

# USFF Systems for Computing and Networking Onboard eVTOL Aircraft

**CURTISS-  
WRIGHT**
**DEFENSE SOLUTIONS**


## Challenge

- Airworthy COTS hardware needed for prototyping
- Multiple I/O device interfaces required
- Electronic subsystems must be lightweight, small, and power efficient

## Solution

- Rugged, COTS-based mission computers and network switches
- Scalable I/O architecture
- Ultra small form factor (USFF), low-power designs

## Results

- eVTOL vendors leverage rugged systems qualified for military applications
- Flexible I/O, including ARINC 429, CANbus, and additional serial ports
- USFF systems delivered lower SWaP impact

## Challenge

With the aviation market looking for cheaper, quieter, and more environmentally friendly alternatives to helicopter flight, electric vertical takeoff and landing (eVTOL) development is growing rapidly. Both military and civil pioneers are working on vehicles that will someday carry passengers and goods. Some are expected to have a pilot, while others will fly autonomously as airport shuttles, air taxis, air ambulances, and air delivery vehicles.

Multiple eVTOL aircraft developers from America and Europe have come to Curtiss-Wright seeking rugged COTS hardware to be used for prototyping as they develop their new aircraft platforms for production. These integrators had similar functional and environmental performance goals, which required electronic subsystems that were rugged enough to operate at altitude, with vibration, under extreme

temperatures, etc. Their air platforms will ultimately need approvals from the Federal Aviation Administration (FAA) or the European Union Aviation Safety Agency (EASA) to successfully start carrying passengers and products in the future.

Not surprising, these eVTOL vehicles all had similar computing requirements. As with many modern air vehicles, these aircraft also needed on-board computers which commonly required support for avionics and sensors interfaces, such as ARINC 429, CANbus, RS-232/422, Ethernet, general purpose digital I/O, and video outputs. In addition, these mission computers required support from an Ethernet switch to provide a network backbone for communications between the computers and other IP-enabled devices on board.



Parvus DuraCOR 311 mission computer

Like most aircraft, eVTOL vehicles are extremely size, weight, and power (SWaP)-sensitive. The weight of mechanical and electronic parts is important because the lighter the vehicle is, the more payload it can carry. Lighter vehicles can therefore fly farther, longer, and faster. Relying on batteries versus a combustion or jet engine to provide electricity, these aircraft must also integrate electronic subsystems with low power consumption.

## Solution

Because the need for optimal SWaP is so critical for eVTOL systems, many vehicle developers have turned to Curtiss-Wright's family of COTS USFF subsystems. Curtiss-Wright has now supplied the civil eVTOL industry with multiple rugged COTS solutions that have a proven pedigree in military aircraft applications. In fact, two Curtiss-Wright products in the Parvus® family of USFF solutions are currently being used in prototypes around the world: the [Parvus DuraCOR® 311](#) mission computer and the [Parvus DuraNET® 20-11](#) Gigabit Ethernet switch.

The Parvus DuraCOR 311 is a USFF rugged embedded computer/controller based on a low-power, quad-core Intel® Atom™ processor. At less than 1.5 lb (0.7 kg), this product is ideally suited for use on-board SWaP-sensitive aircraft platforms. It has undergone comprehensive qualification testing to MIL-STD-810G, MIL-STD-461F, MIL-STD-1275D, and MIL-STD-704F, as well as commercial aerospace standard RTCA/DO-160G test conditions for environmental, power and EMI (thermal, shock, vibration, dust, water, humidity, altitude, power spikes/surges, conducted/radiated emissions and susceptibility). These factors make it ideal for eVTOL aircraft.

Modular in design, the DuraCOR 311 can accommodate a wide range of add-on I/O options. With three slots available for Mini-PCle Cards, Curtiss-Wright can pre-integrate various I/O configurations, such as adding CAN, 1553, ARINC429, additional serial/USB/Ethernet, and more.

Weighing in at only 0.5 lb (0.2 kg) and consuming just five watts of power, the Parvus DuraNET 20-11 is a USFF rugged COTS 8-port Gigabit Ethernet (GbE) switch optimized for the extremely demanding SWaP-constrained platforms of the eVTOL market. This rugged system was engineered for high reliability and also validated through similar extensive qualification testing for extreme EMI/EMC (MIL-STD-461F, DO-160F) and environmental (MIL-STD-810G, DO-160) conditions. Its extended temperature operation (from -40 to +85°C) and resistance to high shock, vibration, humidity, altitude, and dust/water ingress make the DuraNET 20-11 an extremely reliable Local Area Network (LAN) switching solution.

## Results

Because Curtiss-Wright already offered COTS solutions the market was looking for, eVTOL developers selected products in the Parvus family that provided the USFF solutions they needed. The DuraCOR 311 and the DuraNET 20-11 are being used on eVTOL aircraft for a variety of functions, including fault and anomaly detection, data communications, and traffic conversion. And because these electronics already underwent airworthiness testing required for flight, eVTOL developers are able to quickly prototype their aircraft, plan flight tests, and speed up their development schedules.



Parvus DuraNET 20-11  
8-port Gigabit Ethernet switch