



HAWX (Hollow Area Wing – Extendable)

Advanced UAV Capability for U.S. Forces

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FROM VISION TO EXECUTION

VX AEROSPACE

#1 GOAL For Unmanned Air Systems in Combat

“Develop and operationally assess for potential fielding a joint unmanned combat aircraft system capable of performing SEAD/Strike/Electronic Attack/ISR in high threat environments.”

Unmanned Air Systems Roadmap (2005-2030), Executive Summary & pg 75.

What's Driving COCOM's #1 Goal

COCOMS Want Surveillance & Strike Capabilities in One Platform¹

Aircraft Design Optimized Principally for One Mission²

Two Assets Required On Battlefield³

Interchangeable Wings Needed for Different Missions⁴

Time Lost to Reconfigure UAV For Mission Change⁵

Morphing Wings - Many Years Out . . . and Expensive⁶

**VX Aerospace Is Developing
the Solution *Right Now***



HAWX

HAWX (Hollow Area Wing – Extendable)

- ***Telescoping Wing In Flight for Unmanned Air Vehicles***
- ***Operational Within 12-18 Months***
- ***Allows a Single “Multi-Mission” Air Vehicle to Replace Two Separate “Single-Mission” Air Vehicles***

HAWX (Hollow Area Wing – Extendable)

[View Animation](#)



AAI Shadow.wmv





***HAWX Wing Ends
Extended***

Greater Relative Range

Greater Endurance

Greater Payload Capacity

***Slower Approach & Landing
Speeds***

More Stable Platform at Altitude

***Increased Survivability – Fly
Higher***

Reduced Power Requirements



***HAWX Wing Ends
Retracted***

Higher Speeds

Less Transit Time to “Hot” Zone

Strike Mode - Like A “Hawk”

***Increased Survivability – Fly
Faster***

Return to Station - Extend Wings



***HAWX Wing Ends
Halfway***

Continually Optimize Flight Profile

Best Cruise – Fuel Economy

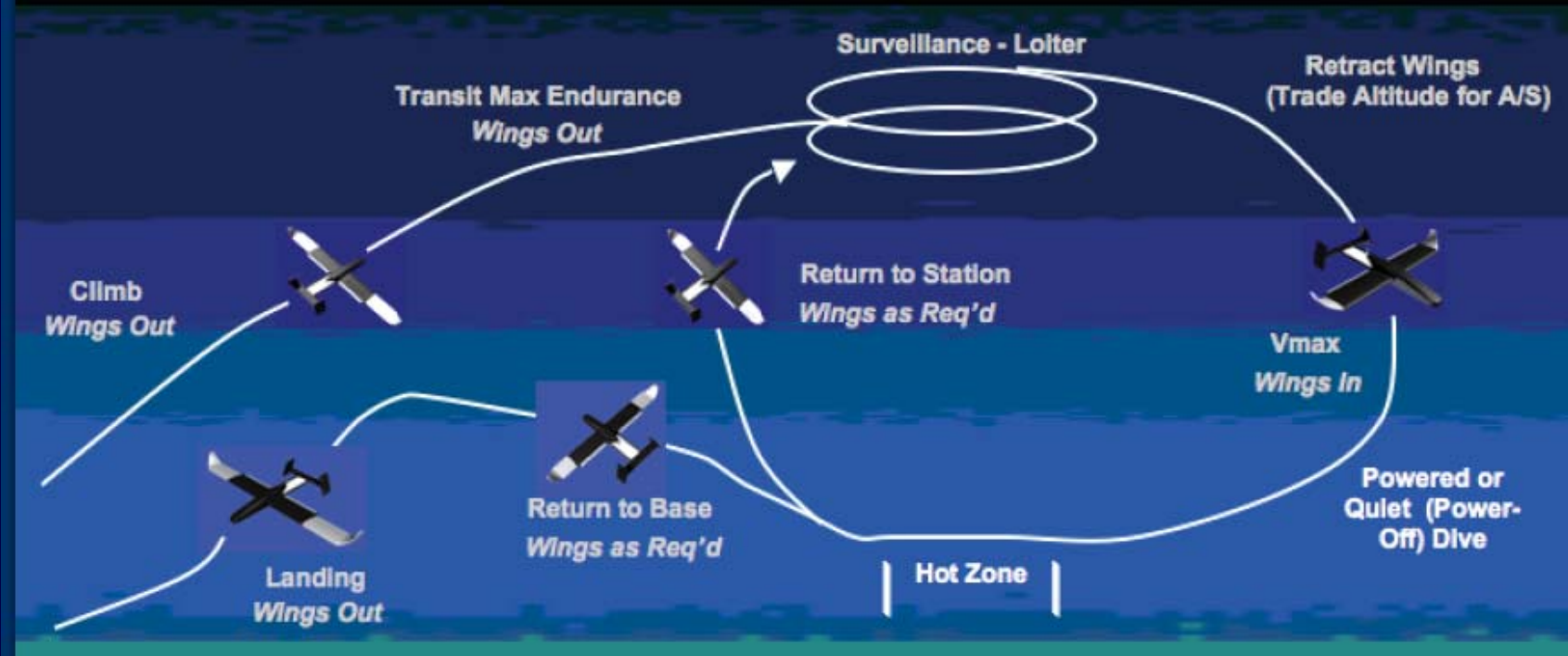
Enable Range/Speed Trade-Offs

Respond to In-Flight Contingencies

Multi-Mission / Multiple Capabilities



- High Altitude Surveillance Missions
- High Speed, Low Altitude Attack Missions
- High Speed, Low Altitude Photo Reconnaissance
- Deliver Logistics Supplies to Forward Locations



Telescoping Wing Key Features

Carbon Fiber (Monocoque) Construction

Simple Actuation Mechanism, Completely Internal

Variable Extension/Retraction Positions Controllable During Flight

No Change in Center of Gravity During Extension/Retraction

Expands Wing Performance Envelope (V-max to V-stall)

Program Benefits

Operating Cost - One UAV performing two missions means less fuel expended, and less wear and tear on other flying assets

Manpower – Support and fly one aircraft rather than two

Combat Strategy - “Time Sensitive Targeting”

Communications – No “drop links” between two different platforms

Logistics – Logistics and maintenance reduced and simplified

Acquisition Costs - Acquisition costs are reduced since HAWX technology can be used on multiple platforms

HAWX - Potential Platforms

AAI - Shadow 200, Shadow 400, Shadow 600, Pioneer



Elbit - Hermes 450, Hermes 1500, Skylark, Sniper



Lockheed – SkySpirit, SkySpirit ER



IAI - E-Hunter, Eyeview, Eagle, Heron, Hunter



COCOMS Want Surveillance & Strike Capabilities

When asked what they would like to change about their air vehicles operators answered “they’d like to be able not only to look for their enemies, but shoot them if they pose a threat.”

UAS in Wartime: To Shoot or Not to Shoot?”, Unmanned Systems, January 2008, pg 17.

Aircraft Designed Primarily for One Mission

Surveillance Missions (Long, Slender High Aspect Ratio Wings)

Operational commanders increasingly value keeping targets of intelligence interest under **constant and persistence surveillance**.

Unmanned Air Systems Roadmap (2005-2030), pg D-6.

Attack Missions (Shorter, Lower Aspect Ratio Wings)

In attack missions the UAV must maneuver closer to the threat, and the survivability of the vehicle must be assured through a combination of **speed, stealth technology, and/or high maneuverability**.

Unmanned Air Systems Roadmap (2005-2030), pg A-5.

Two Assets Required on Battlefield

Military forces worldwide are making a *distinction between surveillance, which uses a slow loitering platform, and combat, where they prefer a fast penetrator.* By employing different aircraft, a sailplane configuration could be used for high altitude surveillance missions, while a fighter-type configuration would be used for the combat missions.

“World UAS Market Set to Triple in a Decade”, Unmanned Systems, Nov/Dec 2007, pg 16.

Interchangeable Wings for Different Missions

The German air force is pursuing an advanced UAV for deployment early in the next decade. **“The concept calls for a common fuselage with different wing and payload options to optimize the airframe for a particular mission.”**

“Advancing UAVs”, Aviation Week and Space Technology, Nov 19, 2007, pg 36.

Time Lost to Reconfigure UAV for Mission Change

The major drawback for interchangeable wings is that the ***battle space is constantly changing, which does not allow time to fly back and reconfigure the aircraft on the ground.***

www.soton.ac.uk/~cedc/pdf/SpringConfPdfs2007/sobester.pdf

Morphing Wings: Many Years Out ...and Expensive

Technologies being investigated today to increase wing performance include airfoil-shape change for multipoint optimization, and active aero elastic wing deformation control for aerodynamic efficiency and to manage structural loads.

Unmanned Air Systems Roadmap (2005-2030), pg D-6.

Currently, these capabilities are at technology readiness level (TRL) 2 or 3, and will need to mature for many more years before being operational.

Maryann Lawlor, The Shape Of Wings To Come, October 2006, SIGNAL Magazine.