

## FUTURE DEFINING

## Switchblade: From Gun-Launched UAV to Precision Strike Loitering Missile System

By Alyce Moncourtois and Brett Hush

Imagine a frontline defense that could neutralize your enemy within seconds and save your life and the lives of those around you. The movie "The Hurt Locker" features a scene in which the protagonists are pinned down overnight by a single sniper. Every time a member of their group peeks over the embankment to fix the location of the sniper, they are shot. Now, imagine if the team possessed a tube-launched air vehicle that they could launch at will and use to find, fix and neutralize the sniper without placing anyone in harm's way. That "imaginary" frontline defense solution is real, and it's called Switchblade.

In 2004, the U.S. Army asked AeroVironment to develop a small UAV that could launch from a 105mm mortar for the purpose of battle damage assessment. The Army wanted the capability to quickly assess whether or not they were hitting their targets and do so without placing soldiers in harm's way. In response to the Army's request, AeroVironment created a small UAV that could be launched from a 105mm Howitzer Artillery Gun and that featured a camera and a data link to provide real-time video feedback to the mortar team.

"This is how Switchblade got its start," said

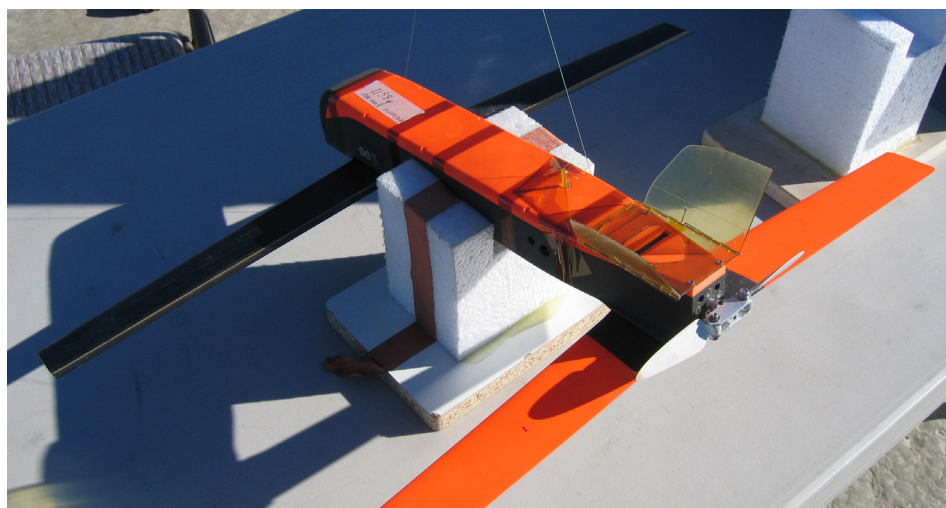
Brett Hush, AeroVironment's senior product line general manager for Tactical Missile Systems. "It originated from a gun-launched, unmanned air vehicle [GLUAV]."

While AeroVironment gave the customer exactly what they wanted, the GLUAV program didn't really get off the ground. "However, something big happened," said Hush. "The innovative concept of a rugged, tube-launched UAV was established,

and it was exciting!" Stemming from this early work, in 2005 AeroVironment initiated an IRAD program called Tube-Launched UAV.

**"However, something big happened - the innovative concept of a rugged, tube-launched UAV was established...and it was exciting!"**

—Brett Hush



Switchblade Block 0, Flight Test at El Mirage, January 23, 2007.



# PROCEED WITH CERTAINTY

Also at this time, AeroVironment won a DARPA demonstration program called Close Combat Lethal Reconnaissance (CCLR), partnering with Raytheon Missile Company. This project used many of the capabilities that had evolved from GLUAV, but employed an optical wire communication (versus a radio frequency-based solution) similar to the original Raytheon TOW missile developed by Hughes Aircraft Company.

With AeroVironment's experience on GLUAV and CCLR solidly on track, the company approached Air Force Special Operations Command (AFSOC) with the concept of a tube-launched, armed UAV. As a result, AeroVironment was awarded an SBIR (Small Business Innovation Research) contract in 2006 from the Air Force Research Lab to develop the first Switchblade-armed UAV.

"AeroVironment came up with the name Switchblade because of the way the spring-loaded wings open like a switchblade knife at launch," said Eric Sornborger, AeroVironment's Switchblade chief engineer.

Under the SBIR contract, AeroVironment built Switchblade Block 0, which used a government-provided payload that came from the U.S. Army lab at Picatinny Arsenal in New Jersey. Block 0 successfully completed live-fire testing, and the Air Force was excited about their new capability. They were so impressed and confident in AeroVironment's work that they funded further development of a fieldable solution, which was called Switchblade Block 1.

For Block 1 development, AeroVironment partnered with Alliant Tech Systems, now part of Northrop Grumman, for a compact, highly-effective warhead. "This was the big breakthrough point,"

stated Hush, "this warhead made Switchblade a very effective weapon."

Hundreds of Block 1 systems were built, tested, taken through safety confirmation, and fielded with AFSOC. When the SBIR funding was nearly depleted, Lt. Col. Todd Hanning, who served as the AFSOC test and technology division chief, partnered with the U.S. Army Infantry Center and the U.S. Army Lab CCLR lead to secure additional funding to complete development.

"This push to increase funding was essential to get Switchblade through development with all the critical capabilities the warfighters needed, such as nighttime capability," said Hanning, now AeroVironment's Switchblade 600 product line director.

According to Hush, the next big, important event came in 2010 when the U.S. Army became aware of this capability and conducted a user operational assessment (UOA) in-theater. The Army determined that Switchblade was suitable for filling a gap in current weapon capabilities. Based on the Army's UOA, additional funding became available in 2011 to enhance the capabilities of Switchblade and field it under the U.S. Army's Rapid Equipping Force (REF). "And so was born Switchblade Block 10," Hush stated proudly.

The Block 10 system, which is similar to the Switchblade 300 AeroVironment builds today, was fielded to U.S. Forces in 2012.

In 2013, Secretary of Defense Chuck Hagel signed the Rapid Acquisition Authority designating Switchblade as a critical capability that required urgent fielding to protect deployed U.S. forces. Such urgent fielding directives are rare within the

## Fast Facts

The Switchblade name was used as soon as product development reached Block 0.

From Block 1 development through present day, 5,000 Switchblades have been built, all in Simi Valley.



# FUTURE DEFINING

Department of Defense and typically compete with a multitude of similar requests for other capabilities. Due to this new fielding requirement, AeroVironment started ramping up production to support the increased demand. Almost immediately, Switchblade began attracting attention throughout the U.S. Armed Forces.

"At this time, we recognized a need for a launcher that could deploy several missiles to support forward operating bases," stated Hush. AeroVironment began developing a Switchblade multi-pack launcher that could hold up to six missiles.

In 2014, AeroVironment's CEO, Tim Conver, now Chairman of the Board, requested new investment ideas from the business leaders to accelerate the company's growth. The Switchblade team proposed the development of a much larger Switchblade variant. "We secured customer funding to complement the AeroVironment investment," said Hush. "This project was originally called Topaz, but today this product is known as Switchblade 600."

A small, focused team led by Win Banning, AeroVironment's Switchblade 600 program director, took on the challenge of developing this larger Switchblade variant and meeting an aggressive live-fire demonstration set for June 18, 2015, only 11 ½ months from program start. "They met their goal and this achievement was the beginning of an entirely new market segment for tactical missiles," said Banning.

Since that time, multiple customers have created distinct requirements with the intent to field such systems. Today, AeroVironment is supporting

multiple, separate customer requirements for Switchblade 600 variants. Switchblade 300 is also available in different variants.

AeroVironment is now supporting the U.S. Marine Corps Organic Precision Fires Mounted (OPF-M) program with Switchblade 600. This variant would be fielded on ground vehicles with an 8-pack launcher. AeroVironment is one of four competitors awarded a phase 1 contract. A competitive fly-off will occur in January 2021 to down-select to a single supplier.

AeroVironment has developed a number of Switchblade variants to address unique customer requirements. One such variant is Blackwing, which is launched from submerged U.S. Navy submarines using an underwater-to-air delivery canister. Its mission is to provide rapid ISR capability to submarine crews. AeroVironment worked closely with another company to integrate Blackwing into the delivery canister.

In 2015, under the JCTD (Joint Capability Technology Demonstration), AeroVironment demonstrated Blackwing. This effort was called AWESUM, which stands for Advanced Weapons Enhanced by Submarine Unmanned Aerial Vehicles against Mobile Targets. The U.S. Navy continues to test, evaluate and field Blackwing systems.

Today, AeroVironment's Tactical Missile Systems continue to lead the industry with cutting-edge, innovative solutions in this rapidly growing market area.

To learn more about AeroVironment's Tactical Missile Systems as well as other products and solutions, go to [www.avinc.com/tms](http://www.avinc.com/tms).

## Fast Facts

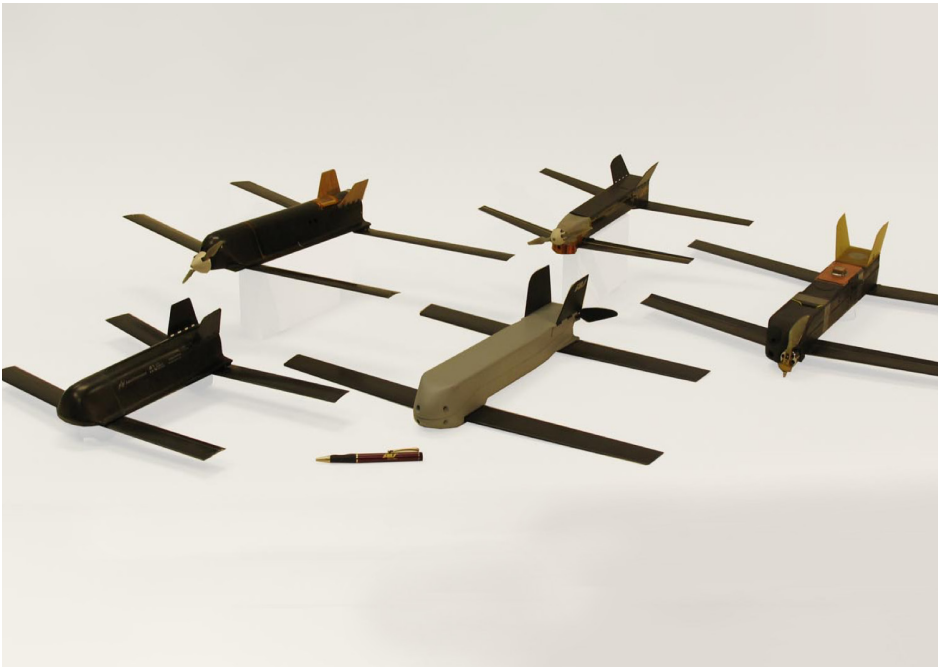
In 2015, AeroVironment introduced the Switchblade 300 and 600 nomenclature to reflect the diameter of the tube from which each version launches - either three or six inches (approximately).

In comparison, Switchblade 600 is 10 times the weight of Switchblade 300.

Over the decade and half that AeroVironment has been developing loitering missiles, we have competed multiple times against some of the largest defense contractors and have won every competition.



Submarine Over-The-Horizon Organic Capability vehicle based on Block 1 Switchblade. Pacific Missile Range Facility, January 13, 2009.



Evolution of tube-launched vehicle starting with GLUAV on bottom left to Switchblade Block 0 in center front.