Hybrid Advanced Lighter-Than-Air UAS

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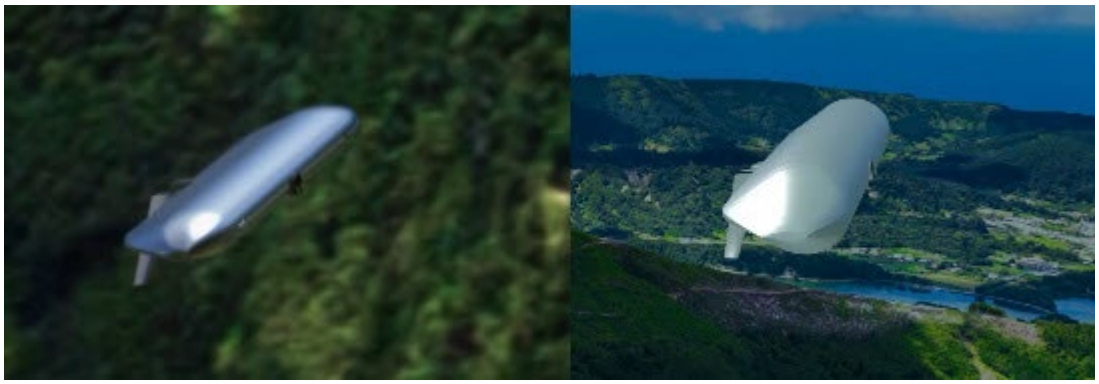
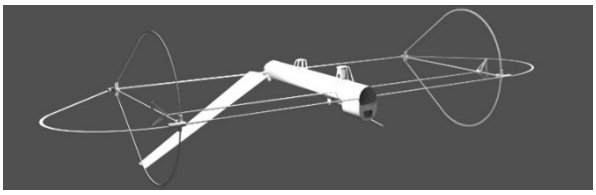


What is HyALTA® - A hybrid lighter-than-air (LTA) and flying wing air vehicle that allows a single vehicle to provide the simplicity, vertical heavy lift, and extended efficient station keeping capabilities of an LTA with the high glide ratio (>40:1) and velocity (up to 200 kts.) of low coefficient of drag flying wings. This patented design (U.S. Patents 9,623,954/10,287,000/10.377,465/10,532,803 and other patents pending) is unlike other conventional or LTA aircraft.

HyALTA® Transition Sequence – Flying Wing to LTA

How Does it Work – HyALTA® delivers these capabilities through an elegantly simple minimalist internal structure that morphs to provide extensive combinations of aspect ratio, chord thickness and top and bottom camber to achieve a wide range of aerodynamic and buoyant lift configurations. A gas impermeable inner bag provides the envelope for lifting gases while a sturdy elastic external envelope stretches to provide the aerodynamic surfaces in any configuration. Internal gas pressure, in conjunction with a simple internal frame, maintains the aerodynamic shape. Thrust comes from one or more ducted fan engines deep in the center composite center tube. Control authority is provided by the variable geometry control surfaces and a thrust vectoring nozzle at the rear of the center tube. The control surfaces actively reposition from horizontal (minimum drag) to inverted "V" (for mid-range speeds) to vertical (for LTA flight). This combination provides optimum control for an infinite range of flight configurations. This patented approach results in almost no "parasitic" structure (used in one configuration but not in another) in the design and results in a vehicle with optimal performance capabilities in all flight configurations.



HyALTA® Minimalist Internal Structure

HyALTA® Control Surfaces and Thrust Vectoring Nozzle

Design Characteristics HyALTA®'s "magic" is in the design, not in high-cost/hard to acquire/manufacture materiel or components. This allows the use of commercially available, low-risk materials and technologies for both affordability and scalability.

Inherent design features provide multiple benefits. Embedding the ducted fan(s) deep in the center tube increases performance and is inherently safer and quieter than designs with exposed blades. HyALTA® can bump into personnel or structures during launch and recovery without injury or damage. Envelop materials can be engineered to be transparent to RF sensors or communications systems mounted in the envelopes. The recessed ducted fan(s) and minimal structure also have small acoustic and RF signatures, making HyALTA® naturally stealthy. Using transparent inner and outer envelopes reduces the visual signature as well.

HyALTA® is also a rugged and easily assembled. Most of the structure is flexible carbon fiber or fiberglass rods and tubes that bend if stressed, instead of breaking. Even with the center tube and flight control surfaces, HyALTA® offers little structure for significant damage from hostile fire. HyALTA® can fly home as a fixed wing vehicle if the gas envelop is compromised. The structure lends itself to ease of assembly and disassembly with common hand tools. When disassembled, HyALTA® can be stored and transported in a shipping tube.

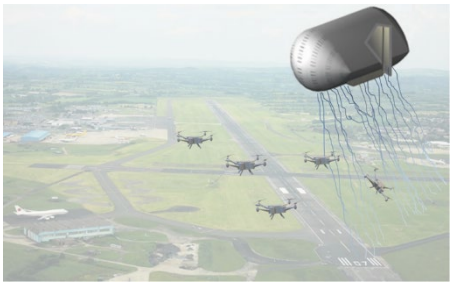
Activities to Date – Our focus has been on a prototype that can demonstrate LTA and flying wing capabilities. We can demonstrate dynamic transition from LTA to flying wing. Transitioning from flying wing to LTA requires developing currently unavailable light-weight, high-capacity buoyant gas management systems. Developing the envelop systems that can both retain the buoyant gas and stretch throughout the full range of structural configurations has been challenging. The NASA weather balloon offices and personnel have been extremely helpful sharing their expertise and even excess weather balloon material.

HyALTA® Prototype in LTA and Flying Wing Configurations

Performance Characteristics / Potential Applications – A single vehicle with HyALTA®'s extensive list of capabilities and characteristics has many potential applications.

HyALTA®'s rapid transit over significant distances and long-term loiter with low detection signatures capabilities makes it an attractive ISR or communications link vehicle, applicable to military missions, disaster scenarios, or major unexpected events such as refugee migrations.

Slight variations further increase HyALTA®'s potential. For example, adding long strands of Mylar or nylon underneath the vehicle turn it into an effective Counter-UAS (CUAS) capture system. In this scenario, HyALTA® loiters in LTA configuration until directed toward incoming hostile UASs. Converting to flying wing configuration, it flies quickly to intercept the UASs and maneuvers to entangle them in the trailing strands. It then safety brings the captured UASs back for exploitation or destruction without falling debris inherent in other CUAS solutions.



HyALTA® Counter-UAS

Other applications pair HyALTA® with one or more UASs to extend delivery range with HyALTA® loitering overhead to act as a communication/data relay and recovery resource. An especially powerful application would have HyALTA carry one or more multi-modal UASs such as HyALTA Aeronautics' HyDrone™ designed for deployment, operations, and recovery in any medium (air, land or maritime).

Path Forward – Limited resources have achieved considerable progress to date. Modest investments would accelerate progress dramatically. Remaining developmental areas include the buoyant gas management system (mentioned above) and refinement of the inner and outer envelopes.

Specific costs depend on performance and other requirements, but costs for basic functional prototypes capable of ground, hover, and limited forward flight demonstrations could be as low as $100k. We estimate full development would take ~$500k, depending on performance specifications and interface requirements for the desired payload, flight autonomy requirements, additional communications needs, etc. We would optimize components and subsystems to improve performance while reducing size, weight, and power (SWAP) needs.

Next – For further information or to schedule discussion, please contact Mr. Scott Kempshall at 727.510.4532, scott.kempshall@hyalta.com. Additional information on HyALTA® or any of our other highly innovative UAS designs, to include MGMWERX and industry briefing, animations, videos, etc. are available at www.hyalta.com.

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