How Leidos transformed the Army's ISR capabilities at minimal cost to the Pentagon

On the modern battlefield, collecting the right electronic signals can enable the military to target an adversary in real time, providing a powerful combat advantage. The Leidos Special Mission Aircraft (LSMA), also known as the Airborne Reconnaissance Target Exploitation Multi-Role Intelligence System (ARTEMIS), delivers that capability while saving the U.S. Army millions in development fees.

THE CHALLENGE: A CHANGING COMBAT ENVIRONMENT

The changing global landscape, to include the rise of China and the resurgence of Russia from—from strategic issues at the level of great power competition to the tactical emergence of new capabilities—is demanding new intelligence, surveillance, and reconnaissance (ISR) strategies for the U.S. Army's G2. For the last two decades, its ISR focused heavily on counter-terrorism operations. The shift to peer-to-peer threats from great power competition is changing the ISR requirements moving forward.

Counterterrorism ISR aircraft fly in permissive air environments controlled by the U.S. or its allies. They fly low and relatively slowly to collect Signals Intelligence (SIGINT) from simple devices such as improvised explosive devices (IEDs) and push-to-talk radios. Peer-to-peer scenarios, such as in the Ukraine, are aviation-contested, meaning that ISR aircraft need a significant standoff capability. That means flying at high altitudes for long-range signals collection.

These aircraft must also look for more varied signals, including surface-to-air missiles, artillery, and tank setups. They are harder to identify as they operate across more varied frequencies, and sensors must distinguish them from other signals in the same area, such as civilian cellphone chatter.

The legacy design and configuration of existing ISR aircraft do not support these needs.
In January 2019, Leidos approached the Army to discuss a different solution.

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THE SOLUTION: RETHINKING ISR FROM THE GROUND TO OVER 40,000 FEET

Although the government has previously worked with contractor-owned and government-operated assets, ARTEMIS is both contractor-owned and contractor-operated. This enables Leidos to be responsible for the entire aircraft lifecycle, including its crew, to provide intelligence data as a service to the Army.

This operating model gave Leidos a new opportunity to innovate. Leidos focused across four areas to ensure that the LSMA would meet the Army's evolving needs.

The LMSA aviation platform

The initiative began with the platform itself, and Leidos purchasing a Bombardier 650 mid-class business jet. It can reach altitudes of over 40,000 feet, operate at higher airspeeds, allowing deeper signals gathering across a broader area while maintaining an acceptable standoff position. It also has a 4,000 nautical mile range, with ten hours of operational endurance, giving it the persistence it needs in areas of interest. Additionally, the 650 offered a platform with significant size, weight, and power capability that would allow for a diverse range of sensor solutions.

A new signal processing equipment architecture

The second focal area was the LSMA's data processing equipment which utilizes more sensors. Conventional aircraft SIGINT processing equipment involves an integrated proprietary design for each signal gathering package. Vendors deliver the package as a black box design with its own power and antenna, creating heavy products that limit time in the air.

Optimizing the aircraft's altitude and endurance meant rethinking the entire SIGINT package design into one with a Modular Open System. Leidos developed a rack-mounted architecture with a common backbone and power system, eliminating hundreds of pounds of weight in dedicated power systems.

The Army realized that the traditional multi-year development cycle for equipment acquisition was too long, and it needed the ability and agility to be more responsive to new signal types. Leidos responded by commercially sourcing processing solutions for the LSMA. It developed a Mission Manager tool to rapidly reprogram these systems with new signals processing capabilities on demand.

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Modular antennae integration

The design team also changed how the sensor packages integrated with the LSMA to make it more modular. It introduced a custom belly fairing, allowing it to mount different antennae packages in five discrete sections. Engineers can swap avionics out with minimal changes inside the aircraft.

Air-to-ground communications

Finally, Leidos modernized beyond line-of-site satellite communications solutions, integrating edge processing, to enable high speed data transfer worldwide. This enables ground operators to remotely operate the signal processing equipment and even adjust what they're looking for in real time. Those communications operate at multiple levels of security to reflect different mission parameters.

THE OUTCOME: A MASSIVE UPGRADE IN CAPABILITIES

Leidos's expertise in design, integration, and deployment enabled it to develop this aircraft in just 18 months, which is significantly less time than the standard acquisition approach. The initiative moved from discussions in January 2019 to aircraft deployment in July 2020. The redesigned architecture also makes major upgrades easier. After the aircraft became operational, the Army requested the addition of more government sensors. This was easily accommodated because of the open system approach.

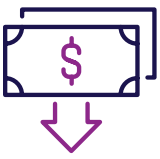
One of the biggest benefits for the Army lies in the aircraft's enhanced sensor capabilities. It has tripled the number of data targets that the Army can monitor during a single mission compared to other aircraft.

The other big win for the U.S. military is the increased agility that comes from an aircraft designed from the ground up with adaptability in mind. Its simpler maintenance and configuration capabilities make it easier to support mission changes with minimal disruption. Software-defined signal processing equipment enables ground-based operators to change its function during flight. When it is necessary to swap out or change avionics, Leidos can do so in a single day.

The LSMA's design, along with Leidos' support of operation, logistics, and sustainment, has had significant impact to mission reliability. Aircraft in the military have an average 80% mission capable rate, which the Army required Leidos to match. The LMSA has continually exceeded that requirement with a 92% mission capable rate since its inception. Historically, the highly specialized sensors required on these missions have been difficult to maintain. When they broke, it would take an aircraft out of operation for several days or weeks. Under ARTEMIS, when a sensor malfunctioned on this aircraft, Leidos had it back in service within 24 hours.

LSMA continually achieves a 92% mission capable rate.

The aircraft can also move around the world quickly, increasing its mission availability based on changing needs. This is changing how the military thinks about aircraft supply internally, enabling them to shift from a COCOM-centric approach. Plus, LSMA's contractor-operated nature and the aircraft's advanced remote operation capabilities make it possible for Leidos and Army personnel to control the aircraft's signal processing both in the aircraft and on the ground, providing maximum adaptability to changing mission parameters.



The increased ISR capability provided by ARTEMIS came at a minimal up-front cost for the Pentagon. Leidos set the bar for others to follow by shouldering much of the project risk, developing this as an internal project and providing it to the Army for significantly less money than a standard acquisition project. This dramatically reduces the Army's capital outlay and helps inform their leaders' decisions about near-term needs.

With the LSMA having helped demonstrate and operationally validate some of the potential requirements of the Army's forthcoming High Accuracy Detection and Exploitation System (HADES) aerial ISR program, the future is bright for this project. The Army has already contracted a second aircraft scheduled for deployment in January 2023 to further support and enhance the Army's ISR capabilities.

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