UAV payload designs turn to COTS

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An industry perspective from Curtiss-Wright Defense Solutions

On High Altitude, Long Endurance (HALE) platforms Size, Weight, and Power (SWaP) is key, with weight and power typically the most critical. Additional weight can affect capability and reduce flight time. Every unnecessary pound and watt must be eliminated. With SWaP so critical for Unmanned Aerial Vehicles (UAVs), the goal is optimal design. Traditionally, system integrators provide a Commercial Off-The-Shelf (COTS) vendor with a set specification. A better approach is to involve the hardware supplier early in the system design process. This has been proven to significantly improve cost and SWaP, boost reliability, reduce design risk, and combat obsolescence.

For example, for the Global Hawk Northrop Grumman worked with a COTS vendor on the Integrated Mission Management Computer (IMMC) that controls the aircraft's flight, and the Advanced Mission Management System (AMMS) that acts as a central data interface to the onboard payload sensors and relays data to the UAV communication links. Part of the success of Northrop Grumman's HALE Enterprise stems from its fostering a real dialogue with suppliers, tapping into their expertise. The benefits are numerous: improvements in form factors, data security, meeting program affordability targets, longevity of supply, and product availability. Some recent examples highlight how close communications between a COTS vendor and the system integrator optimizes UAV solutions.

Northrop Grumman encourages suppliers for its HALE Enterprise platforms to provide their insight and suggestions for subsystem architecture optimization. This approach led to significant improvement in the design of the latest generation of the IMMC. Discussions about the previous generation IMMC revealed that, as the UAV evolved, installation/removal of the system became too time consuming. This simple input led us to evaluate the installation process.

The earlier IMMC used a sliding/stacking approach. Installation and removal of the unit was cumbersome and impeded cooling airflow. Provided with an insight into the platform's configuration, the vendor completely redesigned the box with an alternate mounting technique and improved thermal performance that greatly reduced Mean Time To Replace (MTTR) while increasing system reliability.

UAVs that fly in combat environments need high data capacity to confront data security issues. The technology sweet spot's shift to solid-state media created another challenge: if a data storage unit has a performance issue it must be sanitized of all potential classified data before removal. In the past, data sanitization for tape drives and magnetic storage media involved writing specific data patterns to all non-volatile locations to ensure successful data erasure. As a result adequate low-level access (bypassing provisioning) is now available on this system to achieve proper data sanitization without violating manufacturer's warranty.

Figure 1 | Curtiss-Wright's rugged COTS-based Sensor/Payload Management Unit subsystem is an example of an open architecture solution for unmanned platforms.

Another example of how open communication with the UAV system integrator results in optimal design is found in the retroactive architecture review process. Through dialogue with the customer, the COTS vendor can identify features proven over time to be unneeded or technologically superseded. For example, if data being sent over interfaces can be delivered over Ethernet, those interfaces can be removed. Removing such features provides a cost-effective means of increasing product availability, improving reliability while simplifying logistics without risk or the expense of a technology refresh. Unlike technology refresh that adds functionality, subtracting features from a previously certified solution eliminates the need for re-qualification. The result is improved Mean Time Between Failure (MTBF), lower ownership cost, and extended product availability/support.

Working with COTS vendors is an approach that lowers the total cost of ownership and reduces risk to the program in the long-term.