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## COMMUNICATIONS INTERFACES

- **MIL-STD-1553B** – Can operate as a Remote Terminal (R/T) or a Bus Monitor (B/M)
- R/T operation allows the MDR to be fully integrated with existing aircraft systems and utilize existing displays
- B/M operation allows the MDR to operate independently of existing systems but may require a separate Control and Display Unit
- **RS-422/485** – Provides a maintenance interface for off-aircraft testing and software uploading as well as an interface to on-aircraft functions (e.g. display)
- **ARINC 429**

## MEMORY MANAGEMENT PROCESSOR

- Manages the storage and retrieval of data in the crash protected memory
- Minimizes data loss in the event of a chip failure by spreading data over multiple memory chips
- Manages failed memory locations to permit full operation in degraded mode
- Allows user-defined memory segmentation for various classes of data (i.e. maintenance, safety, digital voice, etc.) in separate areas of memory. For the Apache Longbow, the MDR segments the crash protected memory to separately store four classes of data:
  - **Fixed Maintenance Data** – Data of a known size, not dependent on length of flight (e.g. A/C Tail Number)
  - **Variable Maintenance Data** – Data used primarily for aircraft maintenance or training purposes which is dependent on flight length and flight characteristics
  - **Safety Data** – Data used primarily for incident/accident investigation purposes which is dependent on flight length and flight characteristics
  - **Cockpit Voice Data** – Pilot, Copilot/ Gunner and Area Microphone digitized audio data

# MAINTENANCE DATA RECORDER



*The Maintenance Data Recorder is a state of the art crash-survivable data recorder designed specifically for use on military aircraft. It interfaces with one or two MIL-STD-1553B data buses and up to four ARINC 429 buses to store relevant data in crash protected non-volatile memory. The MDR is a key element of the AH-64D Apache Longbow Integrated Maintenance and Support System and the CH-47SD Chinook.*



MDR Components

## MDR Functional Overview

The MDR is the basic building block of a modular system which encompasses Flight Data Recording (FDR), Cockpit Voice Recording (CVR), Health and Usage Data Monitoring Systems (HUMS) and other aircraft functions which require data acquisition, processing, storage and in-flight indications of critical conditions. The modularity and expansion capabilities of the MDR are beyond those of any military crash recorder available today. The modularity of the MDR allows it to accommodate the unique needs of each aircraft using a common hardware base and adding only what is needed for that particular aircraft.

The stand-alone MDR provides the following functions:

- Communication Interface
- Memory Management Processor
- Crash Survivable Memory Unit
- Cockpit Voice Recorder

## MDR Physical Characteristics

Size:	8.0" x 6.5" x 5.2"
Weight:	9.3 Pounds
Power Dissipation:	2.8 Watts
External Connector:	55 Pin, D38999
EMIC:	MIL-STD-461A
Environmental:	MIL-STD-810
Operating Temperature Range:	- 54° C to +100° C



**Doug Crawford, Strategic Technology Systems, Inc.**  
One Electronics Drive, Trenton, New Jersey, 08619  
Tel: 609 584 0202 • Fax: 609 584 0505 • [www.stratec1.com](http://www.stratec1.com)

## COCKPIT VOICE RECORDING

- The MDR will accommodate a plug-in printed circuit board in a spare card location in the MDR chassis which allows recording of analog voice data in the crash survivable memory unit. With this card installed, the MDR provides the following additional functional capabilities:
  - *Up to four (4) channels of voice recording. Voice digitizing utilizes an international standard algorithm which meets the performance requirements of ED-56A. The number of channels recorded is a software configurable parameter*
  - *Programmable gain control on each recorded channel to allow signal recording levels to be optimized for the specific aircraft and input source*
  - *Programmable recording duration (up to 2 hours on each channel) allows memory requirements to be optimized for a given application*
  - *Built-in-Test is integrated with the overall MDR. BIT status is reported over the 1553 bus (R/T operation) or displayed on the cockpit display (Bus Monitor operation)*
  - *The stored voice data can be downloaded and replayed using a standard PC equipped with multimedia capability and the voice replay software supplied by Strategic Technology Systems*

## CRASH SURVIVABLE MEMORY UNIT

- Meets all Crash Survivability Requirements of ED-55 and ED-56A. Expandable up to 640 MB of memory. Data storage guaranteed for 100 years