

## *ESD3520 Series*

# *Aircraft Integrated Monitoring System (AIMS)*



- *Crash protected data-voice recording*
- *Real time data processing of fatigue life for both engine and structure*
- *Non volatile storage of result data*
- *Trend and power performance analyses*
- *Comprehensive B.I.T.E.*
- *MIL-STD-1553B Compatible option*

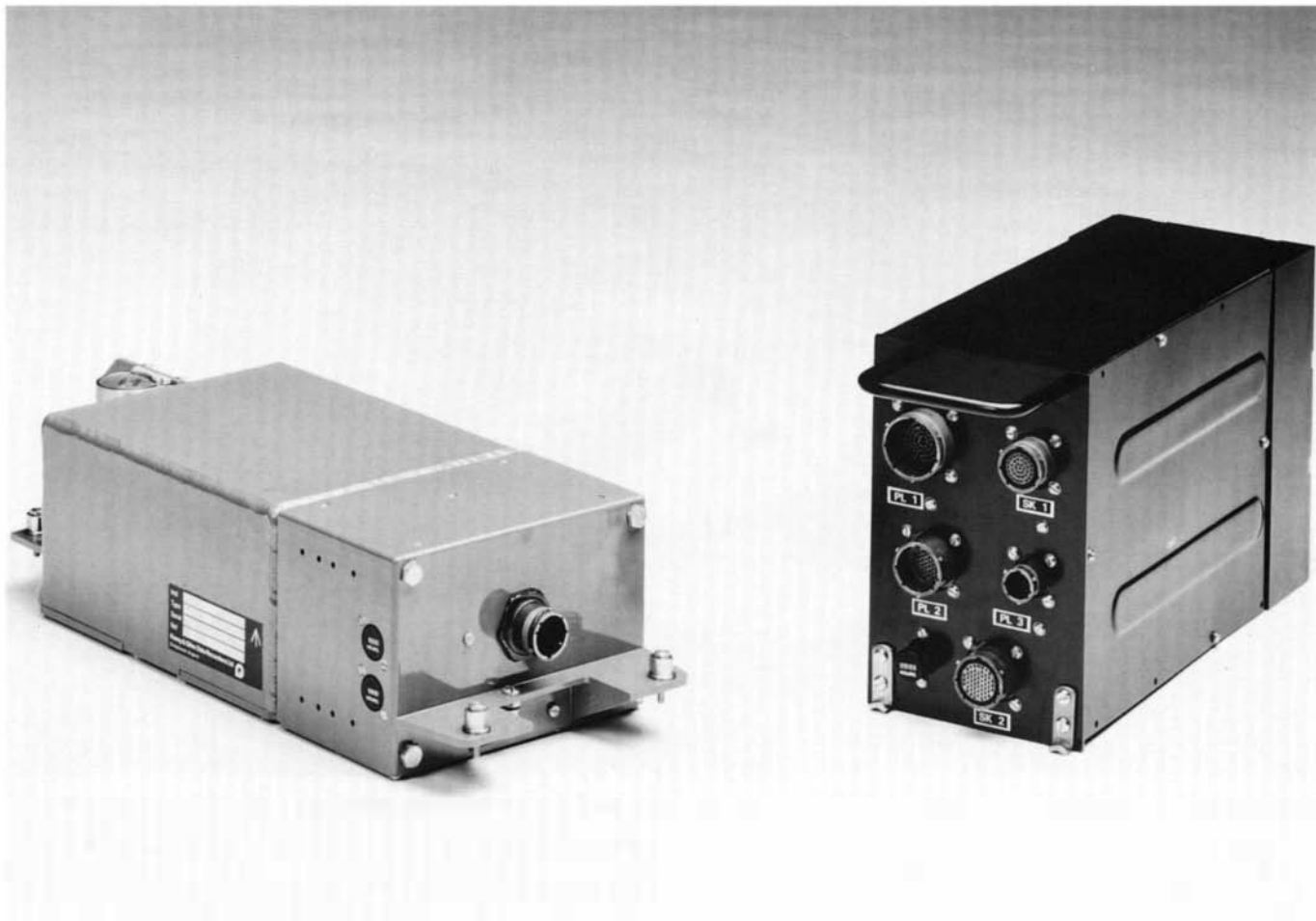
**GEC-Marconi Radar and Defence Systems - Electronic Systems Division (GMRDS-ESD) has three decades of experience in the design and manufacture of flight data acquisition systems. This experience covers many aspects of flight data acquisition including the recording of mandatory civil accident data, structural data gathering and the monitoring and processing of engine data on civil and military aircraft.**

The Aircraft Integrated Monitoring System (AIMS) is a natural progression from the above 'stand alone' providing a compact, flexible and comprehensive equipment having a powerful real time data processing capability.

### **System Description**

The Aircraft Integrated Monitoring System (AIMS) has been designed to calculate, in real time, engine lifting data and structural information, indicate limit exceedances of aircraft parameters, whilst simultaneously performing the mandatory accident data recording functions.

Provision has been made to allow dumping of the accident data recorder's data onto portable ground equipment for ground based analysis of incidents or accidents, eliminating the need for equipment removal. Immediate access to engine lifting data and structural information can be gained by use of a small hand held display unit which can also access the engine and structural information and store it for viewing later, or ground based data logging system access.



### Unit Description

Each airborne system is comprised of two units, these units being:

**ESD3521A** - Data Acquisition & Processing Unit (DAPU)

**D50330 Mk II** - Accident Data Recorder (ADR)

In addition to the airborne system a range of first line test equipment and other ground based support equipment is available:

**D50331** - Data transfer unit for extraction of accident data and voice

**ESD3526** - Engine and structural data extraction unit or direct interface to commercially available hand held mini-computers

**ESD3502B** - Flight line test set for calibration and check out use

### Unit Description

**ESD3521A - Data Acquisition & Processing Unit (DAPU)**

The unit incorporates all the conditioning circuitry necessary to sample and accurately measure a wide range of different types of electrical inputs and is designed to be compatible with standard instrumentation and transducers fitted to aircraft. As an option complementing the analogue inputs, the unit can interface to a MIL-STD-1553B dual

redundant bus system. The aircraft data is sampled and assembled into a format compatible with the accident data recorder. The powerful microprocessor subsystem views the output data and reads data, when necessary, to complete its computational tasks. Using this architecture, failure of the microprocessor system will not result in degradation of the mandatory accident recording.

The microprocessor subsystem carries out all the computational tasks defined by the user supplied algorithms. Algorithm results are stored in non-volatile memory and may be accessed using the data extraction unit.

Comprehensive built in test facilities have been incorporated within the unit and drive capability provided for remote sensing and indication as required.

Suppression and smoothing of supply voltage transients is provided within the power supply.

### D50330 - Mk II Accident Data Recorder

The accident data recorder incorporates all the circuitry necessary to both write data onto the crash protected tape and also to read this data during dumping. The tape is an endless loop which allows the retention of 2 hours of aircraft data in addition to 1 hour each of three audio channels. Crash protection is afforded to the TSO-C-51a specification. An ultrasonic locator beacon is provided.

### Software processing capability

The microprocessor used to process all the algorithms is the powerful Motorola 68008 which allows the use of high level implementation of algorithms. The use of a real time executive allows algorithm processing to be easily scheduled and the modular code structure allows for ease of modification of algorithms and their run rates.

Limit exceedance levels are included and are software programmable. Vibration monitoring can be accomplished with the software "learning" the aircraft's vibration signature during early flights and then using these levels as bases for monitoring.

### Ground equipments

GEC-Marconi Radar and Defence Systems - Electronic Systems Division also supply a comprehensive range of first line support and ground interface equipment. Please ask for a data sheet on the following items:

### D50331 - Mk II Data transfer unit

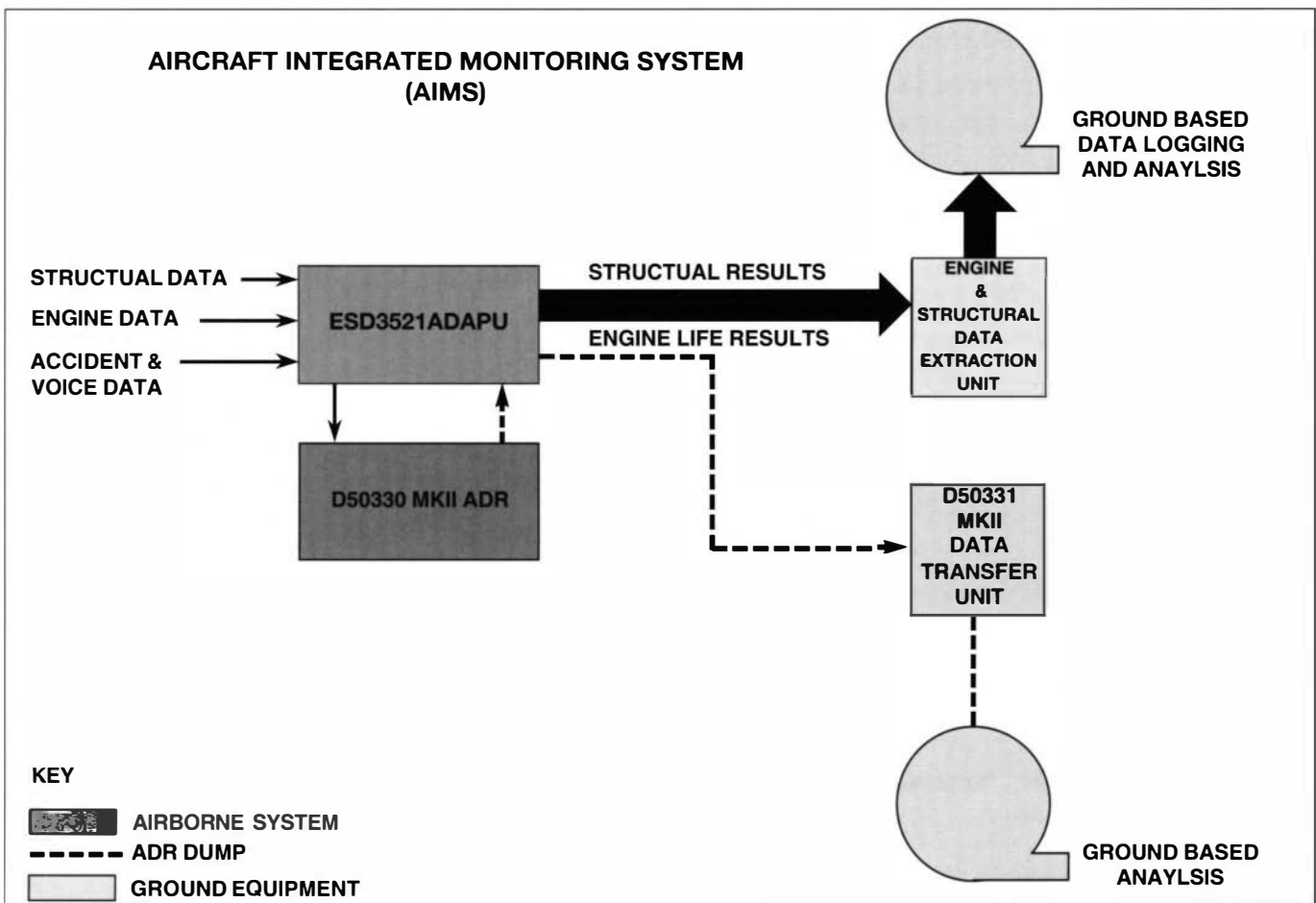
The data transfer unit is a portable data dumping equipment that, when connected to the system, reads the ADR data and places it onto a data cartridge at eight times the normal speed. The audio channels can be similarly transferred but at normal speed only. Ground based analysis of the accident data may then occur. This facility enables data to be easily obtained from the airborne system without the need for equipment removal from the aircraft.

### ESD3526 - Engine & Structural Data Extraction Unit

The engine & structural data extraction unit is a small, hand held, equipment designed specifically for quick access and display of algorithm results and as a transportation medium capable of reading the results from the DAPU, storing them in non volatile store and then display at base or by direct connection to ground based data logging systems.

### ESD3502B - Flight Line Test Set

The flight line test set is used for the validation of both data in the acquisition unit and from the read circuitry of the ADR. It is also used for carrying out calibration and general aircraft checks.



## General

### Input signal types:

#### Analogue:

Ratiometric voltage, potentiometer, absolute differential

#### Shaft:

Spool speeds, synchro

Discretes:

DC-AC (400Hz) voltage levels or pulsed levels

### Option

#### Multiplex data bus:

Two-way communication with digital multiplex data bus to MIL-STD-1553B

### Output signal types

#### Serial data:

Differential line drivers producing two Harvard biphas channels, levels to RS-422-A. Capable of transmitting up to total of 256 words per second. Other speed options available.

12 bits per word - 11 bits data plus odd parity bit (LSB)

#### B.I.T.E.:

Open collector output giving ESD3521A general fail status.

#### Recorder control:

Open collector output giving on/off control of recorder.

#### Transducer supplies:

+5V, 50mA supply for external potentiometers.

### Environmental

Temperature, humidity, altitude:

Mainly MIL-STD-810B. operating temp. range 40°C to +85°C

Vibration, mechanical shock:

Mainly MIL-STD-810B and to McDonnell Douglas MDCA3780.

Electromagnetic interference & compatibility:

To requirements of MIL-STD-461A.

### Reliability

#### MTBF:

5000 hours

### Power Requirements

#### Supply:

28V D.C. conforming to MIL-STD-704C emergency limits.

Consumption:

28W max.

### Dimensions

1/2 ATR short case

Height: 193.5 mm (7.62")

Width: 124.7 mm (4.91")

Depth: 320.5 mm (12.62") this excludes front panel projections

Weight: 4.55 Kg (10 lbs)

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## D50330 - MK II Accident Data Recorder

### Input signal types:

Accepts two, Harvard bi-phase, data channels from ESD3521A.

accepts 3 Audio (voice) channels providing input transformer isolation.

### Recording

#### Tape Speed:

Up to 15/16 inches per second.

#### Recording density:

Up to 2000 bits per inch.

#### Recording speed accuracy:

(a) Long Term:  $\pm 1\%$  peak

(b) ShortTerm:  $\pm 8\%$  peak

Records over two passes of endless magnetic tape loop; each pass utilises 5 tracks-2 tracks for digital data, 3 track for audio.

### Retrieval

Facilities for data retrieval at XI and XI0 recording speed. During retrieval all digital channels are outputted simultaneously.

### Output signal types

#### Serial data (replay):

Differential line drivers producing four data channel outputs (two from each tape pass), signal levels to RS-422-A

#### Audio replay:

Unbalanced audio output.

#### Track status:

Open collector output indicating current tapepass(1 or 2).

#### B.I.T.E.:

Open collector output giving D50330 general fail status.

### Environmental

Primarily same as ESD3521 A apart from TSO-C51a testing.

### Crash survivability

TSO-C51a

### Reliability

#### MTBF:

5000 hours

### Power Requirements

#### Supply:

28V DC conforming to MIL-STD-704C emergency limits.

#### Consumption:

14W max.

### Dimensions

Height: 115 mm (4.53")

Width: 172 mm (6.77")

Depth: 449 mm (17.32")

Weight: 8.3Kg (18.3 lb)

## ESD3520 Series Aircraft Integrated Monitoring System (AIMS)

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