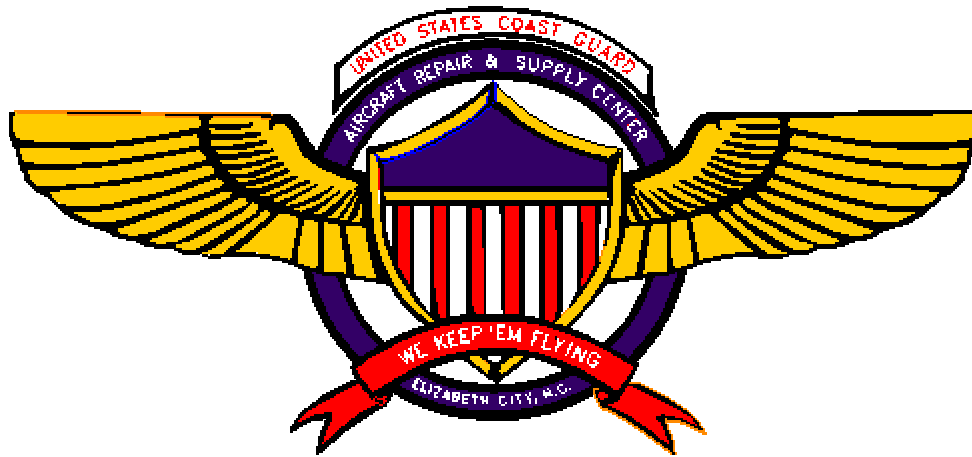


MAY 2005

# VFDR USERS GUIDE

FOR AIR STATION  
AND  
MISHAP ANALYSIS BOARD  
PERSONNEL



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# **Overview**

## **Purpose**

The purpose of this Process Guide is to provide a general overview of the Coast Guard's Voice and Flight Data Recorder (VFDR) Program, including: basic system description, aircraft specific VFDR system installation descriptions, maintenance requirements, data extraction authority, restrictions, and mishap and engineering information retrieval processes/procedures. The VFDR Program, hardware (VFDR boxes), and GSE (computers and software) are owned by the Aviation Safety Division at Coast Guard Headquarters (CG-1131).

## **Introduction**

The true causes of many aircraft mishaps remained unsolved because evidence crucial to the mishap investigation was either destroyed during the mishap sequence or was lost when power to the mishap aircraft's electronic displays was interrupted. Safety organizations in each of the U.S. military services recognized for many years that cockpit voice recorders and flight data recorders were key to overcoming these problems. The challenge these organizations faced, was convincing program managers that investing in flight data recorders would ultimately conserve valuable resources. VFDR use facilitates timely and accurate determination of aircraft mishap causal factors, which in turn leads to the implementation of effective loss control countermeasures.

## **The Coast Guard and VFDR**

The predictive value of VFDRs prompted the USCG to begin VFDR implementation in the HH-60 fleet in May 1996 and the HH-65 fleet in Dec 1996. The HH-60J fleet was completed in March 1997, while installations in the HH-65 fleet were completed by May 1998. The HU-25 fleet has also had a flight data recorder installed for many years, but the aircraft has lacked a voice recorder. Installation of a combination voice and flight data recorder in this aircraft began in Jan 2005 and full implementation is estimated to be completed by Jan 2006. The HC-130H fleet has had a magnetic tape voice recorder in place, but has lacked a flight data recorder. Installations of a digital combination voice and flight data recorder (same type as HU-25) were completed in Jan 2005. In its current configuration the voice recorder is active while the flight data recorder activation pends the installation of a Flight Data Acquisition Unit (FDAU). The FDAU will convert analog and discrete signals into a digital medium acceptable for use by the VFDR. FDAU installs should begin in FY05 and are projected to be completed by the end of FY08. The C-130J and G-5 aircraft were outfitted upon delivery to the Coast Guard.

## **VFDR System (Rotary Wing)**

### **Manufacturer**

The voice and flight data recording system installed in the Coast Guard's helicopter fleet is a Smith's Industries Model 3253C1 Voice and Data Recorder (VADR). Since "VADR" is a trademarked name, it will be identified as the VFDR in this Process Guide. Note: Recapitalization of the 3253C1 begins in FY05. The new generation recorder will be the Smith's Industries VADR 3253 K3.

### **Description**

Unlike prior generation flight recorders, the VFDR is completely solid state and utilizes a flash EEPROM (electrically erasable programmable read-only memory) storage medium for both aircrew voice and aircraft flight data. Compact and lightweight, the VFDR measures only 3.4 inches by 4.25 inches by 8.13 inches and when fitted with an underwater acoustic beacon weighs approximately 9 pounds.

## ***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 of data on 46 flight parameters (from the MIL-STD-1553 data bus)
- A discrete main rotor speed (Nr) parameter
- Approximately 27 minutes 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:**

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

## *HH65B System Description*

### **Location**

The VFDR in the HH-65B is located in the avionics rack.

### **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 HH-65B is automatic and will operate whenever the aircraft battery is switched on.

### **System Indicator**

VFDR system operation is monitored by the CDU-900 via the 1553 Data Bus System and responds with bits of information for GO/ NO-GO.

### **Parameters**

The VFDR on the HH-65B is an *active* component of the 1553 Data Bus System. The data parameters recorded include:

- Approximately 3+ hours of data on 141 flight parameters (from the MIL-STD-1553 data bus)
- Approximately 30 minutes 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.)

\*The aircraft can experience uncommanded left yaw in limited but critical flight regimes requiring the pilot to apply full right pedal to counteract. The sensor provides input to the data bus via the aircraft's signal data converter (SDC).

**The table below depicts the Recorded Parameters monitored on the H-65B/C:**

OADS Temperature
Barometric Altimeter
#1 Engine Ng
#2 Engine Ng
#1 Engine Np
#2 Engine Np
#1 Engine Fuel Flow
#2 Engine Fuel Flow

Total Fuel Quantity
Main Rotor Speed
#1 Engine Torque
#2 Engine Torque
#1 Engine MGT
#2 Engine MGT
#1 Engine Oil Pressure
#2 Engine Oil Pressure

#1 Engine Oil Temp
#2 Engine Oil Temp
MBG Oil Temp
MBG Oil Pressure
#1 Engine Fuel Filter Bypass
#2 Engine Fuel Filter Bypass
Limit Light
Landing Gear Down

Right Rudder Pedal Max
ECU On
Tail Rotor Chip Detector
MGB Chip Detector
#1 Engine Chip Detector
#2 Engine Chip Detector
WOW
CDU System Time
CDU Calculated Total Torque
Vertical Velocity
Basic Aircraft Weight
Aircraft Gross Weight
Crew Weight
Fuel reserve
FLPN To Waypoint Latitude
FLPN To Waypoint Longitude
Ground Speed
True Airspeed
Track
Cross Track Deviation
Magnetic Variation
RNAV Lateral Deviation
RNAV Vertical Deviation
Computed Wind Direction
Computed Wind Speed
RNAV Selected Course
LNAV deviation Valid
VNAV Deviation Valid
VNAV Deviation Enable
VNAV Leg Alert
LNAV Leg Alert
RNAV To/From
Flight Plan Offset
Wind data Valid (Beaufort)
No Rotor Engage Annunciate
Airspeed Limit Annunciate
Enroute Flight Mode
Terminal Flight Mode

Approach Flight Mode
GPS (BC) Valid
GPS (RT) Valid
Time To Go (To Waypoint)
GPS1/Air Data
GPS2/Air Data
GPS1
GPS2
Air Data/Dead reckoning
Lateral OADS Airspeed
Longitudinal OADS Airspeed
TACAN distance
TACAN Bearing
VOR Bearing
Radio Altitude
Pitot Static Airspeed
Pilot HSI Mode
Pilot MAP Mode
Pilot Radar Mode
Pilot HOVER Mode
Pilot RMAP Mode
Pilot FLIR Mode
Pilot PFD Mode
Pilot TACAN Select
Pilot RNAV Select
Pilot VOR Select
Pilot MFD Fail
Pilot COMPASS Valid
Pilot OADS Valid
Pilot TACAN DIST Valid
Pilot TACAN Bearing Valid
Pilot VOR Valid
Pilot RAD ALT Valid
Pilot T-Hover Capture
Pilot Select Range 160
Pilot Select Range 80
Pilot Select Range 40
Pilot Select Range 20
Pilot Select Range 10
Pilot Select Range 5

Pilot Select Range 2.5
Copilot HSI Mode
Copilot MAP Mode
Copilot Radar Mode
Copilot HOVER Mode
Copilot RMAP Mode
Copilot FLIR Mode
Copilot PFD Mode
Copilot TACAN Select
Copilot RNAV Select
Copilot VOR Select
Copilot MFD Fail
Copilot COMPASS Valid
Copilot OADS Valid
Copilot TACAN DIST Valid
Copilot TACAN Bearing Valid
Copilot VOR Valid
Copilot RAD ALT Valid
Copilot T-Hover Capture
Copilot Select Range 160
Copilot Select Range 80
Copilot Select Range 40
Copilot Select Range 20
Copilot Select Range 10
Copilot Select Range 5
Copilot Select Range 2.5
Present Position Latitude
Present Position Longitude
Pilot GPS Latitude
Pilot GPS Longitude
Copilot GPS Latitude
Copilot GPS Longitude
Pilot Pitch Attitude
Pilot Roll Attitude
Copilot Pitch Attitude
Copilot Roll Attitude
Pilot Compass Data
Copilot Compass Data

## VFDR System (Fixed Wing)

### *HU-25 & HC-130H System Description*

#### **Manufacturer**

The voice and flight data recording system installed in the Coast Guard's HU-25's and HC-130's is a L-3 Communications Aviation Recorder Model FA2100 Combination Solid State Voice/Flight Data Recorder. It will be identified as the VFDR in this Process Guide

#### **Description**

The VFDR functions as both a cockpit voice recorder (CVR) and a flight data recorder (FDR). It utilizes a solid-state flash memory as the recording medium. The VFDR measures 5.5 inches by 5 inches by 12.6 inches, and when fitted with an underwater acoustic beacon weighs approximately 9.9 pounds.

**The table below depicts the Recorded Parameters monitored on the HU-25:**

Power Lever Angle
Engine Inlet Temp
Turbine Interstage Temp
Engine Inlet Pressure
N1 Fan Speed
N2 Compressor Speed
N3 Compressor Speed
Inlet Guide Vane Angle
IGV Actuator Current
Fuel Metering Valve Current 1
Fuel Metering Valve Current 2
Computed Fuel Ratio
Permanent Magnet Generator

Battery Input Voltage
Fuel Computer Ref Voltage
ITT Indicated
Master Caution Reset
Fuel Computer Monitor Fault
Altitude
Airspeed
Fuel Flow Indicated
N3 Indicated
Oil Temp Indicated
Oil Pressure Indicated
ITT Reference
Fuel Flow reference
N3 reference
Oil Temp Reference

Oil Pressure Reference
Anti Ice Switch Position
Anti Ice Flow On
Anti Ice Flow
Ignition on/off
Manual Mode Command
Bleed Control on/off
Total Air Temp
Squat Switch
Aircraft Number
Date (1 Sig. Manual Entry at SSO station)



**The table below depicts the Recorded Parameters (projected with the FDAU upgrade) monitored on the HC-130:**

AIRCRAFT CABIN PRESSURIZATION
AIRSPEED TRANSDUCER
AILERON TRIM TAB ACTUATOR
BARO ALTITUDE (GREY CODES FROM IFF)
AUTOPILOT STATUS
AP CPLD #1
HDG #1
NAV/LOC #1
APPR #1
ALT SEL #1
ALT #1
VS
IAS
AP CPLD #2
ALT #2
HDG #2
NAV/LOC #2
APPR #2
CONDITION LEVER TRANSMITTER #1
CONDITION LEVER TRANSMITTER #2
CONDITION LEVER TRANSMITTER #3
CONDITION LEVER TRANSMITTER #4
ELEVATOR TRIM TAB POSITION
ENGINE TACHOMETER GENERATOR #1
ENGINE TACHOMETER GENERATOR #2
ENGINE TACHOMETER GENERATOR #3
ENGINE TACHOMETER GENERATOR #4
ENGINE TORQUE TRANSDUCER #1
ENGINE TORQUE TRANSDUCER #2
ENGINE TORQUE TRANSDUCER #3
ENGINE TORQUE TRANSDUCER #4
ENGINE FIRE WARNING LIGHT #1
ENGINE FIRE WARNING LIGHT #2
ENGINE FIRE WARNING LIGHT #3
ENGINE FIRE WARNING LIGHT #4
ENGINE FUEL LOW LIGHT #1
ENGINE FUEL LOW LIGHT #2
ENGINE FUEL LOW LIGHT #3
ENGINE FUEL LOW LIGHT #4

ENGINE LOW OIL WARN LIGHT
FLAP POSITION TRANSMITTER
GROUND SPEED
HYDRAULIC LOW OIL PRESSURE SWITCH #1
HYDRAULIC LOW OIL PRESSURE SWITCH #2
HYDRAULIC LOW OIL PRESSURE SWITCH #3
HYDRAULIC LOW OIL PRESSURE SWITCH #4
ICE DETECTION MASTER WARNING
INERTIAL HEADING (TRUE HEADING)
INERTIAL HEADING (MAG HEADING)
INERTIAL HEADING (PITCH)
INERTIAL HEADING (ROLL)
LANDING GEAR LEVER POSITION
LANDING GEAR (LEFT UP SWITCH)
LANDING GEAR (LEFT DOWN SWITCH)
LANDING GEAR (RIGHT UP SWITCH)
LANDING GEAR (RIGHT DOWN SWITCH)
LANDING GEAR (NOSE UP SWITCH)
LANDING GEAR (NOSE DOWN SWITCH)
NACELLE OVERHEAT WARNING LIGHT #1
NACELLE OVERHEAT WARNING LIGHT #2
NACELLE OVERHEAT WARNING LIGHT #3
NACELLE OVERHEAT WARNING LIGHT #4
OUTSIDE AIR TEMP
POSITION (GPS)
PROPELLER LOW OIL WARNING LIGHT #1
PROPELLER LOW OIL WARNING LIGHT #2
PROPELLER LOW OIL WARNING LIGHT #3
PROPELLER LOW OIL WARNING LIGHT #4
RUDDER TRIM TAB ACTUATOR
THROTTLE LEVER TRANSMITTER #1
THROTTLE LEVER TRANSMITTER #2
THROTTLE LEVER TRANSMITTER #3
THROTTLE LEVER TRANSMITTER #4
TIME

TRI OR DUAL - AXIS ACCELEROMETER
TRUE AIRSPEED
WIND DIRECTION/VELOCITY
RADALT ALTITUDE
DRIFT ANGLE
PROP SYNCROPHASING CONTROL ENGAGE
GPWS
TCAS
WINDSHEAR
GENERATOR FAIL
CHIP DETECTOR
TIT
MARKER BEACON
ILS/GPS GLIDESLOPE
ILS/GPS LOCALIZER
DME
FUEL QUANTITY TOTAL
OIL PRESSURE #1
OIL PRESSURE #2
OIL PRESSURE #3
OIL PRESSURE #4
ENGINE OIL TEMP #1
ENGINE OIL TEMP #2
ENGINE OIL TEMP #3
ENGINE OIL TEMP #4
P/SIDE NAV MODE (VOR/ILS #1)
P/SIDE NAV MODE (VOR/ILS #2)
P/SIDE NAV MODE (TACAN #1)
P/SIDE NAV MODE (TACAN #2)
P/SIDE NAV MODE (CDNU)
P/SIDE NAV MODE (INS#1)
P/SIDE NAV MODE (INS#2)
CP/SIDE NAV MODE (VOR/ILS #1)
CP/SIDE NAV MODE (VOR/ILS #2)
CP/SIDE NAV MODE (TACAN #1)
CP/SIDE NAV MODE (TACAN #2)
CP/SIDE NAV MODE (CDNU)
CP/SIDE NAV MODE (INS#1)
CP/SIDE NAV MODE (INS#2)
VOR SELECTED FREQ
ILS SELECTED FREQ

## ***HC-130J System Description***

The VFDR system on board the HC-130J is a two-box solution, consisting of separate digital solid state voice recorder (SSCVR) and digital flight data recorder (DFDR).

### ***CVR System***

#### **Manufacturer**

The voice data recording system installed in the Coast Guard's C-130J's is an L-3 Communications Aviation Recorder Model A200S Solid State Voice Data Recorder. It will be identified as the SSCVR in this Process Guide.

#### **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. It utilizes a solid state flash memory as the recording medium. The SSCVR measures 7.5 inches by 5 inches by 14.6 inches, and when fitted with an underwater acoustic beacon weighs approximately 16 pounds.

### ***DFDR System***

#### **Manufacturer**

The data recording system installed in the Coast Guard's C-130J's is an L-3 Communications Aviation Recorder Model F1000 Solid State Flight Data Recorder. It will be identified as the DFDR in this Process Guide.

#### **Description**

The DFDR is installed in the aircraft to monitor and record data related to the operation of the aircraft. It utilizes a solid-state flash memory as the recording medium. The DFDR measures 7.5 inches by 5 inches by 21.50 inches, and when fitted with an underwater acoustic beacon weighs 23.3 pounds.

**The table below depicts the Recorded Parameters monitored on the HC-130J**

Aileron Position	Calibrated Airspeed	Eng Fuel Flow #3
Angle of Attack Vane, left	Differential Cabin Pressure	Eng Fuel Flow #4
Angle of Attack Vane, Right	DME 1 Distance	Eng MGT #1
Barometric Set Corrected Pressure Alt (coarse)	DME 2 Distance	Eng MGT #2
Barometric Set Corrected Pressure Alt (fine)	Drift Angle	Eng MGT #3
Brake Pressure, Normal	Elevator Position	Eng MGT #4
	Eng Fuel Flow #1	Eng NG #1
	Eng Fuel Flow #2	Eng NG #2

Eng NG #3
Eng NG #4
Eng Np #1
Eng Np #2
Eng Np #3
Eng Np #4
Eng Torque #1
Eng Torque #2
Eng Torque #3
Eng Torque #4
Rudder Position
Roll Attitude
Synchronization
Throttle Position #1
Throttle Position #2
Throttle Position #3
Throttle Position #4

Time (seconds)
Time (minutes & hours)
Total Air Temp
Vertical Acceleration
Wind Direction
Wind Speed
Jump Light
APU Fire Warning
Autopilot Engaged
Autopilot Mode
Aux Hydraulic Sys Low Press
Booster Hydraulic Sys Low Press
Cautions & Warnings
GCAS
Door Position

Eng Air Start #1
Eng Air Start #2
Eng Air Start #3
Eng Air Start #4
Eng Fire Warning #1
Eng Fire Warning #2
Eng Fire Warning #3
Eng Fire Warning #4
Flap position
Fuel Weight
Glide slope Deviation
Eng Gearbox Oil Low #1
Eng Gearbox Oil Low #2
Eng Gearbox Oil Low #3
Eng Gearbox Oil Low #4

**The table below depicts the DFDR Discrete Recorded Parameters monitored on the HC-130J. These are available in addition to the above parameters:**

Lateral Acceleration
Latitude
Localizer Deviation
Longitude
Longitudinal Acceleration
Magnetic Heading
Navigation Freq #1
Navigation Freq #2
Pitch Attitude
Pitch (elevator) Trim
Eng Prop Blade Angle #1
Eng Prop Blade Angle #2

Eng Prop Blade Angle #3
Eng Prop Blade Angle #4
Radalt
Eng Power Section Oil Low #1
Eng Power Section Oil Low #4
Main Landing Gear (left)
Main Landing Gear (right)
Nose Landing Gear
Marker Beacon Passage
Radio Keyed-HF #1

Radio Keyed-HF #2
Radio Keyed-UHF #1
Radio Keyed-UHF #2
Radio Keyed-VHF #1
Radio Keyed-VHF #2
Ramp Position
TCAS Mode
Utility Hydraulics Low Press
Weight on Wheels

## ***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 System***

#### **Manufacturer**

The voice data recording system installed in the Coast Guard's G-V is an L-3 Communications Aviation Recorder Model FA2100 Solid State Voice Data Recorder. It will be identified as the SSCVR in this Process Guide.

#### **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. It utilizes a solid-state flash memory as the recording medium. The SSCVR measures 5.5 inches by 5 inches by 13 inches, and when fitted with an underwater acoustic beacon weighs approximately 10 pounds.

### ***DFDR System***

#### **Manufacturer**

The data recording system installed in the Coast Guard's G-V is an L-3 Communications Aviation Recorder Model FA2100FDR Solid-State Flight Data Recorder. It will be identified as the DFDR in this Process Guide.

#### **Description**

The DFDR is installed in the aircraft to record data related to the operation of the aircraft. It utilizes a solid-state flash memory as the recording medium. The DFDR measures 5.5 inches by 5 inches by 13 inches, and when fitted with an underwater acoustic beacon weighs 10 pounds.

**The table below depicts the Recorded Parameters monitored on the G-V:**

Sync	Time (GMT) Low
Sub frame Counter	L Engine EPR Command
Time (GMT) High	R Engine EPR Command
Time (GMT) Low	True Track Angle
Pressure Altitude High	L Applied Brake Pressure
Pressure Altitude Low	R Applied Brake Pressure
Pitch Attitude	Pitch Attitude
VOR/ILS #1 Frequency High	EPR Command Set
VOR/ILS #2 Frequency High	Stabilizer Position

Pitch Trim Position	L Fuel High
L TGT	R Fuel High
R TGT	L Fuel Low/R Fuel Low
GPWS/WOW/Event Marker	Mag Hdg
L EVM LP	L Hyd. Press.
R EVM LP	R Hyd. Press.
Pitch Attitude	Pitch Attitude
L Gnd Spoiler Position	L LP
R Gnd Spoiler Position	R LP

VOR/ILS #1/#2 Frequency Low	Selected DH
Normal Accel	Normal Accel
Longitudinal Accel	Lateral Accel
Pitch Trim	Date (Year)
Rudder Position	Elevator Position
Aileron Position	Roll Attitude
L Angle of Attack	R Angle of Attack
Wind Speed	Date (Month, Day)
Vertical Deviation #1	L Throttle Position
Lateral Deviation #1	R Throttle Position
Vertical Deviation #2	L HP
Lateral Deviation #2	R HP
Indicated Airspeed	Misc. Discretes #1
Ground Speed	Misc. Discretes #2
L EVM HP	Misc. Discretes #3 (Power)
R EVM HP	Misc. Discretes #4

Selected LRUs (discretes)	DME Distance
Selected Nav Source High	Selected Rad Alt #1
Selected Nav Source Low	Selected Altitude
Selected Heading	Selected Airspeed/Mach
Selected Course	Selected Airspeed/FPA
Selected Baro set #1	SAT
Selected Baro set #2	Lateral Mode/Disc
L Oil Press	Vertical Mode/Disc
R Oil Press	L Speed Brake Position/Disc
L Flap Position	R Speed Brake Position/Disc
R Flap Position	FMS Latitude High
L EPR	FMS Latitude Low
R EPR	FMS Longitude High
Flap Handle Position	FMS Longitude Low
Aircraft Tail no. High	Aircraft Tail No. Low

# Use of Voice and Flight Data

## Overview

Highly specialized equipment and computer software provided by the manufacturer is required to extract and analyze VFDR data. It is not possible nor permitted for unauthorized aircrew members or maintenance personnel at field units to extract or “play back” voice or aircraft data directly from the VFDR’s memory.

## Authority

Commandant Instructions M5100.47 series Safety and Environmental Health Manual and M3710.1 series Air Operations Manual provide the authority for the use of the Voice Flight Data Recorder. Currently, authorization to conduct VFDR data extraction can **only** be granted by CG-1131. If a unit believes that VFDR data extraction would benefit the aviation engineering or flight safety community, the command **must first** obtain authorization from CG-1131. CG-1131 will provide direction to coordinate/review with ARSC as appropriate.

## Privileged Status

Voice recordings stored in the VFDR/CVR memory are afforded privileged status. The intercom and radio transmission captured on voice recorders become privileged information and may be used by authorized personnel for mishap investigation, analysis, and certification purposes only.

It is the privileged nature of the voice information as discussed in the COMDTINST 5100.47 reference below, which forms the basis for the Coast Guard’s restricted policy regarding access to all information stored in a VFDR/CVR memory.

“...the actual cockpit voice recordings and names of the individuals whose voices are captured may be safeguarded due to privacy concerns and thus not disclosed.”

In the event that the voice recording provides valuable CRM and/or Human Factors training utility, CG-1131 may seek permission for use from the flight crew involved with the event. CG-1131 is the only authorized requesting source, and release of actual voice recording will only occur with signed consent from each aircrew involved.

## ***Extraction of Voice and Flight Data***

### **Authorized Personnel**

Only the following personnel are authorized to extract VFDR data:

- ARSC representatives or Mishap Analysis Board Members designated by CG-1131 (for Class A and B mishaps)
- Designated ARSC/CG-1131 Safety staff (for Class C, D, or E safety related events)
- Personnel at the U.S. Air Force Safety Center's Mishap Analysis and Animation Facility (MAAF) at the request of CG-1131
- Designated ARSC engineering staff as authorized by CG-1131

## **Data Extraction**

### **When Data May Be Extracted**

Data may be extracted for one of three purposes:

- Class A or Class B mishap investigation analysis.
- Class C, D, or E event for safety/operations analysis, as requested.
- Class C, D, or E event for engineering analysis, as requested.

If a unit has an event that is believed to warrant VFDR data extraction, use the instructions in the Mishap section as a guide.

## **Mishaps**

### ***Class A or Class B Mishaps***

#### **Unit responsibilities**

Secure scene and proceed as follows:

1. Initiate local mishap instructions
2. Pull VFDR circuit breaker as soon as possible after landing or when scene is deemed safe (if aircraft still has power capability)
3. Remove VFDR IAW applicable MPC. Package to prevent further damage in well padded\* shipping container and secure for retrieval/transport by designated representative.

## CAUTION

\*The VFDR contains interface cards that can be damaged by rough handling or dropping. **Only the memory is crash protected. Do not attempt to open the outer case of the VFDR. Vital information may be lost if the case is opened by anyone other than trained/authorized personnel.**

## NOTE:

HH-65 and HH-60J units have been provided with orange “Pelican cases” specifically configured for the Smith’s VFDR. The orange cases are being used to make it easier to find them when they arrive in Supply at ARSC. Please do not use additional packaging (cardboard boxes) for shipping.

**If immersed in fluid as a result of the mishap (salt water, fuel, oil, etc.), immediately rinse in fresh water and package completely immersed in fresh water.** A good technique is to place the VFDR in a thick, sealed, clear plastic bag filled completely with water and placed in a container that can be hand carried on most airlines. Since the VFDR should not be subjected to X-ray machines at airport screening locations, the package must be “visually inspected” prior to authorization to travel. This packaging method allows for such an inspection without a chance of compromise to the watertight bag.

4. Contact CG-1131 for notification and direction.
5. Begin collection of pertinent mishap information.
6. Designate MAB and technical POC to assist and provide information to the ARSC VFDR Program Manager and MAAF personnel, as necessary.

## Headquarters Responsibilities

CG-1131 will do the following (as appropriate):

1. Designate individual(s) to take physical custody of the VFDR (i.e. MAB or FSO).
2. With input from unit and ARSC, determine need for analysis and/or animation.
3. As appropriate, coordinate with MAAF to schedule data analysis/animation.
4. Initiate necessary actions to begin VFDR retrieval (i.e. assignment of MAB and VFDR retrieval message)
5. Appoint representative(s) to collect pertinent mishap information and transport the VFDR to the MAAF



## **VFDR Program Manager or Designated Representative Responsibilities**

As directed by CG-1131, the VFDR representative(s) will:

1. Travel to the mishap unit to retrieve the VFDR.
2. Conduct interviews to collect all required mishap information and a list of parameters needed for animation and analysis.
3. Consult with the Mishap Analysis Board (MAB) and the CG-1131 to determine the desired content of the video animation.
4. E-mail brief event description, request and intentions to MAAF.
5. Make necessary arrangements with airport security personnel to transport VFDR through airport screening facilities without X-ray of VFDR.
6. Transport VFDR to MAAF.
7. Remain at the MAAF to assist engineers during the VFDR data extraction and animation process
8. Provide feedback, progress, and results to CG-1131 and the MAB

### ***Class C, D, or E Mishaps***

#### **Unit Responsibilities**

When a Class C, D, or E mishap occurs where engineering, operational, and/or safety related data captured on the VFDR may be of value, the following procedures shall be followed:

1. Pull VFDR circuit breaker as soon as possible
2. If the aircraft is needed for continued missions, remove the VFDR and install RFI VFDR IAW applicable MPC.
3. Contact CG-1131 to assess the value of extracting VFDR data. CG-1131 will further liaise with ARSC VFDR Program Manager and/or appropriate ARSC product line as necessary to determine course of action (data to be downloaded). CG-1131 will consult with G-OCA as appropriate for operational or safety related events.
4. If the event data is determined to be of value, submit official request to CG-1131 per message traffic, see Appendix C for sample message.
5. If not already removed, remove and pack VFDR for express shipping to the appropriate ARSC engineering cell using 1149. Do not turn in to AMMIS. ARSC Personnel will clear any required Due-Ins once download is complete or return VFDR to unit for installation on aircraft. As referenced before, please use the orange

pelican cases provided to each unit. If not available, please put identifying marks on box to identify it as a VFDR.

6. Provide POC for ARSC VFDR staff to consult during analysis.

**NOTE:**

There is an expectation of privacy on voice portions of the VFDR. Crew conversations may be confidential and/or privileged. It is vitally important to Coast Guard aviation and the safety program to maintain the integrity of the above process. Inappropriate or unauthorized use of the voice portions of VADR downloads will be dealt with in accordance with the UCMJ.

**Headquarters Responsibilities**

CG-1131 will:

1. Determine whether authorization is appropriate for the extraction of data from the VFDR.
2. Send a message to the unit, info ARSC and CG-41, granting permission/direction to ship VFDR to ARSC for download and data analysis.

**ARSC Responsibilities**

ARSC VFDR Program Manager and Engineering Division staff will:

1. Provide technical assistance to determine the engineering value of VFDR data.
2. As authorized, extract data from the VFDR.
3. Ship the VFDR back to the unit or turn unit back into supply.
4. Process requested data for analysis.
5. Provide data/analysis results to designated personnel.

**VFDR Transport Guidelines**

Under no circumstances shall the VFDR be transported in any unauthorized shipping container. Air Stations shall be equipped with appropriate containers for transport of VFDR. In addition to the proper packaging of the VFDR there are issues concerning its transporting to the MAAF. The information below addresses the transport of the VFDR:

- The representative transporting the VFDR shall keep it with him/her during the entire journey. This includes traveling with the VFDR as carry on luggage.

- Smiths Industries states that airport X-ray machines under normal circumstances should not affect the VFDR. In the event that the VFDR is damaged from the mishap, the VFDR should be visually inspected as an alternative to passing through the X-ray machine.
- When making travel plans, the VFDR will need to go through an appropriate Security check. If possible before traveling, call the Customer Support Manager with the Transportation Safety Administration at each airport on your itinerary. Request that the Customer Support Manager coordinate with appropriate Airport Screening Managers to ensure proper handling and visual inspection of the VFDR. Plan to give them your entire flight itinerary. CG-1131 has a formatted letter ready for signature and fax to the appropriate TSA representative to suffice for official notification, (see Appendix D for sample transport letter).
- In the unlikely event that all efforts to preclude sending the VFDR through the x-ray machine fail, and further timely travel to the MAAF is jeopardized, pass the VFDR through the machine and notify the MAAF and CG-1131 at your earliest convenience.

### **Information Required for Downloads and Animations in the Event Of A Mishap**

When an event/mishap occurs, a unit will need to provide certain information to facilitate the collection, collation and analysis of VFDR data.

Below is an example of some of the types of information (as applicable) that may help in locating an event within the data and assisting in the analysis and/or animation of the event:

- Air station aircraft belongs to
- Aircraft type
- Aircraft tail number
- Brief Event Description
- Estimated Class of mishap
- Flight information at the time of the incident (i.e. pressure altitude, position, time, speed, etc.)
- Mishap area dimensions (i.e. distance from point of impact to a known location, from the edge of the runway, from the threshold of the runway etc.)
- If a vessel was involved: vessel position, speed, heading, sea state, vessel dimensions, etc.
- If another aircraft was involved, was it equipped with a VFDR or an FDR, and if so, where will that recorder be processed and can the MAAF get the data to synchronize the animation?

- A list of the aircraft parameters that will be of value to the animation and/or analysis of the event.
- Current Recorder Location
- Contact Information

### **NOTE**

Ensure that the parameters requested are essential and/or defined and of identifiable value to the investigation. VFDR data collection and analysis is an extremely time consuming and computer memory intensive process.

- Provide local chart of the mishap area,
- Provide approach plate of area if applicable,
- Provide a chart with geographical features of the area if applicable,
- Note Magnetic Deviation in the area of the incident,
- Photos and/or videos of area or structures involved are often valuable.

### **Animation Considerations**

After interviewing crewmembers and prior to transportation of VFDR, the President of the MAB will consult with CG-1131, ARSC engineering, and VFDR representative(s) to determine the content of the video animation. Listed below are some of the areas of consideration:

- Select angle of view for the video. Different views can be selected at different points of the flight. Multiple views can be selected at one time (e.g. Window 1 - Cockpit view, Window 2 - Overhead View, Window 3 - Overall flight path view that tracks the aircraft, etc.)
- Select the desired gauges for the video and the format they are to be displayed in (digital, analog, VSI). Keep in mind that the gauges and the video will share the screen. The more gauges that are displayed, the less area there will be on the screen for the video presentation.
- The board should consider if they want an advance copy of the audio. This item can normally be produced within one to two hours after arrival at the MAAF and then shipped out the same day. The audio may be recorded onto a CD or stereo cassette tape; requesting party should identify desired recording medium. Individual channels can be recorded as required for specific audio review.

## Appendix A

### *Points of Contact*

CG-1131 contacts to advise of mishap and /or request permission for a VFDR data downloaded:

CG-1131 Aviation Safety Specialist	202 267-1884
CG-1131 Aviation Safety Specialist	202 267-2972
CG-1131 Assistant Division Chief	202 267-2966
CG-1131 Division Chief	202 267-2971

#### ARSC:

FSO/VFDR Program Manager /MFOQA	252 334-5478
VFDR Project Manager	252 335-6488
VFDR Tech Services	252 335-6232

Accident Investigation Avionic Safety Systems HQ AFSC/SEFE 9700 G Avenue SE Suite 250C Kirtland AFB, NM 87112-5670	505 846-5693
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## Appendix B

### ***VOICE AND/OR FLIGHT DATA RECORDER DOWNLOAD REQUEST MESSAGE***

XXXXXXXXZ XXX  
FM COGARD AIRSTA XXXXXXXXXXXXX  
TO: COMDT COGARD WASHINGTON DC//CG-1131//  
INFO: COGARD AR SC ELIZABETH CITY NC//APPROPRIATE ACFT PLM  
(*example: HH65 ENG*)/EISD//  
SUBJ: VOICE AND/OR FLIGHT DATA RECORDER DOWNLOAD REQUEST

1. AIR STATION: XXXXXXXXXXX
2. AIRCRAFT TYPE: HH65X; CGNR 65XX.
3. BRIEF EVENT DESCRIPTION (DO NOT INCLUDE PRIVILEGED INFORMATION): XXXXXXXXXXXXXXXXXXXX.
4. REASON FOR DOWNLOAD REQUEST: MISHAP INVESTIGATION
5. REQUESTED PARAMETERS:
  - A. XXXXXX
  - B. XXXXXX
  - C. XXXXXXXX
  - D. XXXXXXXX
  - E. XXXXXXXX
  - F. XXXXXXXX
  - G. XXXXXXXX
  - H. XXXXXXXX
  - I. XXXXX
  - J. XXXX
6. COCKPIT VOICE RECORDING IS OR IS NOT REQUESTED.
7. CURRENT LOCATION OF RECORDER: XXXXXXXXXXX
8. AIRSTA REQUESTOR:
  - A. RANK/NAME: XXXXXXXXXXX, FLIGHT SAFETY OFFICER
  - B. TELEPHONE NUMBER: (XXX) XXX-XXXX
  - A. E-MAIL ADDRESS: XXXXXXXXXXX

BT  
NNNN

## Appendix C

### *CG-1131 Mishap Message Example*

Below is a sample message from CG-1131 assigning representatives to assist a mishap analysis. Contents will vary according to the particular circumstances of the mishap.

SUBJ: ASSIGNMENT OF MISHAP ANALYSIS BOARD (MAB); TVL

A. SAFETY AND ENVIRONMENTAL HEALTH MANUAL, COMDTINST M5100.47

1. IAW REF A, THE BELOW LISTED PERSONNEL ARE ASSIGNED TO ASSIST AIRSTA XXXX PERMANENT MAB TO INQUIRE INTO THE CIRCUMSTANCES SURROUNDING THE XXXXX XXXXXX MISHAP INVOLVING AN XX-XX ON XX XXX XX. THESE ORDERS CONSTITUTE AUTHORITY TO RECONVENE AND TRAVEL AS DEEMED NECESSARY BY THE SENIOR MEMBER.
2. TVL PERDIEM CHGBLE: X/XXX/XXX/XX/X/XX/XXXXX/XXXX
3. MAB REPS:
  - A. LCDR X.X.XXXX. XXXX USCG, STAN TEAM REP  
DOC. ID XXXX, EST. COST \$XXXX
  - B. CWO X.X.XXXX XXXX USCG, ARSC VFDR REP  
DOC. ID XXXX, EST. COST \$XXXX
4. THE ABOVE MAB REPS ARE TO ASSIST THE UNIT MAB AS DEEMED NECESSARY BY THE PERMANENT SENIOR MEMBER
5. IAW REF A, COMDT (CG-1131) DELEGATES THE INVESTIGATION OF THIS MISHAP TO THE PERMANENT AIRSTA XXXX MAB. THE MAB FINAL REPORT SHALL BE RELEASED BY THE SENIOR MEMBER VIA MESSAGE.
6. RENTAL CAR (S) AUTHORIZED IAW JTR PARA M4405.5 TO ANY/ALL ABOVE DOC.ID AS DIRECTED BY SENIOR MEMBER
7. MEMBERS SHALL SUBMIT A COPY OF THEIR TRAVEL CLAIM AND COST OF AIR FARE TO COMDT (CG-1131 ) AFTER REIMBURSEMENT. SAME DOC.ID NUMBERS APPLY IF NECESSARY TO ADJOURN AND RECONVENE WITHIN THE SAME FISCAL YEAR.

BT

NNNN

## Appendix D

### *CG-1131 VFDR Transport Letter Example*

U.S. Department of  
Homeland Security

United States  
Coast Guard



Command  
United States Coast Guard

2100 Second Street, S.W.  
Washington, DC 20593-0001  
Staff Symbol: CG-1131  
Phone: (202) 267-2971  
Fax: (202) 267-4255  
Email:

5100  
Month xx, Year

Applicable Airport Security Screener  
U.S. Transportation Security Agency

Dear Sir or Madam:

The holder of this letter, *rank and name*, carries a Coast Guard owned Voice and Flight Data Recorder (*provide type and serial number if able in parenthesis*) that was recovered on *day month year* from a Coast Guard XX-XX helicopter that ditched at sea on *day, month, year*, near *brief location identification*.

As Chief of the Coast Guard's Aviation Safety Division, in the hope of preventing a similar tragedy in the future, I have dispatched Mr. XXX to courier this VADR from *city, state* to the U.S. Air Force's Safety Center on Kirtland Air Force Base in Albuquerque, NM for analysis. The Air Force experts advise me that to maximize the likelihood of full voice and data retrieval, the VADR should remain submerged in fresh water and should not be x-rayed. I request your cooperation in allowing the VADR to bypass the x-ray scanner as Mr. XXX clears security.

Mr. XXX planned itinerary from XXXX, XX to Albuquerque, NM on *day, month, year* is as follows:

- *Provide itinerary for each leg of flight required to arrive at the destination*

This request letter remains in effect until *day, month, year* in the event that Mr. XXX's itinerary is delayed. My contact information in the letterhead can be used to verify authenticity. After hours, I can be contacted at *provide appropriate telephone/cell phone/pager numbers to be used after close of business hours*. Thank you in advance for your cooperation in this matter.

Sincerely,

Commander  
U.S. Coast Guard



## Appendix E

### *Mishap Analysis and Animation Facility*

*(USAF Safety Center, Kirtland NM)*

#### **Overview**

The Coast Guard has established a Memorandum of Understanding (MOU) with the U.S. Air Force Safety Center's MAAF for data extraction, analysis, and animation. Computer animation programs can be generated by the MAAF following ARSC VFDR data downloads. This data is traditionally transferred to the MAAF via email or computer storage media. In the event of a complex animation request the ARSC VFDR Program manager may accompany the data download to the MAAF to assist with animation models and ensure timely handling of the request.

Cooperation under this MOU to produce an animation is based on MAAF personnel workload. Air Station personnel must understand there may be a delay in processing Class C and D safety related animation requests.

USCG MAB members and/or the ARSC VFDR Program Manager will accompany any damaged VFDR hardware from a Class A or B mishap to the MAAF for analysis.

#### **MAAF Notification Example**

If assistance is requested, the VFDR Program Manager shall send a correspondence to the address below notifying them of the intent to request an animation. The message should contain a general event description (see following example):

Military FOQA  
Accident Investigation Avionic Safety Systems  
HQ AFSC/SEFE  
9700 G Avenue SE, Suite 250C  
Kirtland AFB, NM 87117-5670  
505 846-5693

#### **Example:**

On 23 March 2000, CG HH65A 65XX was practicing loss of tail rotor maneuvers on Abandoned Island, Florida. The aircraft landed with the gear up on runway ##. At this time, we are estimating the incident to be classified as a Class B mishap. The CG is requesting that MAAF prepare an animation for this incident.

My current plans are to proceed to Abandoned Island, transport the VFDR and the following requested items: Jeppeson chart, TPC map, and approach plate to your facility. Anticipated arrival at Kirtland AFB is Friday, 25 March 2000.

LCDR C. A. Coastie  
MAB/VFDR Program Manager  
USCG Aircraft Repair and Supply Center  
Elizabeth City, NC 27909  
Email: CCoastie@arsc.uscg.mil  
(252) 334-####

### **Capabilities**

The USAF MAAF is located on Kirtland, AFB in Albuquerque, New Mexico. The Mishap Animation and Analysis Facility have the capability to accomplish the following:

- Extract data from the VFDR
- Decompress the data
- Display data in the form of customized tabular data and graphs
- Analyze data
- Create audio recordings
- Create computer generated video animations
- Synchronize audio and video onto magnetic or digital media
- Provide data on electronic media for CG-1131 and MAB use.