Corr Altitude	FT
PRESS ALTITUDE	FT
Pressure Altitude	FT
Radio Altitude	FT
Vertical Speed	FT/MIN
Acceleration X/Y/Z	G
Groundspeed	KTS
True Airspeed	KTS
Computed Airspeed	KTS

PARAMETER	UNIT
Latitude	DEG
Longitude	DEG
Magnetic Heading	DEG
True Heading	DEG
Pitch Angle	DEG
Roll Angle	DEG
Wind Direction	DEG
Wind Speed	KTS
Aircraft Cabin Pressure	PSI
Headwind	KTS
Outside Air Temperature	DEG
Aileron Trim	DEG
Elevator Trim	DEG
Rudder Trim	DEG
Flap Position	%
Gear Lever Up/Down	DISCRETE
Gear Up/Down	DISCRETE
Landing Lights Extended	DISCRETE
Landing Lights On/Off	DISCRETE
Aft Door Closed	DISCRETE
Crew Door Opened/Closed	DISCRETE
Right Gear Up/Down	DISCRETE
AP Status Engaged	DISCRETE
AP Coupled Off/On	DISCRETE
AP Indicated Airspeed Off/On	DISCRETE
CDNU NAV Mode Off/On	DISCRETE
INS NAV Mode Off/On	DISCRETE
Marker Beacon Inner/Middle/Outer	DISCRETE
Localizer/Glideslope Deviation	DOTS
TACAN NAV Mode Off/On	DISCRETE
VOR Frequency	Hz
VOR/ILS NAV Mode Off/On	DISCRETE
DME Distance	NM
Drift Angle	DEG
ILS Status Enabled	DISCRETE
Roll HDG Off/On	DISCRETE
Roll NAV/LOC Off/On	DISCRETE
Pitch ALT Off/On	DISCRETE
Pitch ALT SEL Off/On	DISCRETE
Pitch APPR/GS Off/On	DISCRETE

PARAMETER	UNIT
Pitch VS Off/On	DISCRETE
GPWS Warning	DISCRETE
Condition Lever	DEG
Cooling Augmentation	DISCRETE
Beta	DISCRETE
Fire Warning Light	DISCRETE
Fuel Dump Active Lf/Rt	DISCRETE
Fuel Dump Switch	DISCRETE
Fuel Dump Switch Position Aux Lf/Rt	DISCRETE
Fuel Dump Switch Position Ext Lf/Rt	DISCRETE
Fuel Flow Engine	PPH
Fuel Pressure Normal Engine	DISCRETE
Fuel Pump Engine	DISCRETE
Gearbox Oil Pressure Engine	PSI
Generator Failed	DISCRETE
Nacelle Overheat Warning Engine	DISCRETE
Negative Torque Engine	DISCRETE
Oil Cooler Flap Position Engine	DEG C
Oil Pressure	PSI
Oil Quantity	GAL
Oil Temperature	DEG C
Prop Oil Level Low	DISCRETE
Prop RPM	%
Throttle Lever Position	DEG
Torque	in-lbs
Turbine Inlet Temp	DEG C
Prop Synchrophasing Control Engaged 2/3	DISCRETE
Aux Pump On/Off	DISCRETE
Auxiliary Hydraulic Pressure	PSI
Brake Hydraulic Pressure	PSI
Emergency Brake Hydraulic Pressure	PSI
Engine Boost Hydraulic Pressure	PSI
Engine Booster Pressure Warning	DISCRETE
Engine Utility Hydraulic Pressure	PSI
Engine Utility Pressure Warning	DISCRETE
Hydraulic Oil Pressure Low System 1-4	DISCRETE
Rudder Boost Hydraulic Pressure	PSI
Rudder Utility Hydraulic Pressure	PSI
Ice Detected Master Warning	DISCRETE

Appendix F

HC-130J System Description

The CVR/FDR system on board the HC-130J is a two-box solution, consisting of separate Cockpit Voice Recorder (CVR) and Flight Data Recorder (FDR).

Location

The CVR and FDR in the HC-130J are located in the aft overhead section of the fuselage over the ramp.

Power

The CVR and FDR receive 28 volts DC from the Essential DC Bus. CVR and FDR operation in the HC-130J is automatic and will operate whenever the Essential DC Bus is on.

Parameters

The FDR on the HC-130J acquires 25 hours of over 100 flight parameters from the 1553 data bus system. The CVR on the HC-130J acquires data approximately 2 hours of audio (from the Pilot, Copilot headsets as well as an area microphone located in the flight deck overhead).

PARAMETER	UNIT
Time (GMT)	HRS:MIN:SEC
Aileron position	DEG
Elevator position	DEG
Flap position	DEG
Rudder position	DEG
Pitch trim position	DEG
Door Position	Closed/Open
Ramp Position	Closed/Open/Transit
Landing Gear Left/Nose/Right	Down/Trans/Up
Differential cabin pressure	PSI
Jump Light	Off/On
Master Caution and Warning	
Baroset corrected pressure altitude	FT
Radio Altitude	FT
Total Altitude	FT
Calibrated airspeed	KTS
Ground Speed	KTS
Magnetic heading	DEG
Pitch attitude 1-4	DEG
Roll attitude	DEG

Wind direction	DEG
Wind speed	KTS
Latitude	HRS:MIN:SEC
Longitude	HRS:MIN:SEC
Drift angle	DEG
Total air temperature	DEG C
Lateral Acceleration	Gs
Longitudinal acceleration	Gs
Vertical acceleration	Gs
Gross weight	LBS
Weight on Wheels	Air/Ground
Auto Pilot Engaged	Engaged/DisEngaged
Auto Pilot Lateral Mode	None/Nav Capture
Auto Pilot Pitch Mode	Alt Hold/GS Capture/Vert Air Speed Hold
Angle of attack vane	DEG
Glideslope deviation	DEG
Localizer deviation	DEG
Marker Beacon Passage	Inner/Middle/Outer
NAV frequency	
DME distance	NM
HF Radio Keying	HF1/HF2/HF 1&2
UHF Keying	1/2/1&2
VHF Keying	1/2/1&2
Aux Low Pressure	Norm/Low
Booster Low Pressure	Norm/Low
Brake pressure	PSI
Utility Low Pressure	DISCRETE
Engine Air Start	Norm/Start
Engine Fire Warning	OK/Fire
Engine fuel flow	LBS/HR
Engine Gear Box Oil Low	Norm/Low
Engine measured gas temperature	DEG C
Engine gas generator speed	RPM
Engine Oil Level Low	Norm/Low
Engine propeller speed	RPM
Engine torque	FT/LBS
Propeller blade angle	DEG
Throttle lever position	DEG
Fuel weight	LBS
APU Fire Warning	OK/Fire
TCAS Mode	Fail/Standby/TA/TA-RA/

TAWS (See Table)
TAWS Table
Enable
Obstacle Caution
Obstacle Warning
Terrain Caution
Terrain Warning
Terrain Clearance Floor
Terrain Inhibit
GCAS warning (See Table)
GCAS Table
Altitude
Bank Angle
Below Glideslope
Sink Alert
Glideslope
Minimums
Pull Up
Sink Rate
Terrain
Too Low Flaps
Too Low Gear
Too Low Terrain
Power Off

Appendix G

G-V System Description

The VFDR system on board the G-V is a two-box solution, consisting of separate digital solid state cockpit voice recorder (SSCVR) and digital flight data recorder (DFDR).

CVR and DFDR System

Description

The SSCVR is installed in the aircraft to monitor and record audio from the cockpit interphone system, with an additional cockpit microphone installed on the flight station overhead console. The DFDR is installed in the aircraft to record data related to the operation of the aircraft. Both units utilize solid-state flash memory as the recording medium. The CVR and the FDR each measures 5.5 inches by 5 inches by 13 inches, and when fitted with an underwater acoustic beacon weighs approximately 10 pounds.

The table below depicts the recorded parameters monitored on the G-V:

PARAMETER	PARAMETER
Sync	Time (GMT) Low
Sub frame Counter	Engine EPR Command
Time (GMT) High	True Track Angle
Pressure Altitude High	Applied Brake Pressure
Pitch Attitude	Pitch Attitude
VOR/ILS Frequency High	EPR Command Set
VOR/ILS Frequency	Stabilizer Position
Normal Accel	Selected DH
Longitudinal Accel	Normal Accel
Pitch Trim	Lateral Accel
Rudder Position	Date (Year)
Aileron Position	Elevator Position
L Angle of Attack	Roll Attitude
Wind Speed	R Angle of Attack
Vertical Deviation	Date (Month, Day)
Lateral Deviation	Throttle Position
Indicated Airspeed	HP
Ground Speed	L & R EVM HP

PARAMETER	PARAMETER
Pitch Trim Position	Fuel High
TGT	Fuel Low
GPWS/WOW/Event Marker	Mag Hdg
EVM LP	Hyd. Press.
Pitch Attitude	Pitch Attitude
Gnd Spoiler Position	LP
Selected LRUs (discretes)	DME Distance
Selected Nav Source High	Selected Rad Alt
Selected Nav Source	Selected Altitude
Selected Heading	Selected Airspeed/Mach
Selected Course	Selected Airspeed/FPA
Selected Baro set	SAT
Oil Press	Lateral Mode/Disc
Flap Position	Vertical Mode/Disc
EPR	L Speed Brake Position/Disc
Flap Handle Position	FMS Latitude High
Aircraft Tail no. High	FMS Latitude Low
FMS Longitude Low	FMS Longitude High

Appendix H

HC-144A System Description

The VFDR system on board the HC-144A is a two-box solution, consisting of separate digital solid state cockpit voice recorder (SSCVR) and digital flight data recorder (DFDR).

CVR/FDR System

Description

The SSCVR is installed in the aircraft to monitor and record audio from the cockpit interphone system, with an additional cockpit microphone installed on the flight station overhead console. The DFDR is installed in the aircraft to record data related to the operation of the aircraft. Both units utilize solid-state flash memory as the recording medium. The CVR and the FDR each measures 5.5 inches by 5 inches by 13 inches, and when fitted with an underwater acoustic beacon weighs approximately 10 pounds.

The table below depicts the recorded parameters monitored on the HC-144A:

PARAMETER	UNIT
UTC Time	HR:MIN:SEC
Master Caution (35)	DISCRETE
Master Warning (26)	DISCRETE
Barometric Setting	INHG/HPA
Pressure Altitude	FT
Radio Height	FT
ADC Source	DISCRETE
Groundspeed	DISCRETE
Indicated Airspeed	KTS
Total Air Temperature	DEG C
Latitude/Longitude	HR:MIN:SEC
Magnetic/True Heading	DEG
Roll/Pitch Angle	DISCRETE
Month/Day/Year	
Acceleration (X/Y/Z)	G
Wind Direction	DEG
Wind Speed	KTS
Aileron Left Position	DEG
Elevator Position	DEG
Rudder Position	DEG
Elevator Trim	DEG
Rudder Trim	DEG
Flap Position	DEG

PARAMETER	UNIT
Control Column Position	DEG
Control Column Force	LBS
Control Wheel Position	DEG
Control Wheel Force	LBS
Rudder Pedal Force	LBS
Rudder Pedal Position	DEG
Stick Shaker	DISCRETE
Air Intake De-icing On	DISCRETE
AOA Antilce On	DISCRETE
Auto Heavy De-icing On	DISCRETE
Pitot Anti Ice On	DISCRETE
Windshield Heater Anti Ice On	DISCRETE
Bleed Valve Position	DISCRETE
Brake Pedal Application	DISCRETE
Engine Fail	DISCRETE
Fuel Filter Bypass	DISCRETE
Fuel Flow	PPH
Fuel Low Wing Tank	DISCRETE
ITT Engine	DEG C
Ng	%
Np	%
Oil Filter Bypass	DISCRETE
Torque Engine	%
TR Deployed Engine	DISCRETE
Hydraulic Oil Pressure Low System	DISCRETE
Hydraulic Oil Pressure System	PSI
Brake Pressure	PSI
Display Mode	DISCRETE
HF Keying	DISCRETE
History Overlay Selected	DISCRETE
IEDS Upper/Lower Failure	DISCRETE
WOW (Left/Nose/Right)	DISCRETE
Landing Gear Control Selection	DISCRETE
Gear Up/Down (Left/Nose/Right)	DISCRETE
Loss of Cabin Pressure	DISCRETE
Mode 1-5	DISCRETE
Mode 6 Callouts (36)	DISCRETE
Mode 7 Visual Alert/Warning	DISCRETE
Primary Propeller De-icing On	DISCRETE
AC Electrical Bus Off	DISCRETE

PARAMETER	UNIT
DC Battery Bus	DISCRETE
DC Generator Bus	DISCRETE
ADL FDAU Enable	DISCRETE
Audio On	DISCRETE
Event Marker	DISCRETE
Background Data Overlay Selected	DISCRETE
AP Engaged	DISCRETE
Pitch Engaged	DISCRETE
Roll Mode Engaged	DISCRETE
Yaw Damper Engaged	DISCRETE
Drift Angle	DEG
DME Frequency	MHz
VOR/ILS/MLS Frequency	MHz
Active Waypoint ID	
Actual Nav Performance	NM
AHRS Source	DISCRETE
GLS Channel	DISCRETE
Airports Selected	DISCRETE
Alternate Flight Plan Overlay Selected	DISCRETE
Altitude Capture	DISCRETE
AltitudeRate to Maintain(100-3200)	FT
Angle of Attack	FT
APPR Armed/Capture	DISCRETE
Approaching Runway Information	DISCRETE
AT SPD HOLD Engaged	DISCRETE
Bearing Source	DISCRETE
Dead Reckoning	DISCRETE
DistanceTo Go	NM
Distance To Runway Threshold	NM
DME Distance/Frequency	NM/MHz
DME Mode	DISCRETE
Drift Angle	DEG
EGPWS Status	DISCRETE
FD and AP Failure	DISCRETE
FMS Selected	DISCRETE
Glideslope Deviation	DOTS
Localizer Deviation	DOTS
GPWS Alerts (25)	DISCRETE
GS Captured	DISCRETE

PARAMETER	UNIT
HDG Sync	DISCRETE
High Altitude MOAs Display	DISCRETE
High Altitude Nav Aids Display	DISCRETE
High Altitude SUAs Display	DISCRETE
Marker Beacon (Inner/Middle/Outer)	DISCRETE
IAS Hold	DISCRETE
Landing System Selected Mode	DISCRETE
Low Altitude MOAs Display	DISCRETE
Low Altitude Nav Aids Display	DISCRETE
Low Altitude SUAs Display	DISCRETE
Lower Display Composite Mode	DISCRETE
MLS Selection (4)	DISCRETE
Nav Armed/Capture	DISCRETE
Navigation Source	DISCRETE
PEM Failure	DISCRETE
PFD Compass Format	DISCRETE
PFD Range	DISCRETE
PFD Status Format	DISCRETE
Pitch ALT Armed	DISCRETE
Pitch Modes (7) Engaged	DISCRETE
Selected Airspeed	KTS
Selected Altitude	FT
Selected Course	DEG
Selected Decision Height	FT
Selected FMS	DISCRETE
Selected Heading	DEG
Selected Navigation Mode Status	DISCRETE
Selected Navigation Source	DISCRETE
Selected Track	DEG
Selected Vertical Speed	FT/MIN
Stand-by Propeller De-icing On	DISCRETE
TACAN Channel Frequency/Channel	NM
TACAN Distance/Mode	NM
Tail De-icing On	DISCRETE
TCAS Advisory/Overlay	DISCRETE
TAWS Caution/Warning	DISCRETE
TAWS Display/Overlay	DISCRETE
Turbulence	DISCRETE
(Vee One) V1	DISCRETE
VHF/UHF Keying	DISCRETE

PARAMETER	UNIT
VNAV Capture	DISCRETE
VOR Selection	DISCRETE
Waypoints Altitude Selected	DISCRETE
Windshear Caution	DISCRETE
WXR Overlay/Popup	DISCRETE