

Portable Micro Air Vehicles

Micro Air Vehicle Protects Warfighters with Fast, Far-Sight Security



Technology and Innovation

Realizing that a smaller, lighter unmanned aerial vehicle (UAV) would help maximize its military use and effectiveness, AeroVironment set out to create the first operating micro air vehicle (MAV). Completed in 2001 under a DARPA SBIR, AeroVironment's Black Widow, weighing just three ounces and measuring six inches across, was able to fly for over 30 minutes with a range of 1.1 miles at altitudes up to 800 feet. The small size responded to the issues of portability and covert operation, which helped to maximize the MAV's use to the military. The Black Widow carried a color video camera and download link, plus stability augmentation and flight data sensors.

At the time the Black Widow was conceived, the smallest state-of-the-art UAVs were about 12 times larger and 50 times heavier. With the MAV, AeroVironment immediately faced the problem of cramming all the avionics, propulsion, and payload systems required by a military UAV into a parcel that would fit into the palm of the hand.

The development team solved this problem by reducing the packaging sizes of all the components, using multi-functional components, and removing any excess capability from the system that was not absolutely necessary.

In recognition of this work, DARPA presented AeroVironment with its prestigious *Award for Outstanding Performance by a SBIR Contractor* in June of 1999. The Black Widow also



won the 1999 Shephard's Press, *Unmanned Vehicles Magazine Readership Design Award* in Paris, France.

Rather than being implemented into a stand-alone product, the Black Widow served as proof-of-concept for a palm-sized aircraft capable of performing "over the hill" reconnaissance. Components developed for the Black Widow became enabling technologies for the extremely successful AeroVironment Raven UAV, which can fly for 90 minutes with a range of 10 kilometers. Raven UAVs have saved countless lives in various military conflicts around the world by providing fast far sight security against threats. The Black Widow program also evolved into another DARPA-funded program, the AeroVironment Wasp MAV.

With a wingspan of 4.5 feet and a weight of 4.2 pounds, the hand-launched Raven provides aerial observation at line-of-sight ranges up to 10 kilometers

Joint Collaborations

AeroVironment has been working closely with the U.S. Army in developing the Raven UAV. The slightly smaller

Wasp air vehicle has been field tested by various military customers, including the U.S. Navy and Marines.

Lessons Learned

- Instead of following today's trends and duplicating other products on the market, look well into the future for solving tomorrow's challenges with today's resources.
- To facilitate transitioning products to the military, make sure the product fulfills all of the customer's critical needs. Concentrate on the important aspects of the design and leave other features out until the technology matures. Delivering a solution that meets 80% of the technical criteria but works well is much better than delivering a solution that meets 100% percent of the technical criteria but is unreliable or cost prohibitive to produce.
- Understand the goals of the program and do not get distracted by challenges that tend to derail or change the course of the program, even if those "side" research studies are more interesting than the principal development task.
- Don't hesitate to submit a DARPA SBIR proposal. It's a great way to jump start a new company or a new division of a company in an area of future technology. The entrepreneur will then be in a good position to fulfill military needs relating to the product developed under the DARPA SBIR.

Economic Impact

The Black Widow program provided monies for cutting-edge technology research that would not otherwise have been funded and promoted internally at AeroVironment. The resulting technologies allowed AeroVironment to produce other UAVs more quickly, saved money on their development, and ultimately led to large production orders by the U.S. military. The success of the Raven UAV



AeroVironment Senior Engineer Matt Keenon with the Black Widow, a tiny reconnaissance tool which can fly for over 30 minutes at a range of 1.1 miles at altitudes up to 800 feet.

resulted in a significant increase in the number of employees at AeroVironment Inc. In addition, DARPA funding allowed AeroVironment to demonstrate its capability to produce very micro-scale air vehicle systems, which has led to subsequent contracts.

About the Company

AeroVironment designs, develops, produces and supports a family of unmanned aircraft systems (UASs), from micro air vehicles to high-altitude long endurance platforms. The company's small UAS products are used to deliver real-time intelligence, surveillance and reconnaissance. ■

Company Information

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Number of employees: 300