Prototype Aircraft Jet Engine Characterization and Test

Application Note 1270-3

Description

Jet engine prototypes must be tested on a number of performance parameters to refine design characteristics. This to improve fuel efficiency at various thrust levels, reduce noise output and vibration at various turbine rotational speeds and many other parameters, all to ensure reliability while optimizing the design.

Problem

Aircraft engines require rigorous testing, not only to ensure proper operation, but also to develop a baseline for future testing and refinement of test procedures. Development test systems for aircraft are unlike production test systems in that development tests are frequently designed on-the-fly, requiring frequent system reconfiguration and programming changes. Engineers might configure data channels one day to test engine pressure, temperature, or rotor speeds. Soon after, engine vibration testing may require a significant system reconfiguration and reprogramming.

Solution

A Hewlett Packard VXI Data Acquisition System offers the modularity and architectural flexibility for quick system reconfiguration by adding and/or substituting instrumentation modules into the base mainframes, reconnecting the various I/O devices and transducer components, and loading appropriate test programs into the embedded system controllers. The controllers transmit the acquired data to several workstations for interpretation and display, and to a file server system which maintains a data base. Dynamic Data Systems (DDS) digital tape recorders, controlled by a PC provide additional data recording and feed HP-UX Workstations for data analysis and broadcasting of test results over a network which allows test engineers to monitor test progress from terminals at their desks.

Key System Features

Open System Architecture
Quick configuration
Ease of Programming
Scalability
Upgradeability

Typical System Configuration

Data Acquisition System	Qty
13 Slot Mainframe	5
Integrating DVM	3
High-Speed DVM	2
Tachometer Module	1
Relay Multiplexer Channels	700
FET Multiplexer Channels	300
Voltage D/A Converter	80

Computer/Software	
PC Embedded Controller	5
HP Series 700	
HP Vectra PC Workstation	1
X-Terminals	
Keyboards, Monitors and Mice	
Disc Drives and Printers	
Software - Lynx real-time	
operating system	
LMS software	
Lab View	
HP-UX	
Oracle data base	

Other Equipment

Digital Tape Recorder