V

Implementation

Cary R. Spitzer
AvioniCon

The ultimate goal of any avionics effort is to reduce it to practice, to build it, and to operate it, or, in other words, to implement it. This section presents five examples of current or projected avionics systems along with a discussion of fault tolerance, a key concept in extremely critical (cannot lose its function) avionics.

Fault tolerance is the ability to continue to operate in a satisfactory manner (as defined by the customer) in the presence of multiple temporary or permanent hardware or software faults. Fault tolerance can be achieved in either hardware and/or software. Chapter 28 reviews many techniques for realizing satisfactory operation in the presence of faults.

Two modern commercial transports, the Boeing B-777 and the Airbus A330/340, have some of the most advanced avionics available today. The B-777 Airplane Information Management System (AIMS) is the first significant application of integrated, modular avionics to commercial transport aircraft and is performing admirably in revenue service. The A330/340 has an advanced, second-generation, fly-by-wire flight control system (featuring side stick controllers) and other cutting edge avionics that have proved to be very attractive to the operators in terms of economic payoff.

The Boeing MD-11 is an interesting retrofit architecture that demonstrates what upgraded, modern avionics can do for a vintage aircraft design (the DC-10). The MD-11 avionics not only eliminated the need for the third flight crew member by automating many of the functions of that position, but also offered reduced operating expenses and increased functionality.

The most modern, cutting-edge avionics architecture in military aircraft is the Lockheed F-22 Raptor. Like the B-777 AIMS, the F-22 makes extensive use of integrated, modular avionics for both the vehicle and the mission functions. The Common Integrated Processor (CIP) cabinets have space for up to 66 modules, but have only five different types of modules.

A visionary look at the future is capsulized in the advanced distributed architecture, made possible by the increasing throughput of microprocessors and the ever-growing bandwidth of data busses such as Ethernet. Perhaps the need for centralized processing will be taken over by distributed microprocessors.