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Trends in flight-line test gear include smaller equipment, software-defined tasks, and generic test sets

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Product Intelligence, 2 Aug. 2011. Today's flight-line test equipment for commercial and military aircraft is becoming smaller, lighter, and more powerful to accomplish increasing amounts of testing at the aircraft, rather than at the depot, as well as increasing its use of software-defined functionality to achieve a growing number of test jobs with one piece of equipment.

Flight-line test equipment today, which tests for potential aircraft system faults such as data bus errors, misaligned sensors, and data corruption, also sees increasing use of modular commercial off-the-shelf equipment, which ultimately could help test personnel share equipment, ease personnel training requirements, and enable test experts to move quickly to different aircraft without much retraining.

"Trends today, from classical flight-line test, involve the equipment getting smaller and technologically much more centered on microelectronics," says Stephen Mensh, director of advanced test and electronic warfare at the AAI Corp. Test and Training segment in Hunt Valley, Md.

Smaller, lighter, more powerful

"The packaging is getting smaller, and we get more power and capability from these flight line test sets," he says. "The equipment is more versatile and adaptable to a wide variety of applications."

It is not out of the ordinary today to see flight-line test equipment small enough to fit in a backpack and operated by one or two people, rather than large enough to fit on several carts of rack-and-stack equipment with several different operators. "It is a one-man carry kind of equipment today," says Kevin Hurley, director of business development at Astronics/DME Corp in Orlando, Fla.

Among the enabling technologies for today's small, powerful flight-line test equipment are open-architectures in which test technicians can plug additional circuit cards into backplanes to add capability or functionality. Field-programmable gate arrays (FPGAs) also enable test technicians to make changes to their test equipment on the fly. "Computing power is advancing to get us more capability in a smaller package," says Paul Vavra, business development manager for flight line test solutions in the electronic combat solutions business unit of BAE Systems Electronic Solutions in Nashua, N.H.

Not only does use of COTS components in flight-line test equipment enhance capability and reduce size and weight, but it enables test equipment managers to attack costs, as well. Test equipment specialists at Data Device Corp. (DDC) in Bohemia, N.Y., are making broad use of USB data ports on their test equipment to enable test technicians to use laptop computers to test aircraft databuses, rather than expensive and dedicated test equipment.

"The USB port is on everything, and the USB protocol leverages the consumer marketplace and reduces costs of our manufacturing, which we can pass along to our customers," says George Los, product manager at DDC. "Our products for the test market also are FPGA-based, which involves a software load to add capability or functionality. It allows us to respond to the market quickly and gives us flexibility to develop new features and capability purely in FPGA."

Software-defined functionality

Today's flight-line test equipment also is making broad use of test functionality defined in software, rather than in hardware. At a generic level, this is similar to trends in advanced software-defined radio in which users program in desired functions in software that run on a generic computing architecture.

"Depending on the application, some of the flight-line test equipment is becoming more software defined," says AAI's Mensh. More functions defined in software also make the test equipment more flexible and reconfigurable. "We are only limited by an up- and down-converter on the kinds of signals we can handle," says Astronics/DME's Hurley.

Reconfigurable flight-line test equipment also means that more test routines can run on the same equipment, cutting down the need for large numbers of testers to handle different tasks. "We can configure waveforms electronically in software, and we don't need new testers," says BAE Systems's Vavra.

Generic test equipment

"What we really see happening in the defense marketplace is a need for commonality and compatibility in one piece of equipment," Vavra says. We provide the Stores systems Tester on the F-16 [jet fighter] that is designed to replace two pieces of equipment, and we want to go further."

BAE Systems provides bore-sighting test equipment for the F-16, and plans to adapt that equipment also to handle similar testing on the F-15 jet fighter-bomber. "We will have one piece of equipment for the F-16 and F-15, and with only different cables for each aircraft." Vavra says this trend will continue as the military services start to take over maintenance of unmanned aerial vehicles from the contractor personnel who do those tasks today.
