

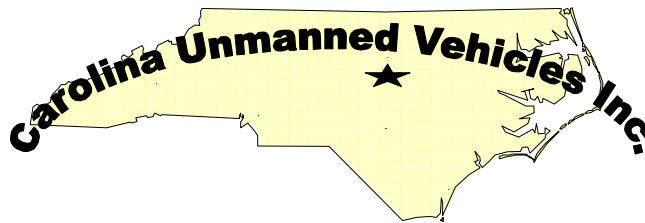
WHITE PAPER
SMALL TACTICAL MULTI-PAYLOAD AEROSTAT
SYSTEM (STMPAS)

A New Surveillance and Communications Capability
For
Homeland Security
Border Control and Maritime Security

Low Cost

Long Mission Duration

Minimum Manpower



Carolina Unmanned Vehicles, Inc.
4105 Graham-Newton Road
Raleigh, NC 27606

Technical POC:

Michael E. Rogers

Project Manager

(919) 851 9898

merogers@carolinaunmanned.com

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Administrative POC:

Glenda L. Rogers

President

(919) 851 9898

glrogers@carolinaunmanned.com

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Small Tactical Multi-Payload Aerostat System (STMPAS)

1.0 BACKGROUND Department of Homeland Security (DHS) agencies such as Customs and Border Protection and the Coast Guard need overhead EO/IR surveillance of border crossings, seaports, and maritime borders that is both less costly and intrusive than aircraft or Unmanned Aerial Systems (UAS) while providing around the clock coverage. DHS agencies also need low cost, responsive, and mobile equipment for wide area resilient and durable communications after a natural disaster, accident, or terrorist act that degrades existing communications systems.

The most efficient means to meet these needs is an aerostat system. Mobile towers are height limited, providing only short range coverage. Aircraft or UAS are expensive and have limited endurance. Aerostats provide coverage of large area, comparable to aircraft or UAS, but with persistence of days and weeks instead of hours. However, traditional aerostats are large, manpower intensive and cannot operate in adverse weather conditions. Their ground equipment has very limited mobility and lengthy set-up times, restricting use to a few fixed sites and almost precluding shipboard operation.

To remove these limitations Carolina Unmanned Vehicles (CUV) developed the **Small Tactical Multi-Payload Aerostat System (STMPAS)**, creating a mobile cost effective aerostat system. STMPAS was deployed by the Army to Afghanistan, with earlier versions built for the USAF, Sandia National Lab, and Lockheed Martin. STMPAS consists of a small specially designed tethered blimp, called a Helikite, mounted on a single HMMWV trailer Carrier, operated by a two person crew (Fig. 1).

The STMPAS blimp, flown at several hundred to thousand feet altitude, provides coverage 24 hours a day for a week or more without maintenance or downtime. Surveillance versions up to 1,000 feet can cover a 20 mile radius, depending upon terrain. A STMPAS relay at 4000 feet provides communication coverage out to 60 miles from its location. STMPAS is very mobile and cost-effective through use of unique designs to reduce the need for ground crews to handle the blimp during launch and recovery. Operating and maintenance cost is a fraction of the cost of using aircraft or UAS to lift surveillance or relay payloads. It does not require the complicated flight clearances needed for UAS deconfliction with manned aircraft.

2.0 MAJOR SUBSYSTEMS STMPAS consists of several unique components that, taken together, comprise a system far smaller and more versatile than any comparable unit. Each component emphasizes the strengths of the others to produce a small, highly mobile capability unequalled by other aerostat systems. STMPAS consists of three major subsystems: The Helikite, Carrier, and Payloads

2.1.1 Helikite The key to making a small, mobile and cost effective aerostat system is to use a Lifting Aerostat, which is an aerostat with aerodynamic lifting surfaces. STMPAS uses the most mature and efficient lifting aerostat on the market, the Helikite developed and patented by Allsopp Helikites Ltd. The patented Helikite combines helium and wind lift so even very small sizes operate easily in high wind, allowing STMPAS to be a

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| <p>Fig 1 Small Tactical Multi-Payload Aerostat System (STMPAS)</p> | | |
| <p>DHS Missions:</p> <ul style="list-style-type: none"> Border Control Maritime and Port Security Post Disaster / Remote Area Communication Secret Service Large Event / VIP Security |  | <p>Attributes:</p> <ul style="list-style-type: none"> High Mobility Off-Road Trailer Helikite Launched From Carrier For Safe Operation, Move While Inflated Rugged Diesel Generator, Electric Winch, Helium Racks and Inflation Manifold Operable by 2 Persons C-130 Roll On – Roll Off Capable |

fraction of the cost and manpower of traditional lighter-than-air designs. Helikites are lighter-than-air like a blimp but are not knocked down by the wind. Wind forces on the kite wings generate lift to counteract the wind side force. With this force to counteract the wind drag the Helikite does not need a large buoyancy margin and we can design the STMPAS to use modern lightweight electronics. The STMPAS Helikites are able to fly in winds up to 70 mph. Other aerostats must be considerably larger to withstand wind forces, so they cannot be designed for small payloads and mobile ground equipment. Helikite performance is the key that allows STMPAS to be very compact, use minimum helium and be operable by only two people.

A Helikite is almost invisible at few hundred feet altitude and so is very difficult to detect and shoot at altitude. It is radar transparent, and has a very small IR signature. The Helikite has only about ½ psi pressure and is a non-stretch material, so even if hit with multiple bullets it does not “pop” and only slowly deflates over several hours. It remains operational during that time, and is easily repaired and returned to service. The non-flammable helium cannot burn. For safety to aircraft the aerostat can be equipped with standard lights visible to aircrew, or with IR lights visible only with night-vision goggles.

2.2 Carrier The Helikite allows even a small aerostat to withstand real world wind conditions, means STMPAS does not require the large, clumsy pivoting mooring system used by other aerostats. Until launch the uninflated STMPAS Helikite is contained in a mobile Carrier with helium tanks, electric generator, and a winch. Use of a single military HMMWV trailer provides good ground clearance for off road capability, ensuring the brakes, tires, etc. are in the government supply system for maximum ruggedness and maintainability. Many comparable aerostat handling systems require multiple trucks for carriage. Carriers are off road capable, air transportable and can respond to any location accessible by a HMMWV and trailer. The Carrier can be made C-130 Roll-on / Roll-off capable in 15 minutes.

The Carrier can operate Helikites of varied sizes, optimized for the particular payloads and operating conditions. Tethers can be non-power for battery powered payloads, or powered with data / power wires and fiber-optic lines, for continuous 24 / 7 operation. A rugged diesel generator provides low fuel consumption and safe operation. All operations are done by a two person crew, minimizing operating cost.

The STMPAS Carrier provides a Launch Box atop the trailer, allowing Helikite launch directly from the trailer. This also allows stowage of the inflated Helikite on the trailer top when not aloft, so that it does not have to be deflated in the event of adverse weather. In areas without overhead obstructions the inflated Helikite can be moved while stowed atop the Carrier and quickly elevated after stopping, for a “quick look” at an area of interest. It can even be kept aloft during movement, for total surveillance and communications coverage.

2.2.5 Field Operations Basic operation is versatile since STMPAS is completely self-contained, with electrical power and all essential equipment on one trailer. The Carrier is towed to an operating location by a HMMWV or pickup truck. A typical operating site is a clear area approximately 90 feet across without trees, power lines or other overhead obstructions. Once on site the two person crew inflates and launches the Helikite. The primary crew tasks during while the Helikite is aloft are operating the surveillance payloads and periodically refueling the generator or running the winch. It carries helium for one inflation and several weeks of helium to “top-off” every 3 to 5 days. It can remain aloft for a week or more if using a power tether, or brought down about once every 12 to 24 hours to change batteries if using a non-power tether.

We have designed a Carrier version for application to small ships, such as Coast Guard Cutters, to provide extended line of sight for communications relay and surveillance payloads. The naval Carrier is a wheeled dolly with all equipment to inflate and launch the Helikite, including winch and helium tank racks but draws electrical power from the ship. It can also be used for ashore missions that do not require extended mobility.

2.3 Payloads STMPAS provides a unique and cost effective overhead capability for many electronic payloads. The main usage categories are surveillance and communications. The system may be ordered with or without payloads, with the customer providing their own payloads. In the latter case we can include development of the payload interface, and integration testing.

