WHITE PAPER

LIGHTWEIGHT AEROSTAT SYSTEM (LAS)

Submitted In Response To
FCC NOTICE OF INQUIRY
Utilizing Rapidly Deployable Aerial Communications Architecture in Response to an Emergency
PS Docket No. 11-15

A New Communications Relay / Surveillance and Border Security Capability For Law Enforcement and Homeland Security

Low Cost

Long Mission Duration

Minimum Manpower

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

Technical POC:
Michael E. Rogers
Project Manager
(919) 851 9898
merogers@carolinaunmanned.com

Administrative POC:
Glenda L. Rogers
President
(919) 851 9898
glrogers@carolinaunmanned.com

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Lightweight Aerostat System (LAS)

1.0 BACKGROUND Customs and Border Protection, the Coast Guard and the Secret Service need overhead EO/IR surveillance of border crossings, seaports, airports, outdoor VIP events, etc. that is both less costly and intrusive than aircraft or Unmanned Aerial Systems (UAS) while providing around the clock coverage. Law enforcement and emergency response agencies need these surveillance capability and low cost, responsive, and mobile equipment for wide area resilient and durable communications after a natural disaster, major accident, or terrorist act that degraded existing communications systems.

The most efficient means to meet these needs is a low cost, mobile 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. Carolina Unmanned Vehicles has developed a **Lightweight Aerostat System (LAS)** to remove these limitations, creating a very cost effective system. LAS forms part of the Small Tactical Multi-Payload Aerostat System (STMPAS) built for the Army Rapid Equipping Force to provide ISR capability for small tactical units in Afghanistan.

1.1 LAS Concept LAS 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 LAS 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 LAS relay payload at 4000 feet provides extended communication coverage out to 60 miles from its location.

The patented Helikite combines helium and wind lift so even very small sizes operate easily in high wind, allowing LAS to be a fraction of the cost and manpower of traditional lighter-than-air designs. LAS 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. It covers a far larger area than tower based cameras, and has reduced blind spots due to obstacles in the field of view (Fig. 2).

Fig 1 **CUV Lightweight Aerostat System**

HMMWV Compatible Carrier Trailer
Helikite Lifting Aerostat
Helirest Protective Mount
Gyro –Stabilized Camera Payload
Networked Communications Payload
Acoustic Gunfire Detectors / Other Payloads

1.2 LAS Operational Advantages Compared to towers, UAS and aircraft LAS has significant operational advantages for mobile surveillance and communications relay:

Mission Duration	Duration of weeks or more, requiring only a helium "top-off" about once a week
Acquisition Cost	Starting under $200,000 for the smallest version. (Total cost depends on the payload)
Operating Cost	Low cost per operating hour. No pilot proficiency flying, etc.
Manpower	Very low, requiring only two persons to launch and retrieve the system. These can be the same people as the communications / sensor operators.
Deployment Requirements	Very low, road and off-road mobile, C-130 and CH-47 transportable
Operating Restrictions and Impact	Minimal FAA restrictions, No noise, unobtrusive, no danger of falling on civilians, not detectable by targets under observation
Coverage Area and Capabilities	Several miles radius for surveillance, limited by camera resolution. Up to 60 miles radius for communications relay. Can function as a translator node and a network-bridge-in-the-sky, providing seamless interoperability and connection of computer and networks across a wide area.

2.0 MAJOR SUBSYSTEMS LAS 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. LAS consists of three major subsystems: The Helikite / Helirest, Carrier, and Payloads

2.1 Helikite / Helirest All blimps in zero wind float straight up from the tether location, with the helium exerting an upward force and the tether an equal downward force. However, the tether cannot exert a sideward force to counteract wind forces, so traditional blimp shaped aerostats are driven into the ground by only moderate wind. Wind drag increases with the square of the wind speed. For example, an increase from winds of 30 to 33 miles per hour, a 10% increase, actually increases drag by 21%. A 20% increase in wind increases drag by 44%! So, very large drag forces can be created at even medium winds.

To counteract wind drag traditional aerostats increase the buoyancy significantly beyond that required to lift the payload, typically with a minimum of 200 to 300 pounds buoyant lift. However, greater buoyancy requires a large blimp, resulting in larger ground handling equipment and more personnel.

Fig. 2

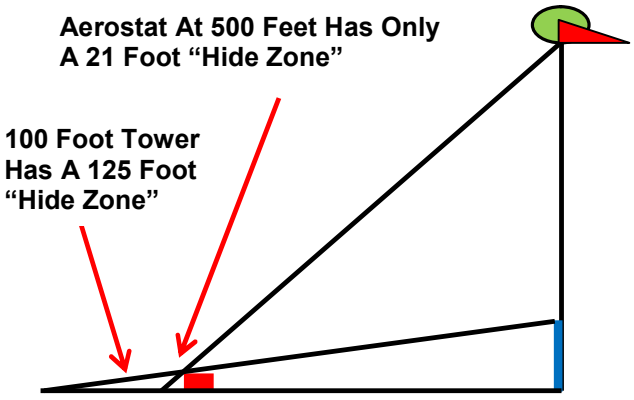
Shadow Effect For Towers and LAS Aerostat

Towers Are Simple And Have Good LOS – Why Use Aerostats For Local Surveillance?

Altitude Minimizes "Shadow Effect" Of Obstacles That Provide Hide Space For Smugglers, Etc.

Compare Shadow Effect Of A Two Story Building 500 Feet From A 100 Foot Tower And A LAS At 500 Feet

Higher Obstacles Such As Hills Can Completely Block Tower Field Of View



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. LAS uses the most mature and efficient lifting aerostat on the market, the Helikite developed and patented by Allsopp Helikites Ltd. of Great Britain (Fig. 3). Helikites combine helium and wind lift to operate easily in high wind speeds at a fraction of the cost and trouble of traditional lighter-than-air designs. Helikites employ a horizontal carbon fiber spar that supports a flexible cloth kite to generate lift in wind.

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 LAS to use modern lightweight electronics. The LAS 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 LAS to be very compact, use minimum helium and be operable by only two people.

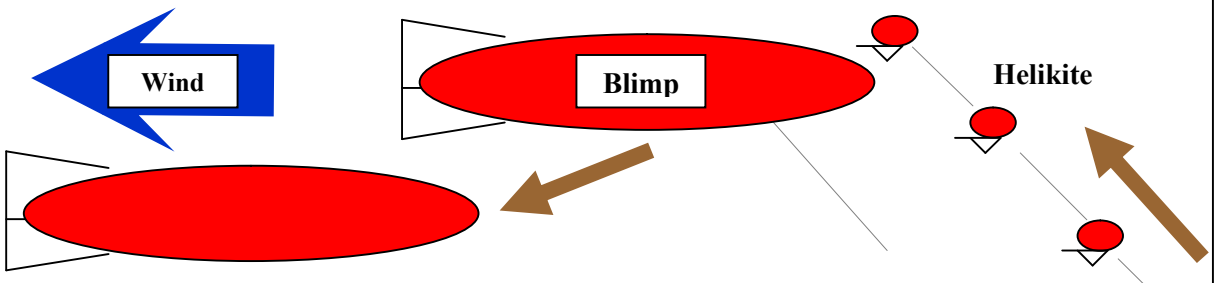
A Helikite is very difficult to detect and shoot at altitude, is radar transparent, and has a very small IR signature. It is almost invisible at few hundred feet altitude. The Helikite has only about ½ psi pressure and is a non-stretch material, so even if hit with multiple bullets it does not "pop" 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.

2.1.2 Other Airborne Items The airborne equipment includes several safety items. The FAA requires tether banners, lights and a system to automatically deflate the aerostat if the tether breaks. Simple "pop valves" which activate when an errant aerostat rises to a high altitude can meet this requirement. However CUV recommends use of a more reliable deflation device to quickly deflate the aerostat if the tether breaks, to avoid drifting into open airspace or loss of a valuable payload.

Our standard Spectra tether is very strong and lightweight. The tether can be a nonpower or power version. With a nonpower tether the aerostat has to be brought down periodically for short intervals to change out payload batteries or refuel fuel cells. A nonpower tether weighs between 0.5 and 1.0 pounds per 100 feet, depending upon the aerostat size and therefore the tether loads in winds. Power tethers that transmit data and/or electrical power provide continuous 24/7 operation, but range from 2.5 lb to 3.9 lb per 100ft., or four times heavier than a nonpower tether. Obviously available aerostat lift is affected.

Fig. 3 **Lifting Aerostat Versus Blimp**

Lifting Aerostat Are Pushed Up By Wind, Counteracting Wind Drag
Even Small Units Can Withstand High Winds
LAS With Lifting Aerostat Can Be Sized To Available Modern Lightweight Payloads



With No Lift Surfaces, Wind Pushes Traditional Tethered Blimps Back and Down
Blimp Based Aerostat Systems Must Be Very Large To Cope With Wind Drag
Requires Large Ground Handling Equipment and Vastly Increases Operating Cost
They Cannot Capitalize On Modern Lightweight Electronic Payloads

2.1.3 Performance All aerostat lift capability is reduced by anything that reduces air density, so both increased ground elevation and air temperature reduce available lift. CUV has developed analysis tools to account for available lift due to ground elevation and temperature. For example a standard 35 cubic meter Helikite (35M3) can lift 30 pounds at Sea Level Standard Day conditions but only 15 lb. at 6,000 feet and 120 degrees F, typical of the US Southwest border. At higher elevations and temperatures the standard LAS uses the larger 64M3 Helikite for greater performance.

Helirest Unique to LAS is the Helirest. During launch and recovery in wind, traditional blimps require several people to avoid ground handling problems, which can easily damage the blimp, particularly when half-inflated. A partially inflated aerostat of any type can flail around in wind like a yacht sail, potentially damaging itself and even injuring crewmembers.

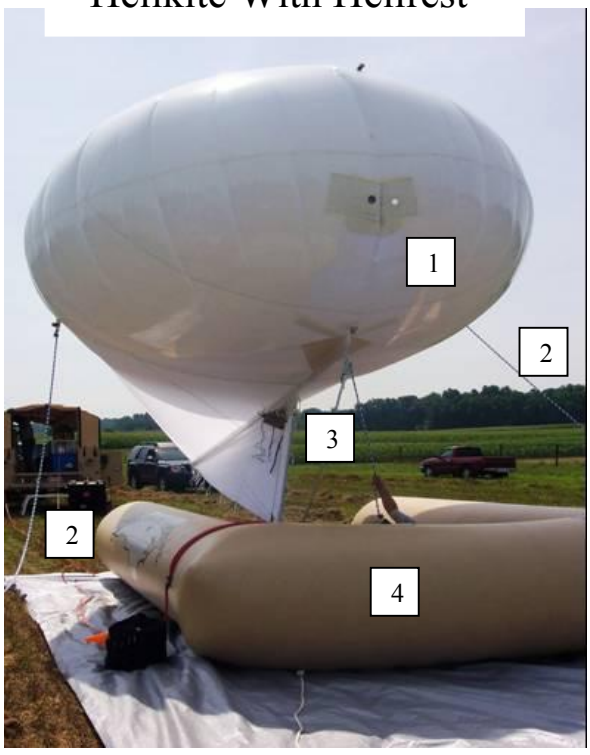
Mooring system must reliably control the aerostat during critical launch and recovery cycles and protect the aerostat while moored in all kinds of weather. Safely controlling the aerostat while on the ground, for inflation / deflation or for storage, can require complex handling equipment. Most larger aerostats use a pivoting trailer mooring system with a retractable tower to capture the aerostat nose. Although fairly effective in inflating and launching aerostats this system has difficulty when bringing an aerostat down. Even with a pivoting trailer it is often hard to align the nose with the tower, and the aerostat thrashes about. Because of this trailer design many of the larger aerostats cannot be launched or retrieved in more than 25 to 30 mph winds, although this is rarely mentioned in aerostat marketing literature. Even these limits often cannot be reached in gusty conditions.

Some smaller systems inflate the aerostat on a ground tarp or use a metal ring shape on a pallet. Although simple, these may damage the aerostat and make it difficult to control in windy conditions.

To overcome these control problems LAS inflates the Helikite inside a U-shaped air inflated unit called a Helirest that protects and restrains the Helikite, minimizing wind effects and allowing two person operation (Fig. 4). The Helirest provides support, restraint and protection to the Helikite during inflation / deflation and ground storage. It is a simple but effective device that can be scaled to each size of Helikite to provide a "snug' fit while the Helikite is stowed on the ground.

The Helikite and Helirest are a synergistic pair. The Helirest protects the Helikite, whose unique features make the Helirest effective. Because of the horizontal keel that supports the fabric kite, Helikites use a single short self-adjusting tether attachment line, close up to the belly of the aerostat. This allows the Helikite to be kept within five to eight feet of the Helirest, where it is protected during all operations. At this height the Helikite can be secured with tiedown lines, and all inflation / deflation and payload work can be done safely by personnel standing inside the Helirest.

Helikite With Helirest



1. Helikite Helium Fill Nozzle
2. Tiedown Lines
3. Deflation Electronics
4. Helirest

Fig. 4

All other aerostat designs employ a number of smaller lines that come down from the aerostat body to a common point well below the body, where they join the main tether. Although some payloads are mounted on the aerostat belly most payloads are placed at the junction of the support lines and the main tether. Because of these diverging lines the winch attached to the main tether cannot bring the aerostat all the way down to the ground, but only to the point where the lines divide. This is often many feet above ground, exposing the aerostat to the very turbulent wind currents near the ground. In turbulence the ground mooring system often cannot capture the aerostat nose and the unit can tear itself apart on striking the ground or mooring system.

Even if other aerostat ground equipment used something like a Helirest the multiple support lines would prevent bringing the aerostat body down snugly against the Helirest body. Due to the multiple attachment lines the aerostat would remain many feet above ground level, exposed to gusts and side winds, and would not be controllable. Use of the Helikite and Helirest together allow a small and simple system that can be operated safely in high winds with a minimum crew.

2.2 Carrier The combination of the Helikite, which allows even a small aerostat to withstand real world wind conditions, and the Helirest, which allows safe operation by a small crew, greatly enhances the LAS ground equipment. We do not require the large, clumsy pivoting mooring system used by most other designs, and can package all the required equipment onto a single HMMWV trailer.

Until launch the uninflated LAS Helikite is contained in a mobile Carrier with helium tanks, electric generator, and a winch (Fig. 5). The Carrier is a modified commercial utility truck body mounted on a standard HMMWV military trailer, ensuring the brakes, tires, etc. are in the military supply system. 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 in Figure 5 launched the Helikite from a Helirest on the ground behind the Carrier trailer. The current Carrier launches the aerostat directly from the trailer, reducing launch times and avoiding muddy or flooded soil. In areas without overhead obstructions the inflated Helikite can be moved on the Carrier and quickly elevated after stopping, for a “quick look” at an area of interest. In some case it can even be kept aloft during border movement, for total surveillance and communcations coverage.

2.2.1 Mobility / Transportability LAS is highly mobile, having been designed to military mobility requirements. The Carrier is built upon a standard HMMWV trailer chassis with good ground clearance and off road capability (Table I). The chassis is unitized body construction using aircraft grade aluminum and chromoly steel. A fully independent progressive rate trailing arm suspension, direct acting telescopic

Fig. 5

LAS CARRIER

All equipment carried in single HMMWV trailer

Components are military or industrial standard

Helium tanks with inflation manifold and regulator

Inflatable Helirest protects Helikite on ground

Rugged JP-8 compatible diesel generator powers the winch and other equipment

Roll-on / roll-off C-130 and Ch-47 capable

Trailer can support up to a 64 cubic meter Helikite, with a sea level, standard day lift of 66 lb.

In high / hot conditions 64M3 helikite can lift 34 Lb. at 6000 feet and 100F.

TABLE I - Carrier Road and Off Road Performance:

Max Speed (Primary Roads)	55 mph	Departure Angle	39 deg.
Max Speed (Secondary Roads)	35 mph	Turning Angle	80 deg.
Max Speed (Off Road)	20 mph	Side Slope	20 deg.
Fording	20 in.	Ground Clearance	16in.

shocks, and tires with 30-mile runflat inserts provide a rugged platform suitable for any type of terrain. An industrial grade aluminum utility body mounted on the chassis provides support for all the remaining equipment. The Carrier can be prepared for air transport in 15 minutes by the two person crew using simple hand tools. The Carrier is then C-130 Roll-on / Roll-off capable.

2.2.2 Equipment The Carrier contains all equipment to launch, operate and retrieve the Helikite and payloads. This includes helium tanks with a high pressure manifold and pressure reduction system to inflate the Helikite. The tanks are a standard commercial and Defense Logistics Agency NSN item. It also includes a ruggedized electric diesel generator that can operate on both standard diesel and military JP-8 turbine fuel, the only fuel available on the battlefield. Military customers can alternately specify a standard 3Kw Tactical Quiet Generator Design (MEP831A or MEP832A).

An electric winch with tether is carried to launch and retrieve the Helikite. The winch is a reversible, variable speed winch strong enough to reel / unreel several thousand feet of synthetic rope tether, working against wind loads of up to 700 lb. The winch mechanism will withstand environments with 100% humidity, salt water and temperature extremes. The winch is rated for marine duty (100% severe duty), rugged, reliable, controllable, and has multiple safety features. Our baseline electric winch design has been used for a Lightweight Aerostat System produced for the Lockheed Martin Advanced Development Group, aka “The Skunk Works” and for the Army Small Tactical Multi-Payload Aerostat System (STMPAS) designed for use in Afghanistan.

2.2.3 Field Operations LAS is operated by a two person crew and carries enough Helium for one inflation and a month of helium to “top-off” once a week. The leakage rate is about 5% or less per week. Once on site the crew inflates and launches the Helikite. 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. In remote operations the crew would be provided with a tent or other accommodation but in many cases the site will be near a command post and the crew can be housed with other personnel. They can be employed in whatever Command Post tasks are required since there are very few LAS task for the crew during normal operations, other than refueling the generator or operating the winch to replace batteries. They can be trained to operate the surveillance payloads if required.

2.2.4 Maintainability & Availability LAS is designed to be easy to maintain and support. All major components are easily to replace or repair even in austere areas. Examples of this are:

The trailer is military standard with all replaceable components in the military / National Guard supply system. Complete maintenance instructions are in TM-9-2330-392-14&P.

The winch, derived from a design used on Oceanographic research vessels, is saltwater corrosion resistant with watertight sub-sea connectors on all connections except 110/220 VAC. It has 2 or 4-man carry recessed sliding tube handles and a Lifting eye for easy load handling.

The generator is a self-contained unit bolted to the trailer floor, easily accessed for maintenance.

Other Carrier Versions The off road trailer Carrier is the current primary product design. A Carrier mounted on a commercial trailer is also available. These are more spacious and provide better work environments for the sensor operators than the military trailers. However they have low ground clearance, so they are not off road capable, and are not air transportable.

We have designed versions of the Carrier for naval applications, such as for deployment on the Littoral Combat Ship (LCS) to provide extended line of sight for communications relay and surveillance payloads. The LCS Carrier is a wheeled dolly with all equipment to inflate and launch the Helikite, including winch and helium tank racks. The Carrier is stored in a Mission Support Module a (20 foot ISO Container) when not in use, with spares and extra helium tanks. It is rolled to the rear of the LCS flight deck for launch operations. The Helikite and the air inflated Helirest are carried in a box on the top, from which the Helikite is launched. This provides a safe controlled environment for inflation, payload checkout and launch.

The LCS Carrier concept, without the ISO Container, is adaptable to other Naval and Coast Guard ships too small for UAS or helicopters, extending their Beyond Line Of Sight capabilities. This could provide a new capability to small USCG vessels at less expense than UAVs, and provide greater persistence.

For very high mobility operations, such as along rugged borders, the entire Carrier equipment can be mounted in a 4 x 4 pickup truck. For more static operations such as port security we have begun work on a version launched from the top of a 20 foot ISO container. The Container contains internal work space as well as the helium system and winch, providing better long term working conditions for the sensor operators.

2.3 Payloads LAS 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.

2.3.1 Persistent Surveillance Payloads A typical airborne surveillance payload is a gryo stabilized pan-tilt-zoom Electro-Optical (EO) and/or Infrared (IR) surveillance cameras with day / night capability, with an included portable Ground Control System. These lightweight payloads can still detect and identify threats at up to out to several kilometers for persistent surveillance and force protection (Table II). This range is enough to provide security for large outdoor events or to protect VIPS, etc. and to do so without the noise and disturbance of helicopters. An example is the Paracam from Latitude Engineering (Fig. 4).

Latitude Engineering's Paracam is a completely self-contained video surveillance unit including power, data-link and a portable base station for video reception and camera control. The airborne unit includes EO and/or IR cameras in various gimbal systems, depending on the mission requirements. Options include full digital datalink or digital-analog for control and video. Paracam is network enabled for video and metadata viewing.

LAS Turret Camera System

The Latitude Paracam uses a Cloud Cap TASE Duo, an EO/IR inertially stabilized gimbal ideally suited for airborne applications with an onboard GPS and IMU for standalone operation.

Camera Turret Mounted on Helikite

Fig. 4 LAS can use a variety of camera systems. Above is a combined EO and IR unit by Latitude Engineering. The Ground Control Station is self-contained in a waterproof case and can be set up in a few minutes. On the right is a camera turret mounted on the Helikite using CUV's below keel camera mounting.

TABLE II - Typical LAS Camera Capability

Widely Used Johnson Criteria:

Detection - an object is present

Recognition - the type of object can be discerned, a person versus a car

Identification - a specific object can be discerned, a woman versus a man, the specific car

Measurements give a **50%** probability of an observer discriminating an object to the specified level.

Data Courtesy **Latitude Engineering**

Camera Abilities (Measured in Meters)		
Sony FCB-EX980 EO Daylight/Color Camera	**Person**	**Vehicle**
Detection	8942	22354
Recognition	3353	8383
Identification	1788	4471
FLIR Photon 640 (Uncooled)	**Person**	**Vehicle**
Detection	2484	6209
Recognition	931	2329
Identification	497	1242
FLIR Photon 640 (Cooled bolometer)	**Person**	**Vehicle**
Detection	7451	18628
Recognition	2794	6986
Identification	1490	3726

2.3.2 Networked Communications Payloads In natural or man-made disasters LAS can act as a relay platform for emergency voice communications, as a network bridge for interconnecting ground computers and networks, and as relay point for dissimilar communications systems. The options are shown in Figure 5, using potential coverage over the Eastern North Carolina area affected by Hurricane Floyd in 1999 as an example. As can be seen a Helikite at even a few hundred feet altitude covers an entire county. LAS to LAS relay allows communication to regional Command Centers. LAS can act as a communications relay platform for emergency response and law enforcement units, particularly in mountainous or urban terrain. LAS could be used to temporarily replace cellular towers damaged by hurricanes, earthquakes or tornadoes, providing emergency management communications to FEMA or other agencies at a critical time.

CUV has delivered LAS communications relay versions to the Air Force, Sandia National Laboratory and Lockheed Martin Corporation. These systems operate up to 4000 feet altitude.

Relay Platform for Emergency Communications In this role, the LAS payload could relay voice communications over a wide coverage area. The LAS would act as a transponder, and convert voice communications between frequency bands. In this manner, emergency responders would have seamless communications with remote emergency management personnel at extended ranges, with no dependence on (potentially) inoperative wired, cellular or point-to-point communications links.

Network Bridge Access to computer communications and emergency networks is critical for responders and emergency management. LAS can act as a "router in-the-sky", providing seamless connection of computer and network resources. Ground networks or individual computers would communicate to the bridge using inexpensive wireless network interface cards, bi-directional amplifier and antenna. This provides simultaneous "many-to-many" communications from one LAS.

Translation For Interoperability Communication interoperability between local, state and federal agencies has been a major problem in all natural disasters and terrorist incidents. In the translator role LAS would receive multiple signals from various agencies, translate them in a ground terminal on the Carrier and then rebroadcast the signals to users equipped with different equipment. Translator hardware is expensive, so LAS's broad area coverage enhances the utility of the translator system by eliminating the need for multiple vehicle mounted translator nodes. This maximizes communications interoperability between local, state and federal units with minimum investment.

2.3.3 Payload Interface / Mounting CUV has developed very simple payload mountings that makes it very straightforward to mount new or alternate payloads. Surveillance payloads, which must be mounted below the lower keel cloth for unrestricted field of view, are amounted on a CUV designed carbon fiber

LAS Coverage Example (North Carolina Hurricane Response)

LAS communications relays can cover large disaster areas, such as the area affected by Hurricane Floyd in 1999. Shown is LAS coverage over affected Eastern counties, with a LAS to LAS relay to the State Command Center in Raleigh.

LAS is mobile and air transportable to get to the disaster quickly, providing one-to-one Communication Relay, multiple user Network In The Sky, and a Translation Bridge for enhanced multi-agency interoperability.

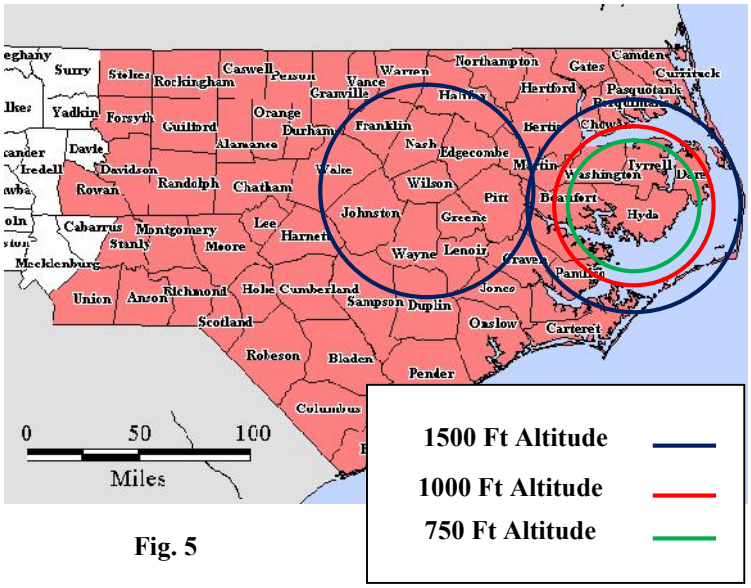


Fig. 5

frame embedded in the keel cloth. Communications and other electronic payloads are mounted direct adjacent to the carbon fiber keel, the strongest and most stable are on the Helikite. Simple composite or metal enclosures are mounted to straps along the Helikite keel. With this method it is easy to mount alternative payloads without extensive, and expensive, redesign of the platform.

3.0 TECHNOLOGY MATURITY Prototype LAS, consisting of Carrier, Helikite and payloads, have been delivered to several customers, including a USAF missile test telemetry version flying to 6000 feet. CUV has delivered a LAS to Lockheed Martin Corporation to lift both camera and communications payloads to 2000 feet. The LAS forms part of the Small Tactical Multi-Payload Aerostat System (STMPAS) built for the Army Rapid Equipping Force (REF). It will provide Intelligence, Surveillance, and Reconnaissance (ISR) capability for small tactical units in Afghanistan and other locations. Therefore the Technology Readiness Level (TRL) of the basic system is 8 or 9. As the LAS prime contractor CUV has teamed with several different companies to develop and integrate various payloads into LAS. Specific payloads developed from existing components will have TRLs of 6 to 8, depending upon the exact payload.

Operation LAS requires a much lower level of skilled personnel than UAS or manned aircraft systems, and requires fewer of the skilled personnel. This makes it ideal to provide to smaller agencies with fewer personnel. For many applications such as disaster response LAS could be operated by part time National Guard personnel. For border or port security it could be operated by Border Protection or contractor personnel. As a ground based system it presents fewer deconfliction problems than UAS.

4.0 DEVELOPMENT AND PROCUREMENT CUV as the prime LAS developer has teamed with several different sensor and communications equipment companies to develop and integrate various payloads into LAS. Typical cost for a LAS ranges from $350K to $450K, exclusive of the payload. Cost depends upon the payload weight and the operating altitude, which affect the size of the Helikite and Carrier, and on payload complexity. For example, a system requiring payload power or data to be transmitted up the tether will require more integration than one carrying a self-contained battery powered payload. The payload cost can vary widely, depending upon the mission. Gyro-stabilized cameras run from $100 for EO systems to $200K or more for dual EO/IR systems. Many communications payloads are in the same range.

CUV can be the LAS prime contractor for a complete system with payload, or provide LAS to carry payloads developed by other companies / agencies. The best arrangement depends upon on customer preferences, project scope and the payloads involved. A Lightweight Aerostat System without payload or with an EO/IR camera payload can be purchased off the shelf. Communications payloads require more specialization and therefore interaction with the customer to develop the complete performance requirements. CUV will be pleased to work with you in developing specific designs to your requirements, or adaptation of our existing products to your needs. By integrating off the shelf subsystems, specific versions can be quickly developed. We can deliver LAS in 5 to 6 months from contract start.

5.0 SUMMARY LAS has great potential to as a platform for various communications relay concepts, local area security / surveillance and other missions. It can provide low cost, highly mobile platform with a mission duration of a week or more. It can operate in weather conditions too severe for many UAVs or aircraft, or other aerostats, and does so without endangering an aircrew. It is a cost effective solution to many Homeland Security missions, for the Border Patrol, FEMA, etc. By integrating off the shelf subsystems, specific versions can be quickly developed in concert with the customer. For a typical system payload integration would be the pacing item, but most versions the LAS platform can be developed and produced in six months or less.

For further information, or to discuss technical, cost or other issues, please contact us.

The Point of Contact for the Lightweight Aerostat System:

Michael E. Rogers LAS Project Manager

919-851-9898

merogers@carolinaunmanned.com