AeroVironment, Inc.
Unmanned Aircraft Systems Overview

Background

AeroVironment provides customers with more actionable intelligence so they can proceed with certainty. Based in California, AeroVironment is a global leader in unmanned aircraft systems, tactical missile systems and electric vehicle charging and test systems, and serves militaries, government agencies, businesses and consumers. For more information visit http://www.avinc.com.

Unmanned Aircraft Systems Overview

With more than 25 years of experience developing, supplying and supporting small UAS, AeroVironment is a prime contractor and supplier to all U.S. Department of Defense (DoD) programs of record for this category of unmanned aircraft system and has delivered more than 30,000 air vehicles to customers to the U.S. and its allies throughout the World. AeroVironment’s family of small UAS includes Raven®, Wasp™, Puma™ and Shrike VTOL™. These backpackable/man portable, hand-launched unmanned aircraft systems are carried and used by troops and security personnel – who frequently operate across large geographic areas, often far removed from their bases and dependent mainly on what they can carry in their packs or vehicles – and deliver frontline, real-time situational awareness to increase combat effectiveness and force protection. By transmitting live, streaming color and infrared video from onboard...
cameras directly to a hand-held Ground Control System with an embedded color monitor, AeroVironment’s UAS provide real-time information that helps U.S. and allied armed forces make more informed decisions that enable them to operate more safely and effectively.

<table>
<thead>
<tr>
<th>Product</th>
<th>Customers</th>
<th>Weight</th>
<th>Nominal Endurance</th>
<th>Payload</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ-11B Raven B+</td>
<td>US Army, Marines, Air Force, USSOCOM, National Guard</td>
<td>4.5 lbs.</td>
<td>90 min.</td>
<td>Gimbaled EO and IR video sensors</td>
</tr>
<tr>
<td>Wasp AE™</td>
<td>US Air Force, Marines</td>
<td>2.85 lbs.</td>
<td>50 min</td>
<td>Gimbaled EO and IR video sensors</td>
</tr>
<tr>
<td>RQ-20A, B Puma AE™</td>
<td>USSOCOM, Army, Navy, Marines</td>
<td>13.5 lbs.</td>
<td>210+ min.</td>
<td>Gimbaled EO and IR video sensors</td>
</tr>
<tr>
<td>Shrike VTOL™</td>
<td>Under evaluation</td>
<td>5.5 lbs.</td>
<td>40 min.</td>
<td>Gimbaled EO and IR video sensors</td>
</tr>
</tbody>
</table>

**Switchblade® Tactical Missile System**

One of AeroVironment’s most dramatic capabilities is the Switchblade Tactical Missile system (also referred to as a loitering munition system. Switchblade provides a portable, high-precision lethal strike capability, creating an entirely new type of force protection.

The backpackable, battery-powered Switchblade launches from a tube, unfolds its tandem wings and transmits streaming video from color and infrared video sensors directly to the AeroVironment Ground Control System. Upon identifying a hostile target on the handheld video
monitor, the operator can designate the target and the Switchblade becomes a weapon – autonomously guiding itself onto the target, detonating its small warhead with high precision and low probability for collateral damage.

Switchblade can rapidly deliver a powerful but expendable backpackable flying intelligence, surveillance and reconnaissance package on a distant target within minutes. The vehicle’s small size and quiet motor make it difficult to detect, recognize and track even at very close range. The Switchblade is scalable and can be launched from a variety of air, ground and sea-based platforms.

**Ground Control System**

AeroVironment’s [Ground Control System](#) provides a common command, control and information solution for the company’s family of small UAS. Small, lightweight, and combat proven, the Ground Control System enables the system operator to monitor and control the air vehicle while also displaying real-time video from its onboard cameras to personnel on the ground.

In addition, it allows the operator to capture screen images and view other data, while also facilitating real-time re-transmission of video and metadata to an operations network.

When embedded at remote locations, the Ground Control System also can operate as a remote video terminal, providing command centers or monitoring stations with the same viewing and analysis capability as the unmanned aircraft system operator. It is compact
and portable, taking up only a portion of a small backpack, and can be assembled in less than two minutes.

**Digital Communications Architecture**

Raven, Puma AE and Wasp AE systems come equipped with a Digital Data Link™ developed by AeroVironment. With digital Raven, Puma AE and Wasp AE systems, users can operate up to 10 times as many air vehicles in the same geographic area as compared to previous analog systems. Digital small UAS also permit beyond line-of-sight operation, the creation of an ad-hoc wireless data network for the battlefield (turning the system into a “flying hotspot”) and encrypted communications.

**UAS Training Services**

AeroVironment develops and delivers training courses for its customers to support a wide range of small UAS applications and tactical situations. Courses are designed to give students a comprehensive understanding of the selected unmanned aircraft system solution, including safety, operational proficiency, aircraft maintenance and air space management, that when applied “in theater” will enable them to accomplish their mission objectives.

**UAS Logistics Services**

AeroVironment’s UAS logistics services ensure mission success by providing quality products and logistics support anywhere in the world. AeroVironment’s UAS logistics support solutions include planning, upgrades, UAS spares and repair services. Support
also is provided in the areas of technical expertise, material management, supply chain management and military and commercial logistics.

**Solutions In Development**

**Blackwing™ Loitering Reconnaissance System**

AeroVironment is a technology innovator focused on solving important customer problems with practical, new solutions. In addition to a growing product line supporting demand for UAS solutions, AeroVironment cultivates a robust pipeline of new solutions under development to drive growth.

The AeroVironment Blackwing is one of several derivatives of Switchblade and carries a payload of extra batteries instead of a warhead to enable longer flight. With greater flight time Blackwing can perform reconnaissance missions and cross-domain command, control and communication linking manned vessels and Unmanned Underwater Vehicles (UUVs). Initially developed for launch from submerged submarines or unmanned underwater vehicles, Blackwing could also provide reconnaissance capabilities for other naval vessels as well as land and air vehicles.

**Commercial UAS Information Solutions**

The same characteristics that make AeroVironment small UAS critical tools for tactical situational awareness, namely, portability, ruggedness, ease of use and reliability, also support a host of commercial applications. Combined with a Cloud-based data analysis
platform, AeroVironment small UAS now help digitize crops, powerlines, pipelines, railroad tracks and other infrastructure for analysis to detect anomalies and changes. The results of these analyses can help growers and asset managers make more informed decisions that enable their businesses to operate more safely and effectively.

**Tether Eye™ Unmanned Aircraft System**

The AeroVironment Tether Eye unmanned aircraft system is designed to provide continuous, 24-hours-a-day surveillance at up to 150 feet above its launch point. Tether Eye deploys automatically from a small, weather-sealed, self-contained base station and ascends to a pre-determined hover altitude from where viewers of its video feed take advantage of its 360-degree field of view. The specially designed and ruggedized tether connecting Tether Eye to its base station provides continuous power, which, combined with AeroVironment’s track record of proven reliability, enables uninterrupted long-term operation.