Low-SWaP Ethernet Switch for Fighter Jet Advanced Sensor Pod

CURTISS-WRIGHT

DEFENSE SOLUTIONS

Challenge

- Integrate Ethernet network into size-constrained aircraft pod

- Support 28V aircraft power and low system power consumption

- Meet tight system development, integration and flight test schedules

Solution

- Miniature rugged COTS GbE switch LRU

- MIL-STD-704 aircraft-power compliant, 5W system

- Pre-qualified MIL-STD-810/461 environmental/EMI testing

Results

- Solution that fit SWaP constrained pod

- Out-of-the-box functional, environmental, EMI compliance

- Switches delivered in time to hit program milestone dates

Challenge

By integrating advanced electronics sensor pods, aerospace system integrators are enabling size, weight and power (SWaP)-constrained fixed-wing aircraft platforms, such as legacy fighter jets, to expand mission capabilities and serve in new tactical roles. Traditionally attached beneath the airframe, these sophisticated pods can deliver processing, networking, sensors, and communications payloads to augment Intelligence Surveillance and Reconnaissance (ISR), Electro-Optical Infrared (EO/IR), long-range targeting or other desired mission capabilities. Given their small mechanical size and the demanding operational environment for fighter aircraft, plus the fact pods are retrofitted to platforms not originally designed for them, the electronics integrated inside must be highly reliable, very small form factor (SFF), and as lightweight and energy efficient as possible, so as to not overburden the aircraft with heavy physical or power requirements that could put mission success at risk.

A major aerospace supplier with proven sensor and aircraft development experience required a low-SWaP Ethernet switch for a multi-sensor fighter aircraft pod designed to fulfill urgent capability gaps for critical air-to-air missions. Providing an IP network backbone for integrated Line Replaceable Units (LRUs) of the pod (such as processors, datalinks and sensors), the network switch needed to deliver advanced managed connectivity while fitting within tight mechanical constraints, operating in demanding environmental flight conditions (e.g. altitude, temperature, shock, vibration, etc.), and running off of unfiltered 28V aircraft power. In addition, the Ethernet switch would need to meet the system integrator's aggressive pod development, subsystem integration and flight test schedules.
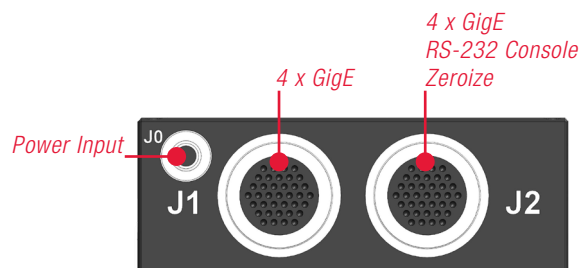
Parvus DuraNET 20-11

Solution

After reviewing the Curtiss-Wright portfolio of airworthy rugged COTS Ethernet switches and receiving an evaluation unit of its latest model, this pod system integrator specified the miniature 8-port Parvus® DuraNET® 20-11 switch into its pod architecture. One of the smallest form factor, rugged, managed Ethernet switches on the market, pre-qualified to the most comprehensive range of MIL-STD-810, DO-160 and MIL-STD-461 qualification tests, this low-SWaP network switch LRU provided the customer with a low-cost, low-risk solution that weighed a mere half a pound (0.23 kg) and was small enough to fit in the palm of a hand. Boasting just five watts of power consumption, a fanless extended operating temperature range (-40 to +85°C) with a sealed waterproof (IP67) chassis, along with a 28V MIL-STD-704F aircraft power supply, the energy-efficient DuraNET 20-11 switch effectively addressed form factor, power, and reliability needs. Additionally, production delivery availability mapped to the program's integration and flight test plans.

Results

Specifying the extremely low-power, affordable, SFF, rugged COTS DuraNET 20-11 switch LRU, which is prequalified for military and aerospace platform deployments, enabled the integrator to meet all program technical and schedule requirements without NRE, while accelerating pod production readiness. Out of the box, this miniature network switch subsystem met all functional, environmental and EMI requirements of the platform, including comprehensive networking capabilities (port management, quality of service, VLAN, monitoring, security, 1588 PTP timing). Measuring a mere 10 in^3 in size and operating off 28VDC power, the unit could easily fit within the pod's mechanical constraints and support aircraft power input, including surge and spike transient conditions. The customer received the units in time to support successful system integration and flight test milestones. The pods now support network backbone functionality and are flexibly designed for plug-and-play portability across platforms to meet current and emerging customer requirements as different sensors and LRUs are integrated to support different configurations of infra-red search and track (IRST) and EOIR functionality.

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