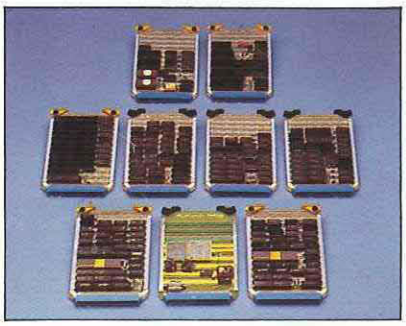
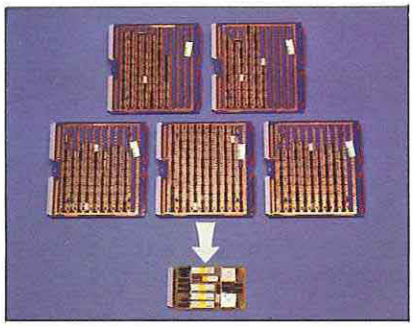
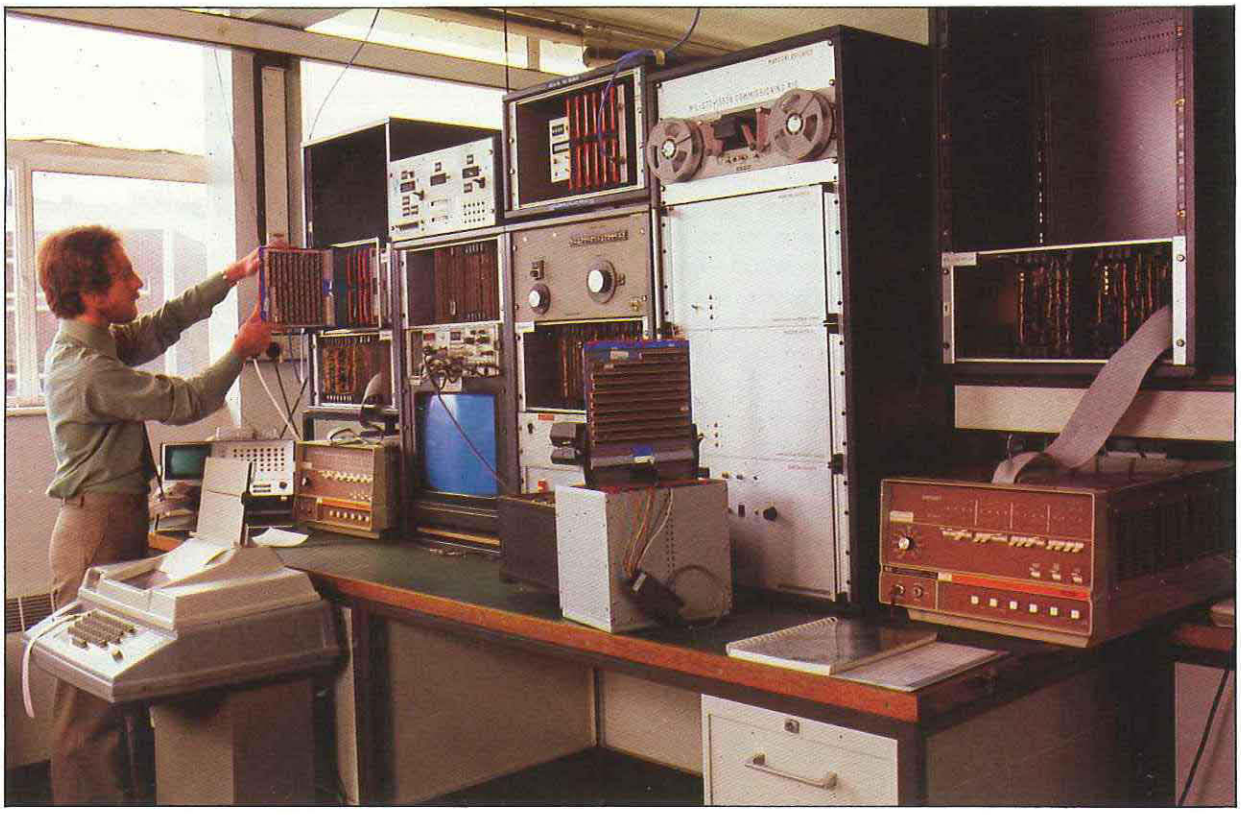
MARCONI AVIONICS

Total Systems Capability in MIL-STD-1553 Data Handling







Total Systems Capability in MIL-STD-1553 Data Handling

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1. Prototype Controller Modules.
2. BCU Laboratory Monitor.
3. 1553 Silicon Chip set.
4. 1553 System Development Rig.

Introduction

Avionic systems are rapidly becoming all digital and of increasing complexity, and the volume of information flow between units is considerable. The basic form in which data is transmitted is largely independant of the message content or the units involved, as in human speech. This basic simplicity allows the complex data flows in a modern avionic system to be carried on a two wire 'bus' which connects all units to a common network. The source and destination of each message is easily included in the digital format. Such a system is called a 'time division multiplexed data' transmission system and has the following important advantages.

- A dramatic reduction in weight due to fewer cables and connectors.
- Additional units plug into the aircraft data bus.
- Changes to information flow do not impact on aircraft wiring.
- Flexibility of control and system management.
- Inherently high integrity of data.

A multiplexed data system will therefore provide very significant operational and economic advantage throughout the life of an aircraft, particularly if avionic updates are envisaged in the future life of the airframe.

Maximum advantage from such a system is realised when equipment and airframe manufacturers accept a common design standard. This has happened in the case of MIL-STD-1553, first originated by the US Armed Forces, now accepted by NATO and the British MOD. The initial version MIL-STD-1553A was inaugurated in 1975, effectively with the F-16 aircraft. An enhanced standard incorporating the experience of 1553A, was introduced in 1978 as MIL-STD-1553B.

Such standardisation allows the centralised control of all message flow, including priorities and error handling, by a small unit called the BUS CONTROL UNIT (BCU).

MAv's Involvement with MIL-STD-1553

MAv has been actively involved in 1553 systems from their inception. The earliest application of MIL-STD-1553A was the F-16 and the Head-Up Display system developed by MAv included the first remote terminal design to enter quantity production in Europe. MAv anticipated the widespread adoption of the enhanced MIL-STD-1553B data bus as a standard interface in future military equipment installations. Silicon chip devices have been developed by MAv Flight Research Labs to implement the complex functions of a Remote Terminal.

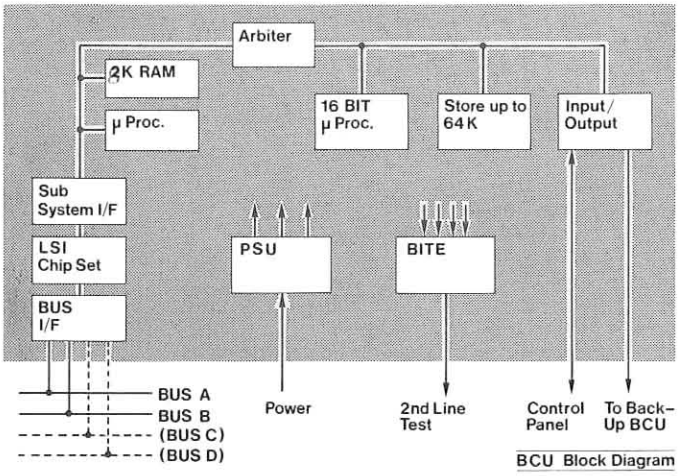
The result is a set of four 40-pin dual-in-line Large Scale Integrated (LSI) components fabricated in CMOS by GEC Semiconductors. A single hybrid package will be made available, containing the five chips required for the usual dual bus arrangement. The chip set is fully compliant with all aspects of the Standard and its design has been vetted by the Design Authority - Wright Patterson AFB. Used in conjunction with proprietary transmitter/receiver components, the chip set provides a very compact, reliable and flexible bus interface for use in both remote terminal and bus controller applications.

The MAv Bus Controller

For complete capability in 1553 systems, MAv has developed a powerful Bus Controller which is of a modular design for both hardware and software. This results in a design that is equally adaptable to current and future applications.

Description

A dual processor architecture has been adopted to provide a BCU with maximum flexibility of operation, which is designed to make maximum use of the data transmission system under all operational conditions. This includes implementing powerful recovery options in the event of detected errors on the data bus system. The way in which this is achieved is shown in the block diagram.



BCU Block Diagram

The BCU contains plug in modules, using large scale integrated components for economy and reliability. The BCU is housed in a 1/2 or 3/4 ATR short rack-mounted unit, the size depending on the module options chosen by the customer. These are decided by the complexity of the system and the comprehensiveness of control demanded.

The key to real flexibility of any BCU lies in the software. MAv has chosen a program structure with a sound basic executive program around which the individual message control and error handling strategy may be easily modified by the customer during the service life of the aircraft. This caters for changes in use of existing avionics or the addition of new role equipment. Embedded in this software are the test routines for self check of the BCU and first line checking of all units on the bus system. The software is written in a high level language to ensure ease of program update so minimising long term costs.

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