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ARMY AIRSHIPS

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USAWC CIVILIAN RESEARCH PROJECT

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ABSTRACT

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The Army Space and Missile Defense Command is now developing an unmanned airship the size of a football field that will remain aloft with various ISR payloads for up to 21 days. In June 2010 Northrop Grumman was awarded a $154 million contract to develop a Long Endurance Multi-Intelligence Vehicle (LEMV), with options for two additional airships totaling $514 million. The first LEMV is scheduled to be transported to the Middle East in late 2011 for an extended military utility assessment.

This paper will address the role and potential gains and pitfalls of the Army adapting long endurance high altitude unmanned airships. The analysis will attempt to answer the following: 1) Are these types of vehicle practical for use in the Army inventory? 2) What are the potential gains and pitfalls associated with adapting this airship?

ARMY AIRSHIPS

After more than nine years of war, commanders on the battlefield have increasingly recognized the powerful force multiplier provided by persistent intelligence, surveillance, and reconnaissance (ISR) capabilities. Unprecedented successes throughout the battlefield have highlighted the importance of signal intelligence (SIGINT), full motion video, and communication relay assets mounted on airborne ISR platforms. Both manned and unmanned aircraft systems carrying ISR payloads have proliferated throughout the battle space, but at an ever increasing cost. Growing budget pressures have encouraged the study of solutions to reduce the costs of the development, procurement, testing and the operations and maintenance of ISR platforms. Additionally, the recent Secretary of Defense efficiency initiative has underscored the importance of examining all Department of Defense (DoD) acquisition efforts in order to reduce redundancies and duplication. Unmanned airships offer the Army a potential low cost solution to gain significant, leap ahead type efficiencies in terms of both an increased persistence stare capability and a reduction in the overall ISR costs. This paper will address the role and potential gains and pitfalls of the Army adapting long endurance high altitude unmanned airships. The analysis will attempt to answer the following: 1) Are these types of vehicles practical for use in the Army inventory? 2) What are the advantages and disadvantages associated with adapting this airship?

BACKGROUND

Department of Defense and Airships

What is an airship? An airship (also called a blimp) is a lighter-than-air aircraft that can be steered and propelled through the air using rudders and propellers or other thrust mechanisms.[1] Airships can be flown manned, unmanned (controlled from a ground station or another aircraft) or autonomously. Unlike fixed-wing aircraft and helicopters which produce lift by moving a wing through the air (called heavier-than-air technology), aerostatic aircraft such as hot air balloons and airships stay aloft with lifting gas. Typically the modern lifting gas used is helium. There are several types of airships: non-rigid, semi-rigid, rigid, and hybrid. A non-rigid airship, such as a small

blimp, does not have an internal skeleton. A semi-rigid airship is larger and contains some type of internal support structure such as a keel. A rigid airship has a full skeleton, such as the Zeppelin model from the mid 1900's.[2] Hybrid airships combine the characteristics of heavier-than-air technology, such as airplanes and helicopters, with lighter-than-air technology. Airships today are used in applications where the ability to hover for an extended period of time is more important than speed or maneuverability. A good example is the Goodyear blimp filming high above a National Football League Monday Night Football game. Aerostats on the other hand, are typically tethered to the ground by a cable that also provides power.

History

In a military role, airships and aerostats have been used primarily for surveillance and submarine warfare throughout history. The earliest military use of tethered balloons for observation was by the French Aerostatic Corps in 1794. During the United States (US) Civil War, both sides used balloons for observation and directing artillery fires. During the World War One, the Germans used zeppelins with limited success to attack the United Kingdom (UK) in a "strategic bomber" role. The US used airships extensively in the Second World War, primarily as a maritime patrol ship. On the West Coast, airships were used as an early warning for Japanese attacks; in the Atlantic, airships were extremely effective hunting U-boats.[3]

The US discontinued its use of manned airships in 1962 as the technology associated with fixed wing aircraft matured. Recent military and government use of lighter-than-air type platforms has been limited to tethered aerostats. The most successful program to-date is the Tethered Aerostat Radar System (TARS) that has operated since 1980 at locations along the US southern border and in the Caribbean. Their primary mission is surveillance for drug interdiction.[4] Recently, the US military has made extensive use of small portable and rapidly deployable aerostats as a force protector in both Iraq and Afghanistan.[5]

In terms of ISR support to the current wars in Iraq and Afghanistan, both the US and North Atlantic Treaty Organization (NATO) countries continue to invest heavily in unmanned aircraft systems. France and the UK recently agreed to partner on an effort

to spend $1.4 billion to design and build a new medium-altitude, long-endurance (MALE) drone. Both countries will evenly split the costs. The system could enter service as early as 2016.[6] It also appears only the US is currently investing in airships as a platform for ISR.

ISR Task Force

In an 18 April 2008 memo to the DoD leadership, Secretary of Defense Robert Gates established the Operational Intelligence, Surveillance and Reconnaissance (ISR) Task Force (TF). The purpose of the TF was to aggressively provide ISR resources needed on the battlefield; in effect, to circumvent the slow and cumbersome requirements and acquisition process of the Services and get more ISR assets into the theater of operation. Secretary Gates directed that the TF assess and propose options for maximizing and optimizing currently deployed ISR capabilities; identify and recommend solutions to resource, authority, program and other challenges associated with deploying increased ISR capabilities; examine the utilization of ISR assets in support of Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) and identify options for optimizing their usage.[7] To date, the ISR TF has spent over $7 billion on assets supporting OEF/OIF.

Long Endurance Multi-Intelligence Vehicle (LEMV)

The LEMV (pronounced lem-vee) is one of the programs initiated out of the Office of the Secretary of Defense ISR TF. In the case of the LEMV, the validated urgent ISR requirement originated at US Central Command (CENTCOM).[8] The material developer selected to establish a program to fill the requirement was the Army Space and Missile Defense Command (SMDC). SMDC is currently developing a football-field-sized unmanned hybrid airship designed to remain aloft with various ISR payloads for up to 21 days. In June 2010, Northrop Grumman was awarded a $154 million contract to develop the LEMV. The award included options for two additional airships totaling $514 million. A decision to buy airships two and three will not be made until the LEMV has demonstrated airworthiness, now estimated to occur sometime during the summer of 2011. The award period of performance is for a five year technology demonstration

inclusive of the fabrication of an airship, integration of payload and ancillary systems, and test. The award also includes contractor support, to include manning, manual piloting and ground station support for five years. The award schedule includes performance testing within 18 months followed by additional testing and demonstration conducted in Afghanistan. Based on the urgency of the requirement, SMDC approved a contracting approach that authorized the program manager to competitively enter into an Other Transaction Agreement (OTA) on the LEMV program. OTA's under section 845 of the National Defense Authorization Act (Fiscal Year 1994) are exempt from many federal acquisition regulations and processes with the intent of fostering the participation of companies that do not traditionally do business with the DoD.[9] OTA's also tend to streamline the often cumbersome acquisition process. The first LEMV is scheduled to be transported to the Middle East in January 2012 for an extended military utility assessment.[10] Although the schedule is ambitious, designers are not starting from scratch. The design of the airship is based on the already successful Sky Cat (see Figure 1), an advanced airship designed and tested by the UK firm Hybrid Air Vehicles Ltd (HAV).[11]

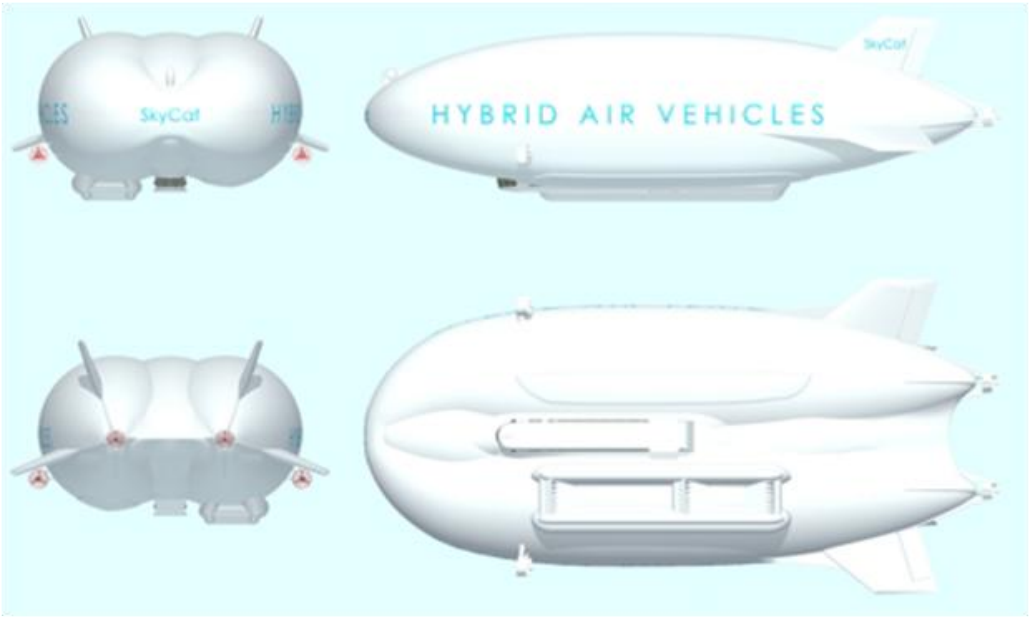

Figure 1. Sky Cat Airship

LEMV Description and Requirements

Basic requirements of the airship include staying airborne for 21 days, carrying a 2,500 pound payload, generating enough power to handle current and future payloads (currently 16kw), traveling at speeds of 30-80 knots, and operating at an altitude of up to 20,000 feet. The LEMV is designed to be interoperable with the Army's Universal Ground Control Station (UGCS) and uses the same hardware and software as the UGCS.[12] Part of the design includes an open architecture payload bays that allows sensor changes by Army personnel in the field. All payloads will be designed to allow plug and play operations.

During operations, LEMV can fly in either an autonomous or remotely operated mode. LEMV can also be flown manually by pilots on board the airship in a gondola-type cabin. On board pilots are required when flying through civil airspace to and from a conflict zone or an area of operation. While flying in autonomous mode, a soldier on the ground would program GPS flight points into the system and the LEMV would actually take off on its own, fly the waypoints and then return and land on its own. In case of an emergency, weather issues or a change to the pre-planned course, an operator on the ground could take control of the aircraft utilizing a joystick type controller. The LEMV Operational View graphically depicts the airships interaction with various capabilities, sensors, and missions on the battlefield (See Figure 2).

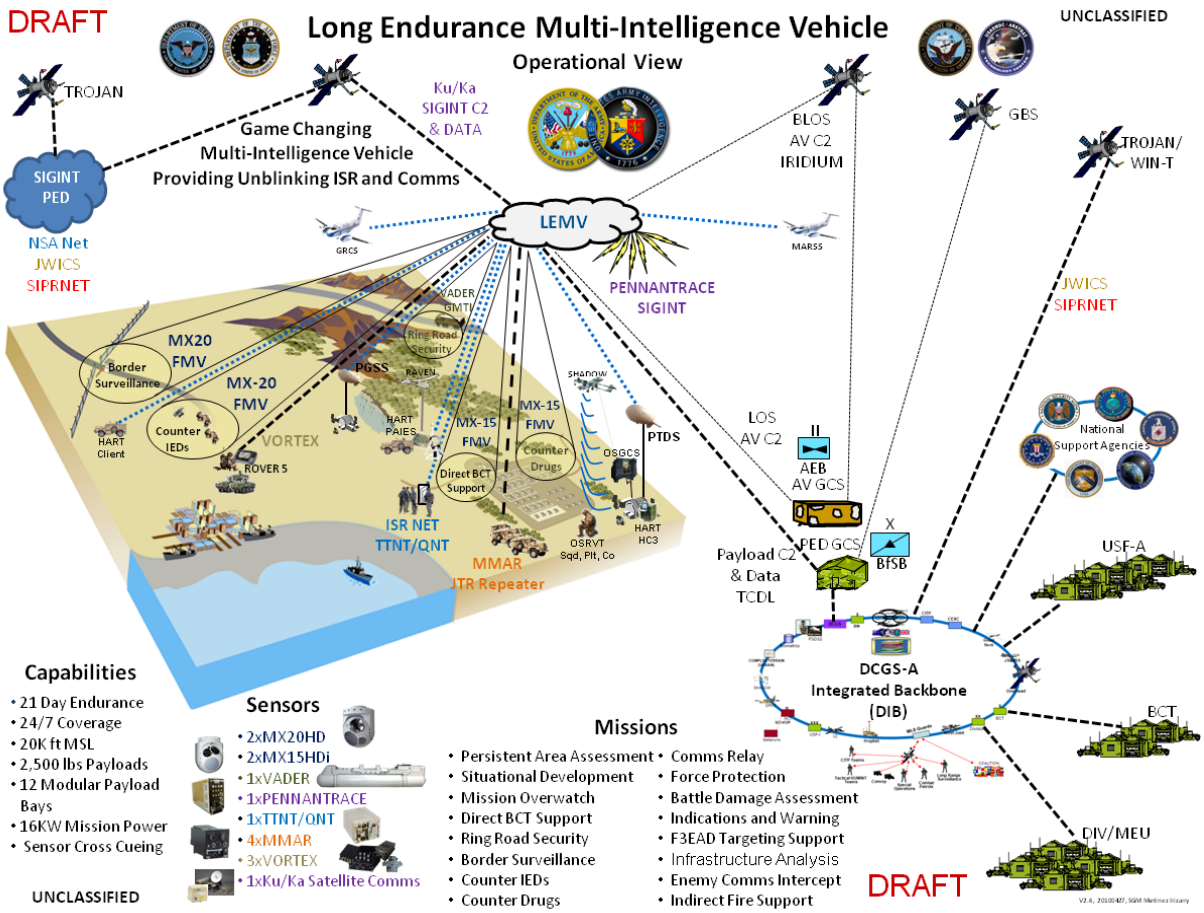

Figure 2. LEMV Operational View

LEMV Transition Planning

It is expected the LEMV program will transition from SMDC control to the Army Project Manager for Unmanned Aerial Systems (PM UAS) once the military utility assessment is completed, currently projected for early 2012. The Army Training and Doctrine Command (TRADOC) has been tasked with developing formal Program of Record (POR) documentation.[13] An Army decision to transition to a formal POR has yet to be made. In December 2010, PM UAS sent a request to the Army Acquisition Executive (AE) requesting PM UAS be designated as the appropriate Project Management office for the LEMV. The Army AE has not yet made a decision. In anticipation of a successful military utility assessment, PM UAS has embedded a five-

person team of acquisition professionals, including program managers and logisticians, on the SMDC program management team to assist in the development and eventual execution of a transition to a program of record.

OTHER AIRSHIPS

Air Force Blue Devil Program

There has also emerged a parallel airship effort funded by both the Joint Improvised Explosive Device Defeat Organization (JIEDDO) and the Air Force that seeks to field a lighter-than-air type airship. Under the Blue Devil Block 2 program, the Air Force managed program integrates various ISR payloads onto an unmanned airship designed to remain aloft for up to 7 days. The airship package is designed to support JIEDDO efforts in the US Central Command area of operation to curb the use of improvised explosive devices.

Program Description

The Blue Devil Block 2 airship is envisioned to be approximately 20% smaller than the LEMV utilizing solely lighter-than-air-gas technology.[14] As of January 2011, the Block 2 funding estimate through 2012 was $211.95 million with the majority of funds supplied by JIEDDO ($173 million). Indeed, in the 2011 National Defense Authorization Act, $3.4 billion were allocated to JIEDDO with $1.4 billion designated for “Attack the Network” type operations including ISR that will lead to offensive missions to eliminate the IED threat.[15] Thirty million dollars of FY10 funds were dedicated to the development of the Polar 1000 airship. A large portion of the FY11 funds ($86 million) is dedicated towards sensor integration and Processing, Exploitation & Dissemination (PED) and ground station infrastructure. The basic requirement of the Blue Devil Block 2 airship includes staying airborne for 3-7 days (average 5 days depending on fuel), carrying a 2,500 pound payload, and operating at an altitude of up to 20,000 feet. Fielding of the first airship is currently scheduled for fourth quarter 2011, several months prior to the LEMV fielding.[16] The program will potentially transition to the Air Force as a POR in 2013. The Air Force has not yet made a transition decision.

Defense Advanced Research Projects Agency (DARPA)

Over the past several years DARPA has been involved in the development of several hybrid airships. The first, called Walrus was cancelled in 2006 by congressional appropriators after several feasibility studies were conducted. The exact reason for the program termination was not publically released. The Walrus project was designed to explore the potential for using airships as long-distance, heavy lift aircraft (see figure 3). The goal of the first phase of the program was to determine the feasibility of building an airship that could carry a 500-ton payload for a distance of up to 12,000 miles. In 2005, two contractors, US Aeros Airships and Lockheed Martin, were awarded contracts of approximately $3 million each to do the ill fated feasibility studies of the concept.[17]

Figure 3. Walrus Early Concept Design

A second DARPA airship program, known as the Integrated Sensor is Structure (ISIS) endeavors to develop a stratospheric airship-based sensor that can remain airborne at altitudes of up to 70,000 feet for more than a year. This is still an active program within DARPA. A $400 million contract was awarded to Lockheed Martin to design and develop the airship. The airship package will be designed to detect both air and ground targets at extremely long range. The idea is to develop technologies to enable large and lightweight radar antennas to be integrated into an airship platform. The program will culminate with a three month flight demonstration in 2013.[18]

PRACTICALITY AND THE ARMY ROLE

Why an airship? The two principal benefits of using airships are the long endurance persistent stare ISR capability and the relatively inexpensive cost to operate. Currently, the longest ISR endurance is calculated in hours, while airships provide weeks of support. A recent Army study comparing the Air Force Predator B system (aka Reaper) and the LEMV fuel consumption to support a 21-day mission concluded that the LEMV used 17,000 pounds of fuel versus the Reapers 776,000 pounds of fuel. This equates to $718 per flying hour for the LEMV versus $5000 per hour for the Reaper.[19] Can and should airships replace all unmanned aircraft operating in a combat zone? Clearly the answer is no. However, by complementing ISR assets provided by unmanned aircraft, a clear reduction in flying hours and related costs can be achieved.

Secretary of Defense Efficiency Initiatives

A review of the Secretary of Defense (SECDEF) efficiency initiatives finds several areas that either directly affect the DoD pursuit of airships or will affect the operations and maintenance of such capabilities in the future. In August 2010, Secretary of Defense Gates announced a number of efficiency initiatives intended to contribute to a Defense Department effort to achieve about $100 billion of savings over the next five years. The initiatives require the DoD to reduce funding devoted to unneeded or low-priority overhead, and to transfer the funds to force structure and modernization so that funding for warfighting capabilities grows at 3% annually.[20]

One of the proposed efficiencies is eliminating redundancy within warfighting portfolios. The Guidance from the SECDEF to the other services is to emulate the Army's Capability Portfolio Review (CPR) approach designed to identify within the Army where multiple programs are pursuing similar objectives.[21] The Army initiated CPR's on every acquisition program to identify redundancies and create efficiencies. CPR's have led to more frequent reviews of requirements. Requirements have to be revisited much more frequently than has been done in the past, primarily because of the rate of technological changes occurring across the Army. The current Army requirements process is bureaucratic, slow and not conducive to identifying the types of efficiencies the Army CPR process identifies. The Army Training and Doctrine command is also committed to increasing the frequency with which it reviews concepts that drive new requirements. Lt Gen Michael Vane, director of the Army Capabilities Integration Center recently stated, "While those concepts are now renewed every five years, that period will decrease to two years."[22] The SECDEF also directed a reduction of funding for support contractors by 10% a year for each of the next three years. This may affect current ISR programs as well as future procurements. Many of the unmanned aircraft programs rely heavily on contractors to operate. The goal of the SECDEF's initiative is to reduce the number of contractors that are performing functions that are inherently governmental.

LEMV and Blue Devil II Comparison

In light of the SECDEF Efficiencies Initiative let's briefly examine the two airship programs most relevant to providing increased persistent ISR to the fight over the next twelve months. Interviews conducted with program management personnel working both the LEMV program and the Blue Devil Block 2 program reveal little or no collaboration between program offices, the services, or the Office of the Secretary of Defense (OSD) related to each program. An examination of both programs shows many similarities and points of synergy that could potentially save the DoD significant dollars while still providing timely and critical ISR to the war effort. Given the tight budget and the current Secretary of Defense focus on elimination of redundancy within

DoD, more emphasis should be placed on a single airship, an open architecture payload design, a common ground station and a common PED facility.

The largest and potentially most significant action would be the Air Force and JIEDDO adapting a version of the LEMV for platform use rather than developing a separate and unique airship with significantly less persistent stare and communication time-on station. Certainly any follow-on airship contract awards by JIEDDO should consider a merger. Currently, both programs appear to be pursuing separate and distinct payload bay and payload designs and interfaces. The Army LEMV program has adapted a standardized 500 pound payload module with plug-and-play capability interoperable with other Army payloads. The Air Force appears to be developing a plug-and-play type payload bay and payload module unique to Blue Devil Block 2.

Both efforts face similar basing, launch and recovery and ground support requirements. Currently, the LEMV program has adapted for use the UGCS used by all Army Unmanned Aircraft Systems utilizing the PM UAS developed Interoperability Profiles (IOPs). The specific IOPs developed for the Army have been adopted by OSD as the IOPs for the DoD. The Blue Devil Block 2 is investing significant dollars in a program specific PED, ground communication suite and a post mission PED. Even though both the Army and Air Force Programs are government owned and contractor operated, much can be said for employing a standardized ground control infrastructure. Additionally, each program could benefit significantly from sharing information related to tactics, techniques and procedures for employing their systems.

Unmanned Aircraft Systems Roadmap

The Army recently published the US Army UAS Roadmap, 2010-2035, a collective vision statement for how the Army will improve upon existing unmanned aircraft systems and expand upon those capabilities in the future.[23] Admittedly by the Army, this document is an internal assessment of Army UAS needs. The document appears to be very well written and lays out a template for the Army UAS future. Obviously when the document was written, the LEMV airship program was not yet on contract with SMDC. According to the document, in the near term (2010-2015), ISR is the dominant mission set. LEMV could easily fill that role if the military utility assessment is

successful. The document does address the potential for airships in the cargo transport area beginning in the mid-term around 2016. As identified in the roadmap, the largest new mission demand for UAS in the future will be in the area of sustainment support.[24]

What about the joint fight? In the background, the Army continues to support the other Services and the SECDEF Unmanned Aircraft System Task Force in the third revision of the Defense Department's Unmanned System Roadmap. This is critical in understanding the roles of the other services (in particular the Air Force) and in establishing commonality with NATO and other partner countries.

GAINS AND PITFALLS OF THE ARMY ADAPTING AIRSHIPS

Capability

In terms of capability brought to the fight, the LEMV will have an exponential advantage over other ISR assets on the battlefield in terms of a persistent, unblinking stare for up to 21 days with no gaps in data. The LEMV will provide true persistent ISR that national satellites and aircraft systems cannot match. Satellites orbiting the earth can only offer windows in which to gather intelligence. Manned and unmanned aircraft are limited by the duration of their particular capabilities.

Operational flexibility

A number of different ISR packages can be contained on a single airship offering untold flexibility to the commander on the ground. Additional redundancy can be built into the ISR package if payload reliability is an issue. Theoretically, mission payloads can be swapped with minimal effort on the ground prior to launch. This is also applicable to changing technology. With an open-architecture payload bay design and open architecture interface control document, technology upgrades can be quickly and seamlessly integrated into the airship (after component and system level testing).

Cost

Both manned and unmanned aircraft providing ISR support are extremely effective, but are increasingly more expensive to operate. With fuel cost in the US nearing $4.00

per gallon (March 2011), the low costs to operate an airship cannot be ignored. Overall life cycle costs are likely to be cheaper to design, build and operate an airship than aircraft, including both manned and unmanned. Additionally, airships are considered green vehicles. They only use fuel to push them along, using a quarter of the fuel as the same payload of manned cargo aircraft. Alan Metzger, Northrop Grumman program manager for LEMV recently asserted that "the LEMV can stay aloft for weeks on around 18,000 pounds of fuel. That is about $20,000 for fuel."[25] Airships are also green in terms of noise signature. Manned aircraft can sometimes be heard overhead. Airships cannot.

In June 2010, PM UAS conducted a cost comparison analysis of the LEMV and an Air Force Predator B (aka Reaper) unmanned aircraft system. In order to conduct an 'apples to apples' comparison, equipment sets were carefully selected to achieve equivalent capabilities that could meet the LEMV basic requirement. Based on the payload capacity and endurance of a single Reaper, a total of eight air vehicles, for this comparison, are required to conduct the 24/7 ISR requirements over a 21 day period (also includes two aircraft available for spares).[26] The results of the study were extremely favorable to the LEMV. The advantages of the LEMV include 31% of the manning of a Reaper Combat Air Patrol (CAP)(130 personnel versus 41), 14% of the cost per flight hour of a Reaper CAP ($5000 versus $718), 1.3% increase in range over a Reaper and no hanger or maintenance facilities needed (see Figure 4).[27]

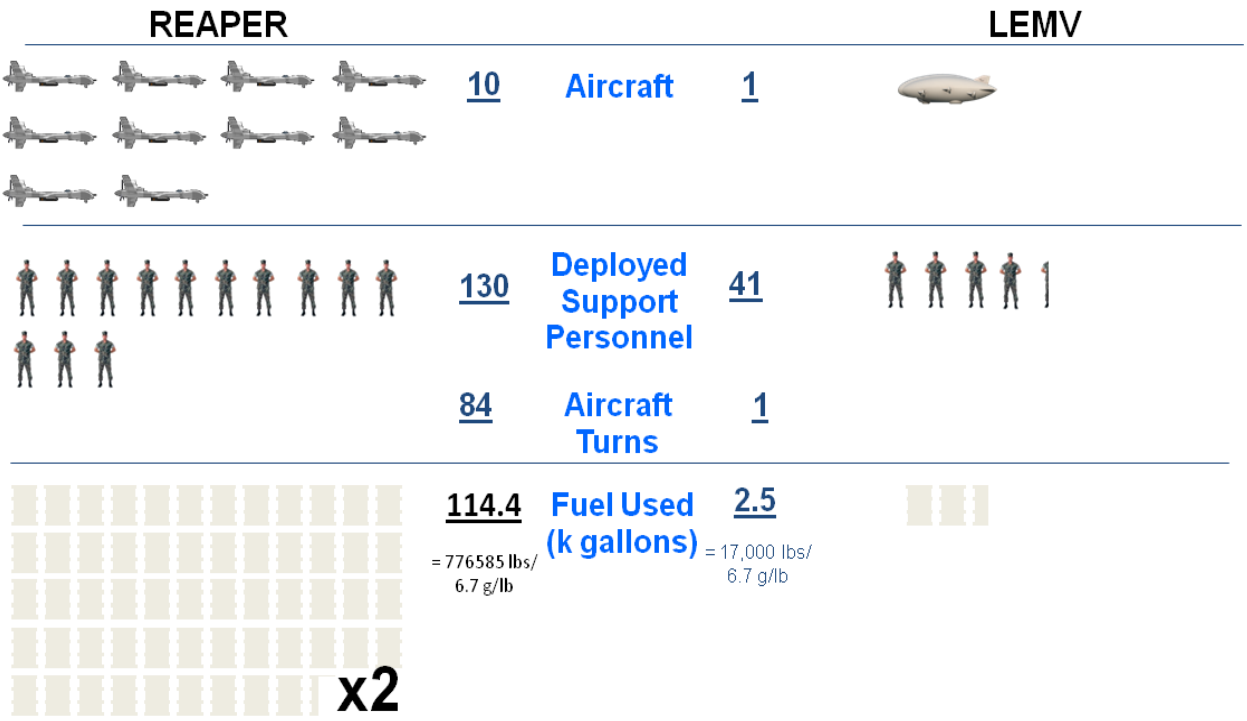

Figure 4. ISR Mission Comparison

Payloads

One potential pitfall that needs to be examined very closely during the development and test phase of the LEMV program is payload integration and reliability testing of the various pieces of payload equipment. The idea of a 21-day persistent ISR requires extreme reliability of the payload and is predicated on all equipment functioning the full 21 days. Redundancy for questionable payload equipment is a potential option; however, the pros and cons of weight and power requirements must be examined.

The second potential issue is related to the required operation profile and compatibility of the various payload packages. For example, can both the SIGINT equipment and the full motion video equipment operate effectively flying at the same airspeed? What are the effects of the communication relay equipment on the SIGINT sensors? Can all the equipment operate effectively at the same altitude? Does one piece of equipment require a different flight path than another to be effective?

In both the reliability case and the compatibility case, the risk of issues can be significantly reduced during developmental testing. As part of the Program Manager's test plan, all payload equipment should be stressed to the extreme to determine if there are any reliability issues. Additionally, all payloads should be flown at altitude and airspeeds comparable to that of the LEMV to identify any compatibility issues. This is easily accomplished by mounting payloads on existing fixed wing aircraft and flying the mission profile. Under the SMDC program managers current performance test plan, 41 flights, totaling 302 flight hours are scheduled over a 14 week period. As a point of reference, there are 504 hours in a 21-day period. Climatic, vibration, and electro-magnetic compatibility (EMC) testing may not be performed.

Data Overload

Analyzing the volumes of data from manned and unmanned aircraft supporting war operations is becoming increasingly more challenging. Lt Gen Richard P Zahner, the Army Deputy Chief of Staff for Intelligence recently said, "Intelligence analysts assigned to dissect the video and data are drowning in content produced by more than 1,000 drones that fly over Iraq and Afghanistan."[28] Gen Zahner has challenged industry to find new ways to analyze data. Automated tools that integrate various sensor suites, cameras and synthetic aperture radar on board an aircraft could be a key enabler in the future. Additionally, automated tools on the ground in the hands of analysts will help reduce volumes of data in order to rapidly assist commanders in making decisions.

Manning

As the Army's unmanned fleet and manning support requirements continues to grow, the Army is on a path to begin cutting end strength beginning in 2015. Tough decisions will need to be made by the Army leadership. According to Tim Owens, Deputy Project Manager, Unmanned Aircraft Systems, "One of the biggest limiters the Army faces today is force structure in terms of having enough operators to fly the amount of unmanned aircraft systems and the amount of flights that are being demanded in Iraq and Afghanistan."[29] Under the current five year LEMV contract, Northrop Grumman will provide contractor manpower through 2015. In terms of

operational and logistical support, the LEMV program is a government owned and contractor operated program.

Threat

Two issues need to be examined when discussing the threat. Obviously, if the US does not have air dominance, then deploying any type of airship is impossible. Airships can only be used when the US owns the sky. The second and more important concern is related to ground fire and anti-aircraft missile threats. The obvious question with a large, slow moving airship is: what about enemy fire? According to Alan Metzger, Northrop Grumman program manager, “This is not a hostile-threat type of vehicle. It’s for command and control areas where we need persistent surveillance”. This then begs the question,” What happens if the airship does take enemy fire?” It is important to note that the LEMV airship’s skin is a blend of Vectron, Kevlar and Mylar fabric. According to Metzger, “It’s a woven fabric and has a lot of redundancy in it to mitigate tears, if one was to experience a bullet hole it’s not going to propagate the length of the hull. You may lose a little bit of helium but the pressure between the inside of the hull and the outside is not very great so a small anomaly like that is not going to cause any significant damage.”[30] Clearly an airship is vulnerable to enemy fire, both direct fire and anti-aircraft while flying at lower altitudes. The same applies for all unmanned, fixed wing and rotary wing aircraft. The LEMV’s short take-off and vertical landing capability, 1,350 foot take-off distance and 100 foot vertical landing distance should reduce the risk of flying low over enemy territory. One other not so obvious point to note is that compared to manned aircraft, airships flown autonomously or via ground control, do not risk lives to gather intelligence or relay communications.

Tactics, Techniques and Procedures (TTP)

One of the unresolved issues facing the LEMV program office is where to berth an airship as large as the LEMV. The airship must take-off and land at some location every 21 days to refuel and conduct maintenance on the airship and payload. As discussed above, the enemy threat situation is a significant consideration when determining basing and ground support options. With only one airship, the cumulative

time flying to a basing location equates to less time providing persistent ISR. Over the last several months, a number of meetings have occurred between US CENTCOM and SMDC to discuss the issue. In Afghanistan there are really only two options. One is to berth the LEMV at one of the two large airfields in country (either Kandahar or Bagram). With only one airship, this option minimizes ISR downtime. It also increases the vulnerability of the airship to enemy fire. The second option is to berth the LEMV at a friendly country in the hemisphere and fly the airship to the Area of Operation (AOR). Clearly the second option reduces persistent ISR capability. If the decision is made to buy additional airships after airworthiness testing is completed during the summer of 2011, then airship redundancy allows for some overlap in terms of the time it takes to fly a LEMV from a safe county to the AOR. As of March 2011, the issue remained unresolved.

Weather

Like all airships, LEMV is susceptible to weather and high winds while flying. The current requirement of LEMV is to operate optimally at 20,000 feet mean sea level (MSL) in sustained winds of 20 knots.[31] Sample data from the National Center for Atmospheric Research related to wind conditions for Kandahar, Afghanistan between the years of 1990 to 2009 showed that at an altitude of 15,000 feet, the average wind speed is at or below 20 knots eight months out of the year and above 20 knots four months out of the year. During the months from December to March, in a given year, wind speeds at 15,000 feet MSL averaged between 25.1 and 29.2 knots.[32]

The large surface area of the airship also makes it more vulnerable to strong surface winds when it is on the ground. Winds up to 20 knots do not appear to be a challenge. Precautions and ground TTP's for securing the airship in high wind conditions will need to be developed.

National Airspace

Unmanned aircraft cannot currently fly in national airspace without manned chase aircraft, and during daylight hours only. This is both expensive and manpower intensive. Advocates for unmanned aviation continue to push the Federal Aviation

Administration (FAA) to allow some unmanned planes to fly in national airspace. One of the sticking points for the FAA has been access to records held by DoD for flights overseas and at test ranges. Flight data provides information to the FAA related to control systems, engines and flight procedures. This is critical information that can help prevent accidents or close calls.[33] The DoD lead for coordinating with the FAA is the Army. The Army's Project Manager Unmanned Aircraft Systems (PM UAS) has stood up a Product Management office responsible for coordinating with the FAA on national airspace access. To date, PM UAS has received FAA approval to fly at night in national airspace using its Ground Based Sense and Avoid System. Flights have not yet begun. As this type of technology matures, unmanned airships could fly in national airspace both day and night.

Future

In the future, unmanned aircraft vehicles will expand their role in warfare well beyond that of current ISR information gathering to becoming a key part of attack, transport and resupply missions. In the keynote address at the Army Aviation Association of America Conference recently in Fort Worth, Texas, Army Vice Chief of Staff Gen Peter W. Chiarelli asserted, "Unmanned aerial systems must provide the ability not only to see, but to shape the battlefield."[34] That same idea applies to airships and the LEMV. A potential use of LEMV in the future is cargo transport. The design of the LEMV adaptable payload bays is such that the airship's surveillance payloads could be easily swapped for cargo in a heavy-lift operation. The trade-off is carried weight versus the amount of time and distance in the air. Indeed, the Marines Corps is currently examining the use of Boeings A160 Hummingbird and Lockheed Martin's K-MAX unmanned rotary wing aircraft to resupply troops in the field in Afghanistan. The Marine Corps program is an effort to reduce the number of trucks on the road in Afghanistan subject to the threat of Improvised Explosive Devices.[35]

Border operations and disaster relief are two additional areas of potential use for airships in the future. Imagine an airship flying high over the nuclear power plant in Japan, providing real-time full motion video and intelligence to our National Command

Authority. Imagine airships stationed over the US and Mexican Border, providing real-time intelligence to Border Control Agents and Drug Enforcement Agents.

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CONCLUSION

Certainly both the Army and the Air Force have mission critical airship programs that will provide additional much needed intelligence, surveillance, reconnaissance and communication platforms to our warfighters in months and years ahead. That is provided the platforms meet operational requirements prior to fielding. The DoD and Army leadership clearly have confidence in the LEMV program. Does the Department of Defense need two separate airship acquisition efforts? Given the urgency of both requirements, the answer may be yes. However, much can be gained by both services and both program offices collaborating on reducing redundancy and gaining efficiencies without impacting support to the fight. Additionally, as the amount of available Defense discretionary funding is reduced, roles and missions debates, including those of redundancies, will become more relevant. This paper outlined the obvious cost/benefit of employing modern airships. Additionally, the paper raised a number of issues related to OSD oversight, programmatic and operational use. At the end of the day, any new systems must show that the benefits outweigh the cost to operate and that the system provides increased capability while saving valuable resources.

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