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Analysis of Rotary Aircraft Alternatives for NATO SOF Organic Air Wing

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NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

ANALYSIS OF ROTARY AIRCRAFT ALTERNATIVES FOR NATO SOF ORGANIC AIR WING

by

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June 2012

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13. ABSTRACT (maximum 200 words)

NATO Special Operations Headquarters (NSHQ) is working to establish an organic special operations air wing. This includes a full program implementation of policy and standards development, manning, training, basing, and aircraft procurement and sustainment.

This project addresses the issue of rotary aircraft procurement and sustainment. Building upon prior research conducted by NSHQ, it analyzes the previously recommended course of action of seeking an Excess Defense Article (EDA) grant of six SH-60s from the U.S. DoD. It compares the EDA SH-60 option with procurement of Commercial Off-the-Shelf (COTS) LAKOTA aircraft. It also compares the establishment of organic NATO maintenance and logistics support capability with the option for Contractor Logistics Support (CLS) available with COTS LAKOTA procurement. The primary consideration in this analysis is life cycle cost, though qualitative considerations of ease of program implementation and sustainment are also considered.

The conclusion is made that COTS LAKOTA procurement with a CLS package is likely to be less expensive and easier for NATO to implement and manage than EDA SH-60s with associated organic maintenance and logistics support.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACT	Allied Command Transformation
APUC	Average Procurement Unit Cost
C4I	Command, Control, Communications, Computers and Intelligence
CLS	Contractor Logistics Support
COTS	Commercial Off-the-Shelf
DA	Direct Action
DAMIR	Defense Acquisition Management Information Retrieval
DLR	Depot Level Repairable
EDA	Excess Defense Articles
EU	European Union
GSBPP	Graduate School of Business and Public Policy
JSOU	Joint Special Operations University
LOA	Letter of Agreement
LUH	Light Utility Helicopter
MA	Military Assistance
MEP(s)	Mission Essential Package(s)
MFP	Multiple Futures Project
MTTR	Mean Time To Repair
NATO	North Atlantic Treaty Organization
NAVAIR	Naval Air Systems Command
NPS	Naval Postgraduate School
NSHQ	NATO Special Operations Forces Headquarters
NSSC	NATO Special Operations Coordination Center
NVG	Night Vision Goggle
O&S	Operation and Support
OMB	Office of Management and Budget
SACEUR	Supreme Allied Commander, Europe
SAR	Selected Acquisition Report
SOATG	Special Operations Air Task Group
SOAWTG	Special Operations Air Warfare Training Group

SOF	Special Operations Forces
SR&S	Special Reconnaissance and Surveillance
USSOCOM	United States Special Operations Command

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I. INTRODUCTION

North Atlantic Treaty Organization (NATO) Special Operations Headquarters (NSHQ) was established through the NATO Special Operations Forces (SOF) Transformation Initiative of 2006. NSHQ's mission is to function as the single point of development, direction, and coordination for all NATO Special Operations related activities in order to optimize employment of SOF. NSHQ is also tasked to provide operational command capability when directed by the Supreme Allied Commander Europe (SACEUR). NSHQ is the alliance developer and manager of NATO SOF policy, standards, doctrine, training, and education assessments. NSHQ is responsible for maintaining and developing a robust operational Command, Control, Communications, Computers and Intelligence (C4I) capability equipped with organic SOF enablers to ensure interoperability and enhance employment of NATO Special Operations.[1]

Since NSHQ's inception, NATO SOF have made significant gains in their ground and maritime SOF capability; however, aviation SOF have not kept pace as noted by Richard Newton, an instructor at Joint Special Operations University (JSOU). To address this imbalance, in March of 2011, 30 representatives from 16 nations met to discuss NATO SOF air capability shortfalls. The decision was made to provide the Military Committee with options to improve the identified shortfalls. The recommendation adopted by the committee was to establish the NSHQ Special Operation Air Warfare Training Center (SOAWTC). The NSHQ SOAWTC is responsible for conducting air warfare training and for fielding a Special Operations Air Task Group (SOATG) when directed. Accomplishing these responsibilities requires a full program including policy, procedures, personnel, and equipment (including aircraft). The present goal of NSHQ is to have a fully operationally capable Combined SOF Air

[1] United States Special Operations Command, *Initial Capabilities Document for North Atlantic Treaty Organization Special Operations Air Warfare Center* (Tampa, FL: United States Special Operations Command, 2012).

Wing by late 2014. In mid-2012, NATO will assign personnel to an Implementation Team, which will assume responsibility for developing this capability.

The Director, NSHQ Future SOF Air, Lieutenant Colonel Manny Diwa approached the Naval Postgraduate School (NPS) faculty seeking assistance with the development of the SOAWTC. By leveraging the research and analysis capabilities of NPS students, LTC Diwa sought to advance the development of the SOAWTC as much as possible prior to the Implementation Team's establishment. As a result, when the Implementation Team is manned in mid-2012, it will already have a large amount of prepared analysis and recommendations upon which to build, rather than starting from scratch. In response to LTC Diwa's request, a collaborative effort between NPS and NSHQ was initiated to focus on four developmental tasks:

1. Policy, doctrine, standards, and capability development
2. Platform selection and fielding
3. Location, selection, and establishment of air bases
4. Organizational design and manning

Two departments at NPS, the Graduate School of Business and Public Policy (GSBPP) and Defense Analysis (DA), joined the effort. From these departments, a multi-disciplinary team was formed of 18 U.S. and international officers from several military specialties. The students were joined in a directed study program led by Lieutenant Colonel Dwight Davis of the DA department and Dr. Keenan Yoho of the GSBPP. The research conducted by this directed study group was sub-divided into eight sections to perform analysis and provide possible solutions within the focus areas listed above. This research assesses the issues of platform selection and fielding for the rotary aircraft portion of the SOAWTC air wing, based upon NSHQ's research to date and NATO SOF doctrine. NSHQ's primary stated constraints are cost and schedule, so this research focuses on the issues of acquisition and life cycle costs along with ease of program implementation and oversight.

II. BACKGROUND

A. NATO'S STRATEGIC CONCEPT AND THE ROLE OF SPECIAL FORCES

In 2010, the heads of NATO member nations met in Lisbon to draft a new strategic concept. This was the first formal revision of NATO's core strategy since 1999, and numerous significant events, such as the September 11 terror attacks and the resultant operations in Afghanistan, had occurred in the years since.[2] Leading up to this summit, various interested parties assessed likely future NATO requirements and the direction that NATO should take in developing its new strategic guidance.

A 2009 paper by RAND Project Air Force framed the future of NATO engagements into five possible focus areas: Europe, the Middle East, fragile states, non-state threats, and a global alliance.[3] Special Forces would have a role in any of these possible focus areas, but the Middle East, fragile states, and non-state threat focuses have the largest direct requirements for a robust SOF capability. Roles for SOF in the Middle East would include the ability to project small-scale force against extremist groups and threats to energy reserves. In fragile state scenarios such as Afghanistan, Somalia and Darfur, SOF provide precision kinetic options beyond the scope of conventional forces.[4] SOF also have proven efficacy against non-state threats like terrorist groups and similar organizations as recently evinced by the May 2011 raid against Osama Bin Laden's compound. Under every combination of focus areas considered likely by RAND for the future of NATO operations, at least one of these SOF-intensive categories was included.[5]

The Multiple Futures Project (MFP) established by NATO's Allied Command Transformation (ACT) observed in their April 2009 final report, *Navigating towards*

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[2] Phillip R. Cuccia, *Implications of a Changing NATO* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, 2010).

[3] Christopher Chivvis, *Recasting NATO's Strategic Concept Possible Directions for the United States* (Santa Monica, CA: RAND, 2009).

[4] Ibid.

[5] Ibid.

2030, that a "large-scale conventional confrontation is unlikely."[6] The MFP report also lists the top two military implications for NATO's likely future as protection against asymmetric threats and the ability to conduct operations against non-state actors.[7] In the MFPs *Findings and Recommendations,* they enunciate their expectation that future threats to NATO will be asymmetric and will include, "irregular, terrorist and criminal elements in mixed modes of operation."[8] Asymmetric, non-state threats, irregular, non-conventional; these are exactly the types of environments and operations that call for well-developed SOF capabilities.

NATO's Strategic Concept, produced at Lisbon in November 2010, affirmed that there is little threat to the alliance from conventional forces, that international terrorism along with instability and conflict beyond NATO's borders is a threat, and that appropriate military capabilities should be developed to address these. They also stated that NATO should maximize the deployability of forces that can operate jointly and that share common capabilities, in an effort to be cost-effective and efficient while showing solidarity among its members.[9] Further development of alliance SOF capabilities would effectively advance NATO's strategic requirements as well as their goals for cost effectiveness and efficiency.

B. NATO SOF AS A COMBINED STRATEGIC ASSET

The *Allied Joint Doctrine for Special Operations* (AJP-3.5) delineates the characteristics of NATO SOF. SOF are described as strategic assets that are innately joint. This distinctly separates NATO SOF operations from individual member nations' SOF operations.[10] As strategic assets, SOF provides NATO numerous options to achieve

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[6] NATO. Allied Command Transformation, *Multiple Futures Project: Navigating Towards 2030: Final Report*, [2009]), 6.

[7] Ibid., 44.

[8] Ibid., 8.

[9] *Security of the Members of the North Atlantic Treaty Organisation: Adopted by Heads of State and Government in Lisbon* (Belgium: NATO, [2010]).

[10] NATO Partnership for Peace. "Allied Joint Doctrine for Special Operations AJP-3.5." January 2009, http://www.tradoc.mil.al/Standartizimi/Downloads/AJP-3.5.pdf (accessed November 30, 2011).

strategic effects through kinetic operations in a variety of conflict situations.[11] This powerful strategic capability is cost efficient, well-suited to combining resources to maximize capabilities, and has the potential to enhance alliance nations' individual forces through training and transferring skills.

Colonel Joel Hillison of the Strategic Studies Institute at the United States Army War College, observes that NATO's "new member states will be eager to contribute to the alliance but will be constrained by political and military capability shortfalls."[12] In the European Union's (EU) Institute for Security Studies (ISS) (2010) report, *What Do Europeans Want from NATO,* Sven Biscop, the Director of the Europe in the World Programme at Egmont—Royal Institute for International Relations in Brussels, states:

> Having largely the same European Member States, NATO and the EU have logically identified the same shortfalls in their members' military inventory. These shortfalls sharply limit the deployability and sustainability of European armed forces, in spite of their impressive overall numbers.[13]

Biscop goes on to note that, "a plethora of small-scale capabilities, of limited deployability and low cost-effectiveness, is scattered across Europe."[14]

NATO has acknowledged the same issues with regard to SOF. Alliance nations have widely varying SOF capabilities. Some nations have advanced capabilities and experience operating in the joint environment while others are only just beginning to develop inchoate SOF capabilities from their existing defense organizations.[15] However, even those nations with robust capabilities are finding themselves constrained financially, and the alliance as a whole could benefit from combining their resources. The NATO Group of Experts study states that:

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[11] North Atlantic Treaty Organization. *The North Atlantic Treaty Organization Special Operations Forces Study* (SHAPE, Belgium: NATO Special Operations Coordination Centre [NSCC], 2008).

[12] Phillip R. Cuccia, *Implications of a Changing NATO* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, 2010), 8.

[13] Sven Biscop et al., *What do Europeans Want from NATO?* (Paris: European Union Institute for Security Studies, 2010), 23.

[14] Ibid.

[15] North Atlantic Treaty Organization. *The North Atlantic Treaty Organization Special Operations Forces Study* (SHAPE, Belgium: NATO Special Operations Coordination Centre [NSCC], 2008).

> The primary limiting factor hindering military transformation has been the lack of European defence spending and investment. Today only six of twenty-six European Allies spend 2 percent or more of GDP on these purposes; only about a dozen have met goals for making military forces deployable and sustainable.[16]

The fiscal environment is likely to tighten even more, as some EU nations teeter on the brink of default, and the Central Bank and Organization of Economic Cooperation and Development predict another European recession. There is even now concern that some countries may leave the EU, which has the potential to significantly damage Europe's financial system and will likely create even greater pressure to reduce defense expenditures.[17]

The significant imbalance in SOF capabilities and universal financial constraints faced by alliance nations are compelling reasons to pursue shared SOF capability. In 2009, NATO convened a Group of Experts led by chair Madeleine Albright to consider the future of NATO. In their report, *NATO 2020: Assured Security; Dynamic Engagement,* they state:

> If NATO is to keep pace with evolving threats, it must improve its capabilities more rapidly than it has. The challenge of catching up is aggravated by a less than favourable economic climate. The best and most realistic way to close the gap is through a commitment to efficiency measures and other reforms.[18]

This sentiment is echoed by Biscop when he states that, "Member states could at the same time opt for far-reaching forms of pooling… Not each individual member state, but member states as a collective entity, ought to be comprehensively capable."[19] Indeed, the new strategic guidance developed in Lisbon stresses the importance of combined capabilities that are greater than those of the individual contributing nations. The concept

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[16] North Atlantic Treaty Organization. Public Diplomacy Division, *NATO 2020: Assured Security; Dynamic Engagement: Analysis and Recommendation of the Group of Experts on a New Strategic Concept for NATO* (Brussels, Belgium: NATO Public Diplomacy Division, 2010), 38.

[17] Robert Haddick, "This Week at War: Europe Powers Down," *Foreign Policy,* November 4, 2011.

[18] North Atlantic Treaty Organization. Public Diplomacy Division, *NATO 2020: Assured Security; Dynamic Engagement: Analysis and Recommendation of the Group of Experts on a New Strategic Concept for NATO* (Brussels, Belgium: NATO Public Diplomacy Division, 2010), 41.

[19] Sven Biscop et al., *What do Europeans Want from NATO?* (Paris: European Union Institute for Security Studies, 2010).

calls for developing and strengthening joint capabilities with a focus on deployability, sustainability, coherence in planning, and reduced duplication of effort to maximize cost effectiveness and to enhance solidarity.[20]

NATO SOF is an ideal area of investment for maximizing efficiency and effectiveness. A small contingent of SOF is as capable as (and frequently preferable to) a much larger conventional force for many of the mission areas NATO is likely to encounter. Additionally, SOF capability can be developed and fielded at a small fraction of the cost of conventional military hardware.[21]

In addition to their cost-effectiveness, NATO SOF can help to improve the capabilities of alliance members with less developed SOF. Extensive, realistic training with repeated rehearsals is the cornerstone of developing SOF capable forces.[22] SOF operators returning to their host nation after a tour with NATO are going to be highly capable, with a host of transferable skills. This will begin to reduce the current imbalance in SOF capabilities throughout the alliance.

C. THE NEED FOR AVIATION SOF CAPABILITY IN NATO

Organic air capability for NATO SOF will require some investment. However, the size of the investment is small, scalable, and offers a strong return on investment when compared to other defense articles. The Group of Experts stresses that military transformation and the development of new capabilities are necessary. These capabilities should enable a "flexible, mobile, and versatile" posture that maximizes financial efficiency in light of NATO member nation's fiscal constraints. They further state: "The Alliance must also make a firm commitment to smarter spending through a variety of

[20] Security of the Members of the North Atlantic Treaty Organisation: Adopted by Heads of State and Government in Lisbon (Belgium: NATO, 2010).

[21] North Atlantic Treaty Organization. *The North Atlantic Treaty Organization Special Operations Forces Study* (SHAPE, Belgium: NATO Special Operations Coordination Centre [NSCC], 2008), 31–32.

[22] Richard D. Newton, *Special Operations Aviation in NATO: A Vector to the Future* (Hurlburt Field, FL: Joint Special Operations University, 2006), 11.

efficiency and reform measures."[23] Among other priorities, the Group of Experts calls for strengthening NATO's SOF to improve their expeditionary capabilities.[24] The heads of NATO affirm the need for new capabilities in the 2010 strategic concept, stating in passage 25 the need to "develop doctrine and military capabilities for expeditionary operations, including counterinsurgency."[25]

Richard Newton notes that NATO has made significant gains in the areas of ground and maritime SOF, but that aviation SOF has not kept pace. This limits the efficacy of their SOF, since the capability to transport personnel for their unique mission sets frequently is not available, or has never been developed.[26] In the introduction to Newton's (2006) monograph, Lieutenant Colonel Michael Mahan, the Director of JSOU's Strategic Studies Department, observes:

> However, the role of SOF will be extremely important, especially as NATO operates outside its traditional European zone of operations. The need to work with non-NATO forces and allies will increasingly require SOF capabilities. These SOF requirements will operate across the full spectrum of SOF capabilities and, logically, will need to include a robust and capable air component.[27]

The NATO Special Operations Coordination Centre's *Special Operations Forces Study* completed in December 2008 explicitly calls for air mobility as a key enabler for NATO SOF, stressing that the current ad-hoc arrangements used for SOF transportation do not meet the necessary high levels of proficiency needed for SOF operations. The study notes that effective SOF aviation operations require a tremendous amount of specialized and repetitive training that can best be met with organic SOF aircraft and

[23] North Atlantic Treaty Organization. Public Diplomacy Division, *NATO 2020: Assured Security; Dynamic Engagement: Analysis and Recommendation of the Group of Experts on a New Strategic Concept for NATO* (Brussels, Belgium: NATO Public Diplomacy Division, 2010), 11.

[24] Ibid., 40.

[25] *Security of the Members of the North Atlantic Treaty Organisation: Adopted by Heads of State and Government in Lisbon* (Belgium: NATO, 2010).

[26] Richard D. Newton, *Special Operations Aviation in NATO: A Vector to the Future* (Hurlburt Field, FL: Joint Special Operations University, 2006).

[27] Richard D. Newton, *Special Operations Aviation in NATO: A Vector to the Future* (Hurlburt Field, FL: Joint Special Operations University, 2006), V.

personnel.[28] Ad-hoc arrangements for SOF mobility reduce SOF effectiveness and flexibility while increasing risk to their "No Fail" mandate. Most recently, NATO Special Operations Headquarters (NSHQ) commissioned a *Special Operations Air Group Concept for Development and Organization* study intended to develop a specific aviation proposal that would maximize the utility of NATO's current SOF investments.[29] The primary goal of this initial investment is to enable and enhance current NATO SOF ground capability.[30]

The AJP-3.5 calls for special operations to be "covert, discreet, or low prominence"; it also calls for "adaptability, improvisation, innovation, and self reliance."[31] Keeping operations discreet requires a high level of operational security. As described in the NATO Special Operations Coordination Center (NSCC) study, "Special operations are routinely conducted under circumstances where the activities performed must remain unnoticed, are not attributable, or are conducted discretely so as to minimize visibility."[32] An organic air capability allows SOF to operate independently of conventional support forces, and thereby improves operational security by limiting the number of personnel and organizations that are required to be in-the-know.

The ability to rapidly field capability in response to opportunities is also dramatically improved with the availability of organic air assets. A dynamic target is defined as "a target that has been identified too late or has not been selected for action in time to be included in the deliberate targeting process."[33] As emphasized in NSHQ's *Special Air Warfare Manual* (2010):

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[28] North Atlantic Treaty Organization. *The North Atlantic Treaty Organization Special Operations Forces Study* (SHAPE, Belgium: NATO Special Operations Coordination Centre [NSCC], 2008), A2.

[29] NATO Special Operations Headquarters, *DRAFT Special Operations Air Group Concept for Development & Organisation* (SHAPE, Belgium: NATO, 2010), 4.

[30] Ibid., 6.

[31] North Atlantic Treaty Organization, *Allied Joint Doctrine for Special Operations AJP-3.5* (Belgium: NATO, 2009), 1-1-1-2.

[32] North Atlantic Treaty Organization. *The North Atlantic Treaty Organization Special Operations Forces Study* (SHAPE, Belgium: NATO Special Operations Coordination Centre [NSCC], 2008), 8.

[33] North Atlantic Treaty Organization, *Special Air Warfare Manual. Version 1.0* (SHAPE, Belgium: NATO Special Operations Headquarters, 2010), 41.

> Timing is a critical factor in tactical mission planning. While an SOATG (Special Operation Air Task Group) can usually execute its assigned missions rapidly, the time required for joint mission planning, rehearsals, preparing the aircraft and the aircrew, deconflicting required routes and battlespace, and coordinating with other components for enabling air/aviation support can be significant.[34]

SOF ground supported by organic air units that train together and have properly outfitted aircraft can reduce mission lead times from days to hours, greatly enhancing the flexibility and decision space for commanders.[35] When time is of the essence, there is no replacement for organic capability.

Organic air also provides operational capabilities that cannot be matched by outside support agencies. The joint SOF doctrine specifically states that "special air operations differ from conventional air operations in degree of physical and political risk, *operational techniques*, *methods of employment*, and *independence* from friendly support".[36] These unique techniques, methods, and autonomy of air operations are frequently critical to the effective employment of SOF. As described in the NSCC SOF (2008) study:

> SOF environmental training habitually prepares SOF to 'conduct operations in austere, harsh environments without extensive support.' SOF typically thrive in such environments because of their ability to exercise the operational autonomy and independence these circumstances create. Quite often SOF seek to leverage the conditions in these environments to their advantage for infiltration, exfiltration, or to obscure the signature of their activities.[37]

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[34] North Atlantic Treaty Organization, *Special Air Warfare Manual. Version 1.0* (SHAPE, Belgium: NATO Special Operations Headquarters, 2010), 43.

[35] NATO Special Operations Headquarters, *DRAFT Special Operations Air Group Concept for Development & Organisation* (SHAPE, Belgium: NATO, 2010),8–9.

[36] North Atlantic Treaty Organization, *Allied Joint Doctrine for Special Operations AJP-3.5* (Belgium: NATO, 2009), 2–5.

[37] North Atlantic Treaty Organization. *The North Atlantic Treaty Organization Special Operations Forces Study* (SHAPE, Belgium: NATO Special Operations Coordination Centre [NSCC], 2008), 14.

The AJP-3.5 states more generally that:

> The successful conduct of special operations relies on individual and small unit proficiency in a multitude of specialized, often nonconventional operational skills applied with adaptability, improvisation, innovation, and self reliance.[38]

Air capability has not advanced as rapidly as have other areas of NATO SOF. NATO has acknowledged the need to improve capabilities, and SOF air is an ideal place for that investment. Organic air would enhance and enable the capabilities of currently existing SOF ground forces, and it would offer benefits of training and skill transfer to participating member nations. It would align strongly with NATO's stated goals of cost-effectiveness, efficiency, and combined capabilities, all while providing improved flexibility to NATO commanders.

D. SOF AIR MISSIONS AND REQUIRED SKILL SETS

SOF air shares the common missions of Direct Action, Special Reconnaissance and Surveillance, and Military Assistance with all SOF forces.[39] However, as delineated in the *Special Air Warfare Manual*, "The *primary mission* of special operations air forces is enhanced air mobility—specialised air transport (AT) activities via fixed-wing, rotary-wing, or tilt rotor aircraft."[40] These missions include tasks that exceed conventional air forces capabilities. As listed in the *Guidelines for NATO SOF Helicopter Operations,*[41] the primary skill sets include:

> (a) Advanced Night Vision Goggle (NVG) flying, including NVG formation, nap of the earth (NOE) flying, and NVG over-water operations.
>
> (b) Fast rope insertion and extraction techniques

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[38] North Atlantic Treaty Organization, *Allied Joint Doctrine for Special Operations AJP-3.5* (Belgium: NATO, 2009), 1–2.

[39] NATO Special Operations Headquarters, *DRAFT Special Operations Air Group Concept for Development & Organisation* (SHAPE, Belgium: NATO, 2010), 7.

[40] NATO Special Operations Headquarters, *DRAFT Special Operations Air Group Concept for Development & Organisation* (SHAPE, Belgium: NATO, 2010), 5–6.

[41] Ibid., 9–10.

(c) Multi-story building landings

(d) Aggressive tactical approaches and departures

(e) Deck landings on vessels

(f) Approaches to moving vehicles

(g) Airborne vehicle control point (VCP) operations

(h) Specialised personnel recovery techniques

(i) Joint planning with strategic and operational level reconnaissance assets

(j) Coordinating and directing joint fires

E. NATO SOF CHALLENGES UNDER THE CURRENT STRUCTURE

The NATO *Special Operations Forces Study* proffers that SOF operates under a "No Fail" mandate. As small unit, highly trained forces operating in complex environments on irregular and critically important tasks, a level of perfection is called for that is unparalleled. The high level of proficiency and performance required necessitates lengthy training and rehearsal, and as a result SOF forces and capabilities cannot be generated on short notice.[42] To enable NATO SOF to conduct short notice missions with critical aviation elements (e.g., low level insertion/extraction, perhaps at night, perhaps using unconventional methods), it is imperative that the SOF aviators train extensively with the SOF ground operators to hone their skills. Currently, that is not always an option, and capability is lessened as a result.

In the absence of well-integrated SOF with extensive experience working together, ad-hoc arrangements of forces and support must be utilized. NATO SOF forces have been called upon to conduct numerous recent missions out of area in the Balkans, Africa, Afghanistan, Iraq, and beyond.[43] However, experience has shown that deficiencies in organization, interoperability, and resourcing have limited the efficacy of

[42] North Atlantic Treaty Organization. *The North Atlantic Treaty Organization Special Operations Forces Study* (SHAPE, Belgium: NATO Special Operations Coordination Centre [NSCC], 2008), 15–18.

[43] North Atlantic Treaty Organization. *The North Atlantic Treaty Organization Special Operations Forces Study* (SHAPE, Belgium: NATO Special Operations Coordination Centre [NSCC], 2008), 1.

these forces in many cases. As the NSCC (2008) study recounts, "Historically, ad hoc temporary arrangements cobbled together to perform these operations prove incapable of fulfilling the challenges inherent to special operations and result in disastrous consequences."[44]

Even without "disastrous consequences," the reliance upon ad hoc arrangements may result in the inability to perform missions or acceptance of less preferred tactics and reduced objectives. As noted by Richard Newton,

> conducting air transportation operations to meet the Special Forces' primary needs of insertion, extraction, and resupply… has proven to be a daunting environmental challenge and has highlighted severe shortfalls in current and projected special operations aircraft.[45]

Since NATO SOF frequently does not have dedicated air platforms, they must rely on ad hoc arrangements for air mobility support. According to the draft NSHQ Special Operations Air Group (2010) report, in Afghanistan, numerous NATO SOF missions have not been executed because of air mobility shortfalls. In some cases, no aircraft were available at all. In other cases, aircraft were available but were assigned to other emergent missions for their parent organizations. Even when aircraft are available, it may not be possible to execute missions due to the longer mission planning, rehearsal, and execution cycle required by non-SOF aviation. As a result of these circumstances, NATO SOF sometimes found themselves "unable to execute a mission when they were otherwise capable and ready to do so."[46] Organic aviation capability would have tremendously mitigated, if not eliminated, these situations for Special Operations Forces. Organic air provides improved availability, response time, reliability, and performance, all of which result in a significantly more capable force and improved options for commanders.

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[44] North Atlantic Treaty Organization. *The North Atlantic Treaty Organization Special Operations Forces Study* (SHAPE, Belgium: NATO Special Operations Coordination Centre [NSCC], 2008), 17.

[45] Richard D. Newton, *Special Operations Aviation in NATO: A Vector to the Future* (Hurlburt Field, FL: Joint Special Operations University, 2006), 7.

[46] NATO Special Operations Headquarters, *DRAFT Special Operations Air Group Concept for Development & Organisation* (SHAPE, Belgium: NATO, 2010), 8.

F. THE PRIMACY OF SOF PERSONNEL OVER EQUIPMENT

The fundamental attributes of SOF operations, and the specific skill sets for SOF aviation described above, all focus primarily on the capabilities of the SOF personnel and their level of expertise in operating their aircraft rather than the type of aircraft utilized. This illustrates an underlying principle: SOF personnel and their skill sets are more important to mission performance than their equipment. As Newton observes:

> Many missions can be safely accomplished by highly trained crews using conventional, unmodified aircraft. Time and again, SOF aviators have reaffirmed the validity of a SOF truth, 'Humans are more important than hardware.' It was SOF aviators, flying conventional aircraft better than their non-SOF counterparts—more precisely, in harsher environments, mitigating the risks, and using conventional equipment in innovative ways—that proved it is the person, not the technology, that defines special operations.[47]

This principle is included in NATO doctrine. As presented in AJP-3.5:

> Special air operations, like ground and maritime special operations, are not defined only by equipment utilized, but rather by the unconventional and innovative ways aircrews employ whatever they have at their disposal… What is required… are highly trained airmen who employ their aircraft in ways unexpected by their adversary.[48]

The *Special Air Warfare Manual* reiterates that: "It is the capabilities of the people, rather than the equipment they use, that defines special air warfare."[49]

Beyond the primacy of people versus equipment, a focus on high-end aircraft will likely incur inefficiencies. An illustrative example is described in some detail by Newton in his 2006 monograph. In it, he discusses the experience of United States Air Force (USAF) Special Forces operating C-130 Hercules aircraft that have been modified into MC-130 Combat Talons. These aircraft have enhanced capabilities for operating in sophisticated air-defense environments; however, this performance enhancement comes

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[47] Richard D. Newton, *Special Operations Aviation in NATO: A Vector to the Future* (Hurlburt Field, FL: Joint Special Operations University, 2006), vii.

[48] North Atlantic Treaty Organization, *Allied Joint Doctrine for Special Operations AJP-3.5* (Belgium: NATO, 2009), 2–5.

[49] North Atlantic Treaty Organization, *Special Air Warfare Manual. Version 1.0* (SHAPE, Belgium: NATO Special Operations Headquarters, 2010), 3.

at great cost. The modified aircraft are very expensive to procure and maintain. Additionally, the aircrews require extensive specialized training beyond standard SOF baselines to utilize their advanced systems. Since these top-of-the-line aircraft were organically controlled by USAF SOF, they tended to be used for all missions, even those for which a lesser aircraft would have sufficed. The high cost of these platforms also meant that only a small force could be fielded. The end result was extremely expensive aircraft being worn out flying missions that could have been conducted by standard aircraft.[50]

In the constrained fiscal environment that NATO faces, the most efficient bang-for-the-buck will be to focus on developing aircrew skills rather than purchasing high-end air frames. General purpose helicopters with highly trained personnel can conduct a wide range of operations within the likely scenarios faced by NATO, and represent a very efficient use of limited financial reserves.

In addition to being cost-effective, general purpose helicopters provide training advantages and enhanced interoperability. A focus of effort on perfecting baseline SOF aviator skills like night ops, fast roping, and building landings is a more efficient use of training time than learning advanced systems for specialized aircraft that will typically not be required and will have little in common with the aircraft that many member nations fly.

Newton (2006) points out numerous historical examples of SOF airmen who did not have advanced aircraft, rather:

> They flew their airplanes, helicopters, or gliders better than anyone ever thought possible. Therefore, I would also recommend that organic special operations air and aviation units have dedicated airmen and aircraft that train to higher standards and meet the minimal qualifications for special operations aviation.[51]

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[50] Richard D. Newton, *Special Operations Aviation in NATO: A Vector to the Future* (Hurlburt Field, FL: Joint Special Operations University, 2006), 6.

[51] Ibid., 12.

Training and rehearsal at the level necessary to *perfect* baseline special operations skills is extensive, and represents the best use of NATO SOF Air training time. To efficiently and effectively meet this goal, a general-purpose platform is preferable to a specialty helicopter.

Interoperability is also enhanced by selecting a basic helicopter for SOF use. As stated in the Special Air Warfare Manual: "Interoperability is the key to successful NATO special air warfare."[52] As reiterated in the NATO *Backgrounder, Interoperability for Joint Operations* (2006), the alliance can only operate effectively with strong interoperability. This enables forces to work together, share resources, reduces duplication of effort, allows pooling of resources, and results in synergies.[53] Common equipment is not required for interoperability; however, it greatly enhances it. Beyond interoperability is commonality. The NATO SOF study points out that:

> Commonality is defined by NATO as 'a state achieved when groups of individuals, organizations, or nations use common doctrine, procedures, or equipment.' This is precisely what NATO SOF requires to coalesce into a viable NATO instrument.[54]

Major General Ton van Loon of the Royal Netherlands Army said in 2007, upon returning from Afghanistan:

> When I was commanding RC (regional command) South, we had four national Chinook detachments on the ramp at Kandahar from Australia, the Netherlands, the U.K. and the U.S.—but their respective aircraft were so different that their mechanics could not work on other nations' aircraft; nor could the aircrew fly in aircraft other than those of their own unit. Because we can't share the logistics and maintenance, the whole thing becomes more expensive and more complicated to organize, which is directly translated in loss of potential.[55]

[52] North Atlantic Treaty Organization, *Special Air Warfare Manual. Version 1.0* (SHAPE, Belgium: NATO Special Operations Headquarters, 2010), 11.

[53] North Atlantic Treaty Organization, "Backgrounder: Interoperability for Joint Operations," http://www.nato.int/docu/interoperability/html_en/interoperability01.html (accessed December 2, 2011), 1.

[54] North Atlantic Treaty Organization. *The North Atlantic Treaty Organization Special Operations Forces Study* (SHAPE, Belgium: NATO Special Operations Coordination Centre [NSCC], 2008), 34.

[55] Joris Janssen Lok, "Rotary Imbalance." *Aviation Week* 167, no. 21, November 2007, 32.

This type of struggle is all too common in joint operations and is a strong argument for NATO SOF fielding standardized general-purpose helicopters.

G. AIRFRAME SELECTION

Cost, as previously stated, is an obvious and central consideration for selection. If a general purpose rather than a high-end/specialty aircraft is desired, what should the other criteria for selection include? The NSHQ draft *Special Operations Air Group Concept* (2010) study used the following minimum requirements to narrow the selection:

(1) Currently in Production (major platform model, not specific variant)

(2) Available for Purchase

(3) Replacement and Repair Parts in production

(4) Sufficient numbers in existence for "normalizing" data

(5) Availability of reliable third-party specifications and performance data

(6) In use by the armed services of two or more NATO member nations

(7) Minimum Surface Ceiling (1,364 kg load) 3,658 meters

(8) Internal Payload of 6 Fully Equipped PAX

(9) Wire Strike Protective System

(10) Armoured Crew Seats

(11) Active and Passive Countermeasures

(12) Weather Radar

(13) Night Vision Equipped/Capable

(14) Cargo Hook with Rescue Hoist Capable

(15) Range of 400KM +

(16) Minimum Useful Load 1,364kg

(17) Minimum 2 Heavy Machine Gun (NATO 7.62 or 12.7)

This reduced their original list of more than one-hundred variants to just eight.[56] However they were unable to reduce the list further "due to the number of aircraft variants that can be properly configured to meet requirements."

With "heavy weighting… placed on a platform's past history, NATO member nation usage, and production availability," along with price, performance, analysis of NSHQ missions, and interviews with operators, the report suggested a few platforms that stood out from the rest.[57] These aircraft were: the EC-145, NH-90, and MI-17/8MT, though no quantitative analysis or suggestion beyond this was offered. Ultimately, the report strongly suggested using loaned/gifted SH-60 aircraft from the U.S. in the near term. This would provide more time to consider the best long-term solution, would allow a low-cost initial capability, and was considered cost-effective since it deferred procurement costs.[58] The study also proposed an initial capability of two rotary wing squadrons with four aircraft each, for a total of eight aircraft.[59] Subsequent guidance from NSHQ has indicated a reduced requirement for initial capability of two squadrons of three aircraft each for a total of six aircraft.

H. ANALYSIS OF ALTERNATIVES

This research conducts further market analysis of procurement and sustainment options. It considers the loaned/gifted U.S. airframe option, recommended European airframes, a hybrid solution of gifted U.S. airframes for initial capability transitioning to European aircraft for long-term operations, and organic versus contracted maintenance. The goal of this work is not to select the platform for NATO. Rather, it is to present more detailed (predominately financial) analysis of the alternatives for developing the initial NATO SOF organic helicopter capability.

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[56] NATO Special Operations Headquarters, *DRAFT Special Operations Air Group Concept for Development & Organisation* (SHAPE, Belgium: NATO, 2010), 20.

[57] Ibid., 23.

[58] Ibid.

[59] Ibid., 2.

1. UH-72A LAKOTA

The UH-72A LAKOTA, is a militarized version of the Eurocopter EC-145 built by the American Eurocopter division of European Aeronautic Defense and Space Company N.V. (EADS), and is readily available as a COTS item. The Eurocopter EC-145 was identified in the NSHQ air study as one of the air frames that stood out from the rest.[60] The U.S. Army currently uses the LAKOTA as its Light Utility Helicopter (LUH). The LAKOTA program provides the Army with the capability to accomplish a wide-range of administrative and logistical missions. For the Army and the Army National Guard, these aircraft provide General Support, Homeland Security mission assistance, to include security and support, search and rescue, counterdrug operations, reconnaissance and surveillance, and traditional medevac. The planned delivery of 345 aircraft will replace the Army's aging UH-1 and OH-58A aircraft, freeing up the UH-60 Black Hawk for use in other theaters of operation.

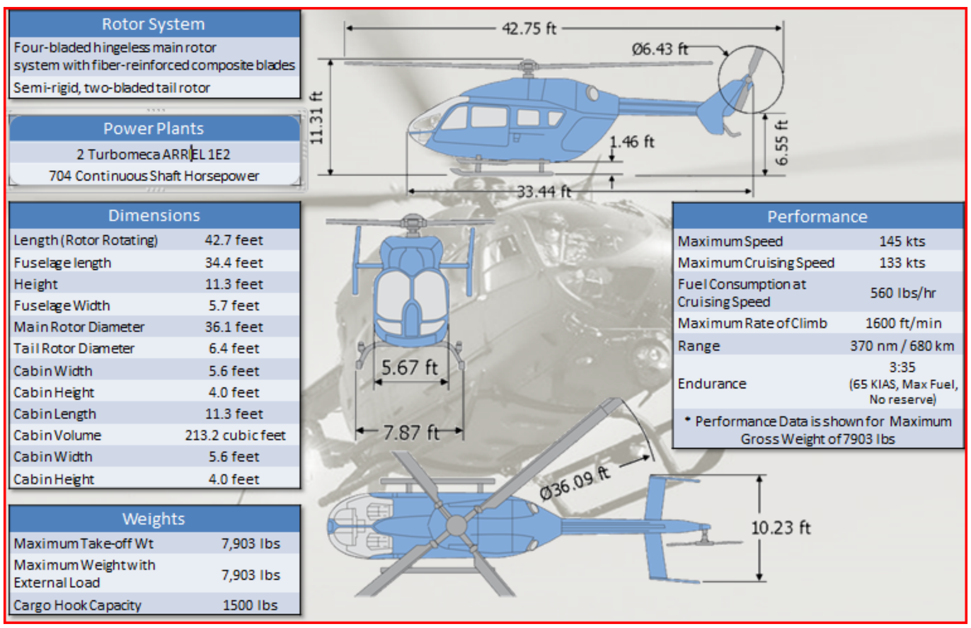

Figure 1. UH-72A LAKOTA[61]

[60] NATO Special Operations Headquarters, *DRAFT Special Operations Air Group Concept for Development & Organisation* (SHAPE, Belgium: NATO, 2010).

[61] "UH-72A Lakota Light Utility Helicopter" (presentation, Aviation Applied Technology Directorate, Ft. Eustis, VA, November 8, 2011)

The standard configuration for the UH-72A comes equipped with modern cockpit communication and navigation systems compatible with civilian aerospace systems. The flight station is NVG compatible and includes radar altimetry, full autopilot, and a unique First Limit Indicator, which simplifies engine monitoring and reduces pilot workload.[62]

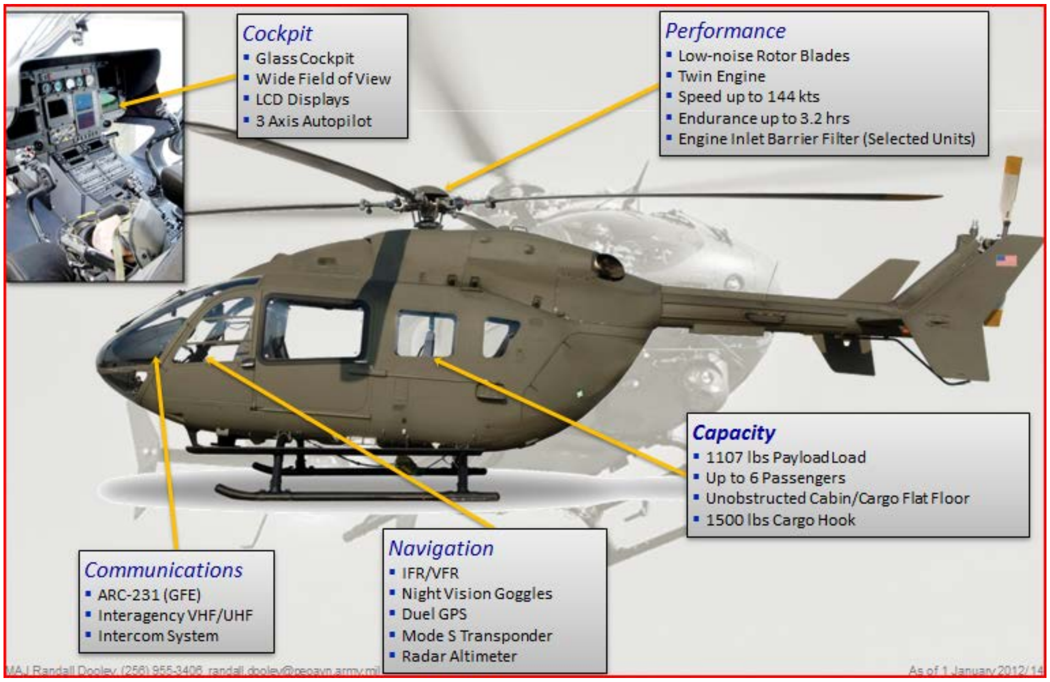

Figure 2. UH-72A LAKOTA Port Aspect Overview[63]

Since the UH-72A is a COTS aircraft, the modification process is different from a tradition defense combat system. Operational Needs Statements (ONS) are submitted through Army Commands (ACOM) to the Headquarters, Department of the Army (HQDA) G3 to modify the aircraft configurations for Mission Essential Packages (MEPs) to suit specific mission requirements. All modifications must be conducted in-accordance-with (IAW) FAA regulations. However, it should be noted that any airframe modification will cause changes in contracted logistic support rates. The Security and

[62] Defense Acquisition Management Information Retrieval, s.v. "LUH," last updated December 31, 2010, https://ebiz.acq.osd.mil/damir.

[63] "UH-72A Lakota Light Utility Helicopter" (presentation, Aviation Applied Technology Directorate, Ft. Eustis, VA, November 8, 2011)

Support MEP is best suited to handle mission requirements highlighted in the NSHQ draft *Special Operations Air Group Concept* (2010) study. The Security and Support modifications are displayed in Figure 3.

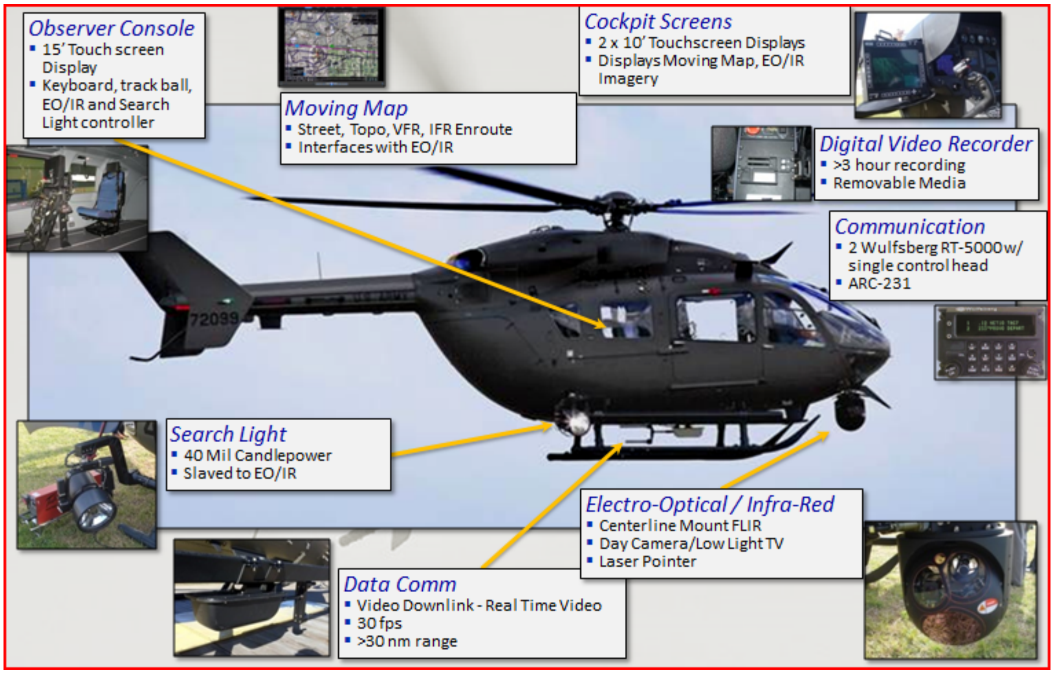

Figure 3. UH-72A LAKOTA Starboard Aspect Overview[64]

The UH-72A program developed for the U.S. Army uses contractor logistics support (CLS) for its maintenance. Active Army units receive full CLS, while the Army National Guard has implemented a hybrid form that allows Guard members to conduct field-level maintenance. The UH-72A program has benefited from this logistics support arrangement and the resultant ease of program implementation, which has allowed the aircraft to quickly enter service with major success, meeting all of its cost, schedule, and performance goals.[65]

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64 "UH-72A Lakota Light Utility Helicopter" (presentation, Aviation Applied Technology Directorate, Ft. Eustis, VA, November 8, 2011).

65 "Army Weapons and Equipment: Aircraft," Army Magazine 60, no. 10 (October 2010).

2. SH-60F SEAHAWK

Naval development for the SH-60 began in 1977 when the UH-60A Black Hawk won the Light Airborne Multi-Purpose System (LAMPS) Mk III competition for shipboard helicopters.[66] The first SH-60B was received by the Navy in 1983. Then the Navy began development of the SH-60F variant to replace the SH-3 Sea King and the first SH-60F was delivered in 1988. The SH-60F is categorized as a carrier (CV) inner-zone Anti-Submarine Warfare (ASW) helicopter and its primary role is for close-in ASW protection for carrier groups. The secondary mission for the SH-60F included search and rescue (SAR) and plane guard during carrier flight operations.[67]

SH-60F is a twin engine helicopter equipped with all the LAMPS Mk III avionics; with exception to the large cylindrical fairing under the nose, housing the 360-degree-Magnetic Anomaly Detector (MAD), an electronic surveillance/ support measures (ESM) system, missile jamming equipment and missile plume detectors.[68] In addition to the removal of the MAD fairings, the cargo hook and Recovery Assist, Secure and Traverse (RAST) systems were also removed. Integrated into the SH-60F were the ASW mission avionics including Honeywell AN/AQS-13F dipping sonar, MIL-STD-1553B data bus, dual Litton AN/ASN-150 tactical navigation computers and AN/ASM-614 avionics support equipment, automatic flight control system with quicker automatic transition and both cable and Doppler auto hover, and tactical data link.[69]

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[66] Jane's All the World's Aircraft, s.v. "Sikorsky S-70B," accessed February 29, 2012, http://search.janes.com.libproxy.nps.edu/Search/documentView.do?docId=/content1/janesdata/yb/jawa/jawa1458.htm@current&pageSelected=allJanes&keyword=Sikorsky S-70B&backPath=http://search.janes.com/Search&Prod_Name=JAWA&.

[67] Jane's All the World's Aircraft, s.v. "Sikorsky S-70B," accessed February 29, 2012, http://search.janes.com.libproxy.nps.edu/Search/documentView.do?docId=/content1/janesdata/yb/jawa/jawa1458.htm@current&pageSelected=allJanes&keyword=Sikorsky S-70B&backPath=http://search.janes.com/Search&Prod_Name=JAWA&.

[68] "SH-60 LAMPS MK III Seahawk," Federation of American Scientists, last modified December 27, 1999, accessed March 3, 2012, http://www.fas.org/man//dod-101/sys/ac/sh-60.htm.

[69] Jane's All the World's Aircraft, s.v. "Sikorsky S-70B," accessed February 29, 2012, http://search.janes.com.libproxy.nps.edu/Search/documentView.do?docId=/content1/janesdata/yb/jawa/jawa1458.htm@current&pageSelected=allJanes&keyword=Sikorsky S-70B&backPath=http://search.janes.com/Search&Prod_Name=JAWA&.

Figure 4. SH-60F Illustration[70]

Figure 5. SH-60F Photograph[71]

[70] "SH-60 LAMPS MK III Seahawk," Federation of American Scientists, last modified December 27, 1999, accessed March 3, 2012, http://www.fas.org/man//dod-101/sys/ac/sh-60.htm.

[71] "SH-60 LAMPS MK III Seahawk," Federation of American Scientists, last modified December 27, 1999, accessed March 3, 2012, http://www.fas.org/man//dod-101/sys/ac/sh-60.htm.

In later versions of the SH-60F, communications control system, multifunction keypads and displays for each of four crew members; internal/external fuel system and extra weapon station to port allowing carriage of three Mk 50 homing torpedoes; provision for surface search radar, FLIR, night vision equipment, passive ECM, MAD, air-to-surface missile capability, sonobuoy data link, chaff/sonobuoy dispenser, attitude and heading reference system (AHRS), Navstar GPS, fatigue monitoring system and increase of maximum T-O weight to 10,659 kg (23,500 lbs); secondary missions include SAR and plane guard.[72] Table 1 gives and aircraft comparison for both the UH-72A and the SH-60F.

Table 1. Comparative Aircraft Performance Data.

	UH-72A	SH-60F
Length	42 feet, 7 inches	64 feet, 10 inches
Height	11 feet, 9 inches	17 feet
Rotor Diameter	36 Feet	53 feet 8 inches
Max Take-off Weight	7,903 lbs.	23,500 lbs.
Range	370 nautical miles	245 nautical miles
Airspeed	145 knots	183 mph
Ceiling	18,000 feet	12,000 feet
Propulsion	(2) Turbomecca Arriel 1E2 turboshafts	(2) General Electric GE-T700-401C
Thrust (per engine)	738 SHP	1,890 SHP
Rate of Climb (FPM)	1,600	1,650
Crew	2	3-4
Capacity	8 Troops or 2 Stretchers	8-10 Troops

[72] Jane's All the World's Aircraft, s.v. "Sikorsky S-70B," accessed February 29, 2012, http://search.janes.com.libproxy.nps.edu/Search/documentView.do?docId=/content1/janesdata/yb/jawa/jawa1458.htm@current&pageSelected=allJanes&keyword=Sikorsky S-70B&backPath=http://search.janes.com/Search&Prod_Name=JAWA&.

III. METHODOLOGY

This section presents the rationale used for the analysis of alternatives available to NATO SOF for establishing a six helicopter air wing, and the approach taken in analyzing the data obtained during research. The analysis makes both quantitative and qualitative comparisons to assess options for moving the program forward, considerations for program sustainment, and recommendations for further research. Underlying goals and objectives were synthesized from NATO SOF doctrine and the 2010 NSHQ draft *Special Operations Air Group Concept* study (as discussed in the background chapter), along with information obtained during discussions with NATO personnel. The goal is to assess various courses of action NATO SOF could select to acquire organic general purpose helicopters. These helicopters will meet the missions of air mobility (to enhance NATO SOF ground capability) and training and skill transfer (to enhance NATO member nation capabilities). The primary concerns of the analysis are cost effectiveness and ease of implementation. Quantitative analysis will consider acquisition costs and the portions of operation and support costs that aid in discriminating between platforms. Qualitative analysis will address the ease of implementation, training and skill transfer considerations, organic maintenance and logistics support implementation versus Contractor Logistics Support (CLS) options, and a discussion of concerns and considerations regarding the MI-17.

A. AIRCRAFT CHOSEN FOR ANALYSIS: SH-60, EC-145, MI-17

The primary aircraft analyzed for this study are the SH-60 and the EC-145. The SH-60 and its variants are ubiquitous aircraft in the United States military with easy availability and a ready supply of excess defense articles (EDAs). Under section 516 of the Foreign Assistance Act of 1961 (P.L. 87-195), as amended, the U.S. Government has the authority to transfer surplus military equipment to foreign security forces.[73] The Department of State, in their FY2008 Congressional Budget Justification for Foreign Assistance states that:

> EDA articles are transferred in an "as is, where is" condition to the recipient and are only offered in response to a demonstrated requirement. The grant EDA program operates at essentially no cost to the United States, with the recipient responsible for any required refurbishment and repair of the items as well as any associated transportation costs.[74]

The statement that EDAs are "as is, where is," at "essentially no cost" to the U.S., and that the recipient is liable for refurbishment, repair, and transportation is notable. This means that there can be significant costs for the recipient of EDAs. In fact, analysis of this alternative will include a detailed estimate of costs from a 2009 proposed transfer of six EDA SH-60s from U.S. Navy stocks that includes the costs mentioned above.

The second helicopter considered at length is the UH-72 LAKOTA, which is a militarized version of the Eurocopter EC-145 built by the American Eurocopter division of European Aeronautic Defence and Space Company N.V. (EADS), and readily available as a commercially available off-the-shelf (COTS) item. The Eurocopter EC-145 was identified in the NSHQ air study as one of the air frames that stood out from the rest.[75] The U.S. Army currently uses the LAKOTA as its LUH, and significant data pulled from U.S. Army experience is included in this analysis.

A third helicopter, the MI-17 Hip is addressed in this research, but in less detail. It was also identified in the NSHQ air study as a stand-out airframe, but reliable operation and support costs were unavailable, acquisition costs are fluctuating significantly, and the reliability/availability of spares and repair parts was questionable. This airframe will be discussed in the qualitative analysis section with a recommendation for further research, but will not be addressed in the quantitative analysis.

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[73] Committee on International Relations and Committee on Foreign Relations, *Legislation on Foreign Relations through 2002* (Washington, DC: U.S. Government Printing Office, 2003).

[74] U.S. Department of State Bureau of Political-Military Affairs, *Congressional Budget Justification: Foreign Assistance: Title IV Supporting Information*, 2007).

[75] NATO Special Operations Headquarters, *DRAFT Special Operations Air Group Concept for Development & Organisation* (SHAPE, Belgium: NATO, 2010).

B. DATA ASSESSED AND SELECTED FOR USE

Naval Air Systems Command (NAVAIR) provided a line item summary of a letter of agreement (LOA) for an EDA transfer of six SH-60 aircraft from 2009 (see the Appendix). This LOA includes all of the before mentioned costs of refurbishment, repair and transportation so serves as a useful basis of estimate for those. Additionally, it includes costs for initial spares and logistics support for a two year startup period. It also includes expenses for U.S. assistance in standing up organic logistics support capabilities for the recipient nation in a model similar to that used by the U.S. Navy. The LOA is used in the quantitative analysis of the EDA procurement option since it so closely mirrors the requirements of the desired initial NATO rotary wing capability. It has the added benefit of being divided into discrete and easily separable charges that can be used for estimates under various assumptions regarding which costs NATO will be responsible for covering.

From the brief assessment of the advantage of using EDA SH-60s in the NSHQ Air Study, and from discussions with NSHQ personnel, it appears that the costs delineated in the NAVAIR estimate are significantly higher than NATO is anticipating. NATO personnel discussed these SH-60s as being free or nearly free, and an inexpensive way to initiate the program. This assumption might be justified if U.S. funding was made available to cover the costs associated with a traditional EDA grant. NATO has been in discussion with United States Special Operations Command (USSOCOM) regarding funding, and it is expected that USSOCOM will pay some of the costs of the program. Since the U.S. may therefore, pay the initial costs of the SH-60s, a "SH-60 Free" calculation is included in the analysis. This reflects the financial requirement of fielding the SH-60 aircraft if all of the refurbishment, repair, and transportation costs are defrayed by the U.S., and NATO is delivered free, fully operational helicopters.

Procurement Costs of the EC-145 LAKOTA variant were taken from the Defense Acquisition Management Information Retrieval (DAMIR) Selected Acquisition Report (SAR). The number used for analysis of procurement costs is the Average Procurement Unit Cost (APUC) of the 345 LAKOTAs acquired by the U.S. Army at the time of the report. The possibility that economies of scale might make the Army's APUC lower than what NATO could expect was considered, and an additional source of data sought. The U.S. Navy operates just five LAKOTAs, offering the opportunity to analyze the effects of quantity on procurement cost. The procurement cost to the Navy was found to be within five percent of the Army's. This alleviated the concerns of small batch procurement driving up costs for the LAKOTA. With costs almost equal, the decision was made to use the Army data for analysis, since the Army's cost data came from a formal report, while the Navy's cost data came from a technician's spreadsheet.

Operation and Support (O&S) cost estimates are based upon the Assistant Secretary of the Army for Financial Management and Comptroller published reimbursable rates from FY2011. These numbers include fuel, depot level repairables (DLRs), consumables, depot costs, and CLS costs for the SH-60. For the LAKOTA, they include just fuel, CLS, and a small portion of depot costs (from the hybrid CLS contracts) since the other maintenance costs (DLRs and consumables) are included under the CLS contract. Therefore, the comparisons made in O&S are between an organic maintenance capability for the SH-60 and a CLS (i.e., contractor provided logistics) package for the LAKOTA. The comparison of these disparate support options for the two airframes will be considered both quantitatively (cost per flight hour) and qualitatively (ease of use/management for the operator). Personnel costs for the pilots and aircrew are not included in this analysis, since NATO manning decisions are being made independently of the platform selection decision. However, when NATO is determining total program costs, the personnel costs will need to be included.

C. QUANTITATIVE (I.E., COST) ANALYSIS

All costs were normalized to BY2011 using GDP deflator calculations based upon the most recent published Office of Management and Budget (OMB) tables. Acquisition costs and the O&S costs mentioned above were combined to determine annual costs (not including personnel costs, as discussed), and extended to determine lifecycle costs. The amount of funding available to NSHQ for program initiation and sustainment has not yet been determined. Therefore, a variety of scenarios are outlined and costed to illustrate a representative range of options. The duration of the SOF rotary wing program has also not been determined. The possibility of a 2019 end date has been mentioned, but the potential for extended operations should also be considered. Therefore, this analysis presents estimates for both a 2019 end-date, and twenty-year program duration. Twenty years was selected since it is the estimated operational life of many helicopters. The three estimates analyzed and compared are:

1. The Full NAVAIR EDA Program Startup Estimate:

The costs from the NAVAIR provided LOA for six EDA SH-60s was analyzed by line item. The analysis accounts for both the full-cost estimate including all elements for a full program startup, and for a zero-cost estimate assuming that all associated costs of bringing the EDAs to full operational capability will be paid by another agency. An analysis of partial costs may be warranted if NATO is ultimately expected to pay only certain portions of the startup costs. In that instance, the same methodology used in this research could be applied. However, since no basis for such a partial estimate was available, it was not included in this analysis. The O&S estimates were then added to these acquisition estimates, and extended to the year 2019. The twenty year estimate was not made for the full-cost scenario. Since EDA helicopters are already well into their operational life, the expense of repurchasing additional helicopters at this high cost prior to the end of the 20 year period was considered prohibitive.

2. Comparison of "Free" SH-60s to EC-145 LAKOTA Variants over a Twenty-Year Period

Free SH-60s (all startup costs paid by another agency) are less expensive in the short-term due to their zero procurement costs, but remain more expensive in the long-term because of their greater O&S costs. However, the initial expense of procuring six LAKOTAs at once may be prohibitive; therefore scenarios are considered for beginning the program using EDA SH-60s and replacing them with LAKOTAs in subsequent years, as funds become available. Four different representative estimates are compared:

1. Accepting six free EDA SH-60s and maintaining them, with additional free EDA SH-60 replacements as necessary. This option therefore accrues only the O&S costs of the six aircraft for the twenty year period.

2. Purchasing six LAKOTAs in the initial year and maintaining them for the twenty year period (foregoing the use of EDA SH-60s altogether).
3. Accepting six free EDA SH-60 aircraft to initiate the program, and then replacing them with LAKOTAs at a rate of two aircraft per year beginning in the second year of the program. Assuming program initiation in 2013, the resulting aircraft inventory under this "Rapid Replacement" schedule is depicted in Table 2.

Table 2. Aircraft Inventory Using the Rapid Replacement Schedule

Year	**2013**	**2014**	**2015**	**2016 and After**
SH-60s	6	4	2	0
LAKOTAs	0	2	4	6

- Accepting six free EDA SH-60 aircraft to initiate the program, and then replacing them with LAKOTAs at a rate of one aircraft per year beginning in the third year of the program. Assuming a program initiation in 2013, the resulting aircraft inventory of this "Gradual Replacement" schedule is depicted in Table 3.

Table 3. Aircraft Inventory Using the Gradual Replacement Schedule

Year	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020 and After**
SH-60s	6	6	5	4	3	2	1	0
LAKOTAs	0	0	1	2	3	4	5	6

The comparison of these four options illustrates the tradeoffs available to NSHQ between startup costs, life-cycle costs, and annual costs of the program.

A final analysis considers the potential scenario of very short program duration that was mentioned as a possibility in discussions with NATO personnel. SH-60 and

LAKOTA costs are reconsidered in this analysis with an assumed program start in 2013 and an end in 2019 to determine the impact of short program duration on platform selection.

D. QUALITATIVE ANALYSIS

The Contract Logistics Support option available with the LAKOTA is considered and compared to the establishment and sustainment of organic maintenance and logistics support capabilities that would be required for the SH-60. Analysis will consider availability and reliability, along with ease of program implementation and management of the CLS option. The effect of platform selection on the stated goals of skill transfer and training among participating NATO member nations will be considered. This section will also include a discussion of research conducted on the MI-17, with the benefits and potential pitfalls to NSHQ should they pursue procurement.

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IV. QUANTITATIVE ANALYSIS

There are three primary sources of cost data used in this analysis. Purchase price for the Excess Defense Article (EDA) SH-60s was taken from a 2009 NAVAIR estimate prepared for a grant of six EDA SH-60s. The cost breakdown is presented in Table 4. More detailed information is contained in the Appendix.

Table 4. NAVAIR Costs for Grant of Six EDA SH-60s (2009 $s)

CATEGORY	PER UNIT	QUANTITY	TOTAL
PLATFORM COST	$0.00	6	$0.00
ENGINES	$803,665.00	14	$11,251,310.00
TECH ASSIST	$176,175.00	1	$176,175.00
SUPPORT EQUIPMENT	$7,191,881.00	1	$7,191,881.00
SPARES	$29,417,966.00	1	$29,417,966.00
TRANSPORT	$647,863.00	1	$647,863.00
OVERHAUL	$5,325,529.50	6	$31,953,177.00
TRAINING	$4,650,785.00	1	$4,650,785.00
PUBLICATIONS	$3,393,117.00	1	$3,393,117.00
LOG TECH ASSIST	$1,357,977.00	1	$1,357,977.00
OTHER TECH ASSIST	$3,505,855.00	1	$3,505,855.00
ENG. TECH ASSIST	$2,599,162.00	1	$2,599,162.00
ENG. TECH SERVICES	$2,436,000.00	1	$2,436,000.00
ADMIN CHARGE	$3,746,089.00	1	$3,746,089.00
		TOTAL	$102,327,357.00
		Per helo	$17,054,559.50

The helicopters were offered at no cost under section 516 of the Foreign Assistance Act of 1961, and "as is, where is." The condition of these aircraft was described in the LOA as "serviceable, used—good." While the platforms themselves were no cost, the associated costs to return the aircraft to fully operational condition, transport them to the purchasing country, and implement a U.S. style logistics support program were considerable. The line items cover materiel and support costs as follows:

- Engines: Two new engines per helicopter were required, and two additional engines were procured as spares.

- Tech Assist: An assessment of the receiving nation's existing logistics support system and the development of a subsequent plan of action enabling them to develop their logistics support capabilities to support the SH-60s.
- Support Equipment: New-condition support equipment and calibration gear for one land-based (as opposed to sea-based) organizational level maintenance site.
- Spares: Sufficient aircraft spares and repair parts to meet anticipated requirements for organizational level maintenance at one main base and one detachment for a period of two years.
- Transport: The movement of the helicopters to the purchasing nation. Does not include any import duties or fees nor any enroute maintenance requirements.
- Overhaul: The costs of new engine installation, other necessary new equipment procurement and installation, software installation, and follow-on testing as required. This includes check flights.
- Training: For six pilots and ten organizational level maintainers at a location in the United States. Does not include room, board, or travel expenses for students.
- Publications: All references required to conduct organizational level maintenance, including required publication updates for two years.
- Logistics Technical Assist: Integrated logistics support and interim contractor support for the establishment of logistics programmatics.
- Engineering Technical Assistance: One engineer and two contractor support personnel for five years.
- Engineering Technical Services: One airframe/engine representative and one avionics/electrical representative for two years.
- Other Technical Assistance: unexplained
- Administrative Charge: unexplained.

The estimate indicates that $17,054,560 (in BY2009 dollars) per helicopter covered initial overhaul, a significant portion of operation and support costs for the first two years, and the startup requirements for a U.S. Navy style logistics support program.

The purchase price of the LUH LAKOTA (militarized EC-145) comes from the DAMIR SAR for the LUH and uses the average procurement unit cost. None of the above mentioned program costs are included, but they are also not required if a CLS package comparable to that purchased by the U.S. Army is implemented. In that case, NATO would not need to establish any organic maintenance capability.

Operation and Support (O&S) costs are taken from the Assistant Secretary of the Army for Financial Management and Comptroller published reimbursable rates for FY2011. For the purpose of this analysis, O&S costs include fuel, depot level repairables (i.e., parts), depot maintenance costs, consumable item usage, and associated contract logistics support costs. Notably, it does not include crew pay.

Costs used in the following analysis have all been converted to BY 2011 dollars using Gross Domestic Product (GDP) deflator calculations based upon figures reported by the OMB located at the White House web site at http://www.whitehouse.gov/omb/budget/Historicals. Acquisition and O&S costs are presented in Table 5.

Table 5. Summary of Cost Data

PLATFORM	PURCHASE PRICE	Fuel/ FH	DLR/ FH	Consumables/ FH	Depot/ FH	CLS/ FH
LAKOTA	$5,758,500	$348	$0	$0	$192	$2,249
SH60 COSTED	$17,549,142	$354	$2,151	$586	$1,655	$962
SH60 FREE	$0	$354	$2,151	$586	$1,655	$962

Table 5 clearly illustrates that the majority of the costs listed as maintenance and support for the SH-60 are instead included in the CLS line item for the LAKOTA. Additionally, the O&S cost for the LAKOTA ($2,789/flight hour) is significantly less than for the SH-60 ($5,708/flight hour).

The SH-60 Costed model assumes NATO pays the full costs associated with an EDA grant (overhaul, transport, etc.) and program startup delineated in the NAVAIR LOA. The SH60 Free category assumes that some other agency pays these costs on NATO's behalf resulting in zero initial cost to NATO for the acceptance of fully operational SH60s. If another arrangement were made wherein NATO was responsible for a portion of the startup costs, then the same methodology should be used with the SH-60 purchase price adjusted as appropriate to reflect NATO's initial costs.

A. PURCHASE PRICE, ANNUAL COST, AND LIFE CYCLE COST OVERVIEW

The initial purchase price, annual costs, and life cycle costs of the various options differ significantly. To date, the focus of NATO stakeholders appears to be in keeping the initial procurement cost near zero. This would enable a more rapid acquisition of helicopters, thereby expediting the process of standing up the SOF rotary air capability. However, the SH-60 has significantly higher O&S costs per flight hour than the LAKOTA. Therefore, even with potentially zero procurement cost for the SH-60s, they may still be more expensive, depending upon how long the program endures. Three scenarios will be discussed to illustrate the range of financial options. First, NATO could acquire EDA SH-60s from the U.S., and maintain them for the duration of the program. Second, NATO could forego the EDA SH-60s and procure and operate LAKOTAs at the outset. Third, NATO could initially acquire EDA SH-60s to get the program started, and then replace them with LAKOTAs as funds become available. Since the lump-sum procurement costs (i.e., single-year cost) of new helicopters would be the primary obstacle in this scenario, the new helicopters could be phased in over a few years to minimize costs in any one year. Program duration has not yet been determined. Some at NATO have suggested the program may only last until 2019. Therefore, this analysis will consider a potential 2019 end date, and a twenty-year cost determination. Operation and Support costs per annum are based upon an assumption of 250 flight hours per platform per year.

B. SH60 COSTED OPTION

With the high O&S costs of the SH-60, any significant initial costs of procurement make the SH-60s much more expensive in the long term. The SH-60 Costed model, based upon the full program start-up estimate delineated in the NAVAIR LOA, has extremely high costs as presented in Table 6. Significant amounts of the O&S costs for the first two years are included in the LOA bottom line price. Therefore, this estimate uses the bottom line price (adjusted for inflation) from the NAVAIR LOA, adds only fuel costs for the first two year's O&S, and uses full O&S estimates for the following years.

Table 6. Annual Cost of Full Program Startup using EDA SH-60s (BY2011)

SH60 FULL COST MODEL	
Year 1	$105,825,852
Year 2	$531,000
Year 3 and After	$8,562,000

These are used airframes, and are not expected to have twenty years of service life remaining. Therefore, the cumulative acquisition and O&S costs will only be projected to 2019. The price of acquiring replacement EDA SH-60s at the price level of the Costed model would be prohibitive. Also, estimation of this seven-year period will suffice to illustrate the high costs of this option as presented in Figure 6.

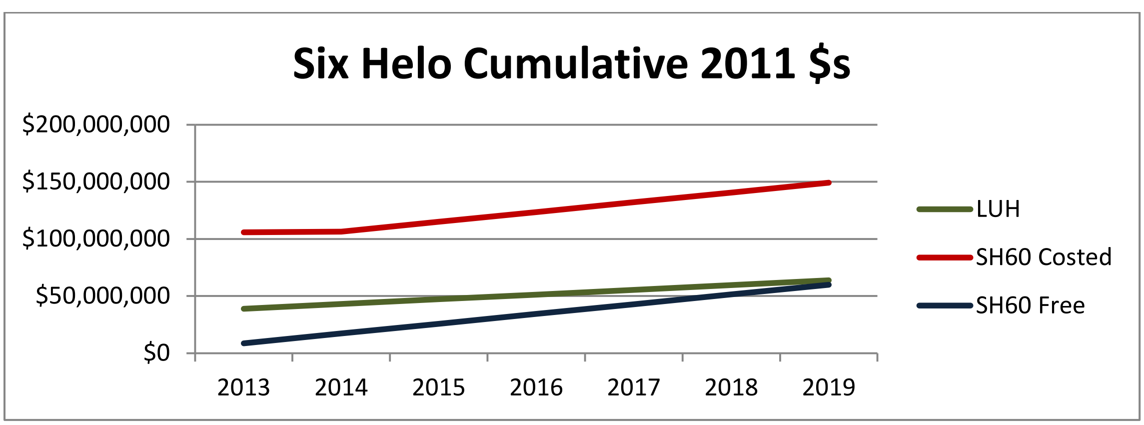

Figure 6. Comparison of Cumulative Costs

Accepting that price is the primary consideration in determining which alternative to pursue, the Costed model for EDA SH-60s is not recommended. It is far more expensive initially and cumulatively than the procurement of Commercial off-the-shelf (COTS) LAKOTA aircraft. Having shown the prohibitive costs of this option, no further analysis of it will be made. The following analysis will compare only the potential zero-cost SH-60 option with the COTS LAKOTA.

C. SH60 FREE AND LAKOTA 20-YEAR COST COMPARISON

Extending costs over a twenty year period for free SH-60s and LAKOTAs using the dollar values in Table 5, we arrive at the annual costs listed in Table 7, and cumulative costs presented in Figure 7.

Table 7. Annual Costs

	LAKOTA	**SH60 Free**
Year 1	$38,734,500	$8,562,000
Year 2 and After	$4,183,500	$8,562,000

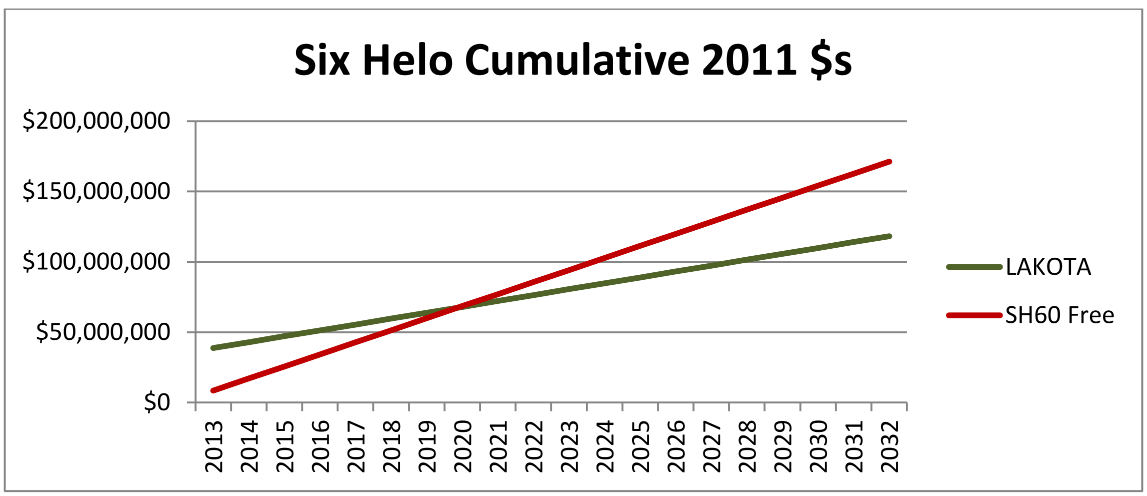

Figure 7. 20-Year Cumulative Costs

The cumulative costs are significantly less for the LAKOTA than the SH-60 over a 20-year period because of the different O&S costs. However, the initial procurement costs of the LAKOTAs in year one are considerable. If start-up funds are not available in sufficient quantities to purchase six LAKOTAs in year one, then the best way forward may be acceptance of the free SH-60s with subsequent replacement by LAKOTAs as funds become available. Two illustrative options for such phased replacement are presented below and compared to the options of either maintaining only the free SH-60s or purchasing six LAKOTAs in year one. They are:

- Rapid Replacement: Acceptance of six free SH-60s in 2013 with replacement by two LAKOTAs per year beginning in 2014; Annual Costs are presented in Table 8 and cumulative costs are presented in Figure 8.
- Gradual Replacement: Acceptance of six free SH-60s in 2013 with replacement by one LAKOTA per year beginning in 2015; Annual Costs are presented in Table 9 and cumulative costs are presented in Figure 9.

Table 8. Rapid Replacement: Two LAKOTAs/year beginning 2014

Year	2/yr begin 2014	LAKOTA Only	SH60 Free Only
2013	$8,562,000	$38,734,500	$8,562,000
2014	$18,619,500	$4,183,500	$8,562,000
2015	$17,160,000	$4,183,500	$8,562,000
2016	$15,700,500	$4,183,500	$8,562,000
2017 and After	$4,183,500	$4,183,500	$8,562,000

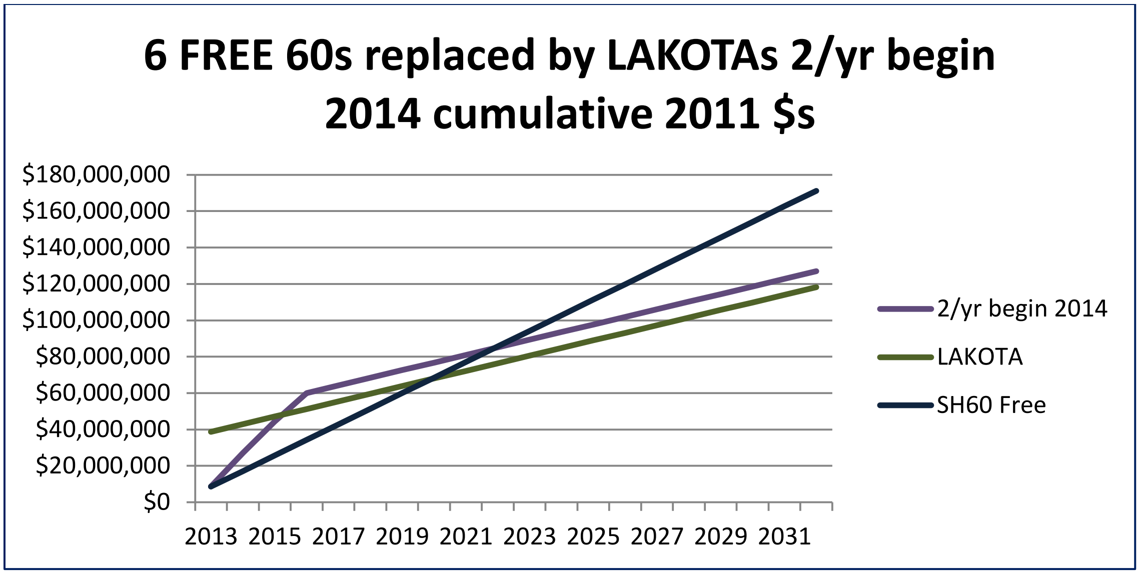

Figure 8. Cumulative Cost of Six EDA 60s Followed by LAKOTA Replacement at a Rate of Two Aircraft Per Year

The Rapid Replacement schedule has a cumulative twenty year cost of $126,978,000 versus $118,221,000 for the LAKOTA only option and $171,240,000 for the SH60 free only option. Though more expensive cumulatively than the LAKOTA only option, its highest cost in any one year is just $18,619,500, less than half of the $38,734,500 first year cost of the LAKOTA-only option.

Table 9. Gradual Replacement: One LAKOTA/year beginning 2015

Year	**1/yr begin 2015**	**Only LAKOTA**	**Only SH60 Free**
2013	$8,562,000	$38,734,500	$8,562,000
2014	$8,562,000	$4,183,500	$8,562,000
2015	$13,590,750	$4,183,500	$8,562,000
2016	$12,861,000	$4,183,500	$8,562,000
2017	$12,131,250	$4,183,500	$8,562,000
2018	$11,401,500	$4,183,500	$8,562,000
2019	$10,671,750	$4,183,500	$8,562,000
2020	$9,942,000	$4,183,500	$8,562,000
2021 and After	$4,183,500	$4,183,500	$8,562,000

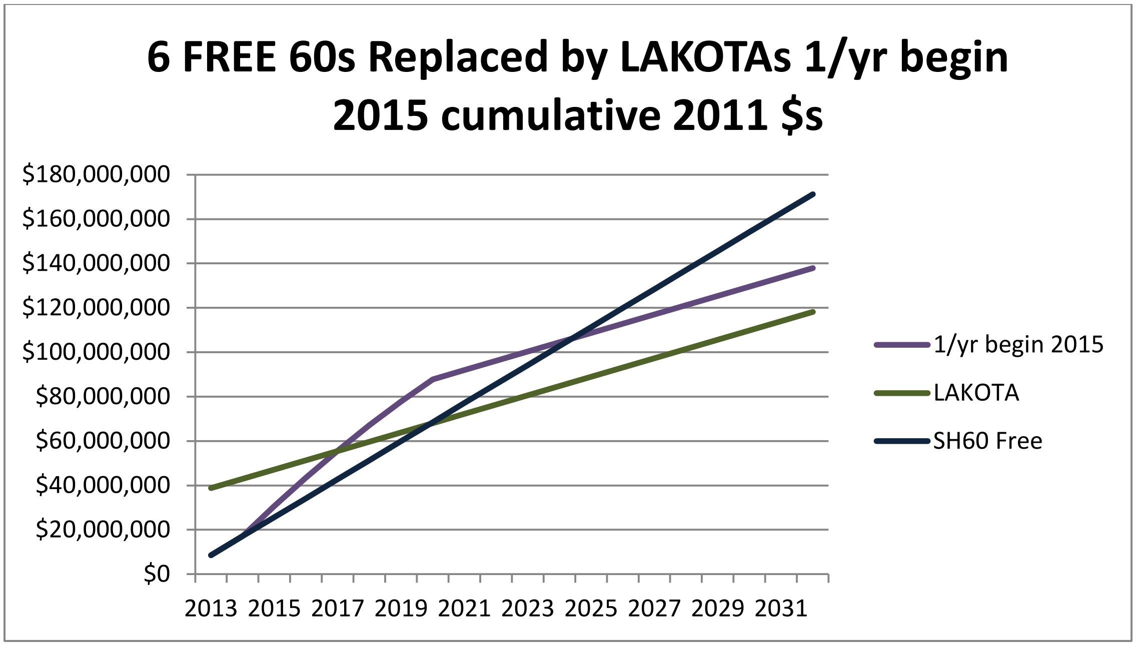

Figure 9. Cumulative Cost of Six EDA 60s Followed by LAKOTA Replacement at a Rate of One Aircraft Per Year

The gradual replacement schedule delays procurement expenses and flattens annual costs by spreading purchases out even further. It does so at the expense of higher cumulative costs (since more SH-60s would be operated for a longer duration). The gradual replacement schedule has a cumulative 20-year cost of $137,924,250 versus $118,221,000 for the LAKOTA only option, $171,240,000 for the SH60 free only option, and $126,978,000 for the rapid replacement option. Its highest cost in any one year is only $13,590,750 versus $18,619,500 for the rapid replacement option and the $38,734,500 first year cost of the LAKOTA-only option.

D. COSTS CONSIDERED WITH A PROGRAM END DATE OF 2019

As illustrated in Figure 9, with a program start date of 2013, the cumulative costs of the SH-60 free only option would be less than the LAKOTA-only option until 2020, at which point the higher O&S costs of the SH-60 offset their zero procurement costs. Estimates of cumulative costs through 2019 are $63,835,500 for the LAKOTA-only option and $59,934,000 for free SH-60s, a difference of $3,901,500. LAKOTAs maintained under the CLS contract would have residual commercial sale value that would adjust these figures moderately. If the then seven-year-old helicopters could be resold for just $650,250 each, the total costs of the LAKOTA only and SH-60 free only options would be identical. This seems a reasonable estimate of the LAKOTA’s residual value, so 2019 is the estimated break-even year for the LAKOTA only and SH-60 free only options. The break-even year for phased replacement options would be even later, so replacing SH-60s with LAKOTAs is not a recommended option if a firm program end date of 2019 is likely.

V. QUALITATIVE ANALYSIS

A. PLATFORMS

In 2005, the Army Training and Doctrine Command (TRADOC) Analysis Center completed an AoA study for the DoD to replace the Army's aging Vietnam-era LUH OH-58A/C and their UH-1H/V fleet. As defined by the Army, the requirements for the LUH program called for a lightweight, low cost helicopter capable of providing reliable, general support at affordable life-cycle cost.[76] Using the UH-60 to conduct the LUH mission was deemed cost prohibitive and in 2005 the Joint Requirement Oversight Council (JROC) offered the following guidance.

> A need exists for a helicopter that can provide reliable and sustainable general support and administrative support in permissive environments at reduced acquisition and operating and support costs. Program guidance is that acquisition cost and operating and support cost must be less than the current Army utility helicopter (UH-60).[77]

TRADOC's AoA included extensive analysis of 35 COTS/Non-Developmental-Item (NDI) aircraft alternatives. The list of 35 possible airframes was reduced to 11 based upon an acquisition price-ceiling target of $6 Million per aircraft. For the qualitative assessment, TRADOC employed a survey group consisting of six Active Duty pilots, six Active Duty National Guard pilots, 1 Reservist, 3 Retired, and 1 other, which together gave a combined total of 206.5 years and 29,998 flight hours of LUH experience.[78] The survey requested the LUH community members to rank 30 LUH attributes with respect to four different mission types. The AoA then conducted a performance and cost integration analysis to determine the "Best Value" selection. The combined financial and qualitative assessments led to their selection of the LAKOTA as the single platform solution to the Army's LUH requirement.[79]

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[76] Morris G. Hayes et al,. *Light Utility Helicopter (LUH) Analysis of Alternatives* (Fort Lee, VA; TRADOC, 2005).

[77] Ibid.

[78] Ibid.

[79] Ibid.

The capabilities sought by the Army for their LUH program were very similar to those sought by NSHQ. It is unsurprising, therefore, that two of the final aircraft considered by the Army were the UH-60 and the LAKOTA, as their equivalent aircraft (the SH-60 and EC-145) are also on the short-list for consideration by NSHQ. Figure 10, below, shows 16 key attributes from the Army's LUH Capabilities Development Document (CDD) that have commonality with NSHQ's mission requirements.

Passenger Seating Capacity (KPP)	No less than six passengers when not in the MEDEVAC configuration.
Internal Cargo Capacity	The LUH shall operate in a High/Hot environment defined as 4,000 feet pressure altitude and 95° Fahrenheit in the standard mission configuration. The LUH aircraft shall have an internal useful load of no less than 1,500 pounds during High/Hot operations, in addition to the crew of two, and full mission fuel plus a 30 minute reserve using not more than 100 percent maximum rated power (MRP) for takeoff.
External Cargo Capacity	The LUH shall operate in a High/Hot environment defined as 4,000 feet pressure altitude and 95° Fahrenheit in the standard mission configuration. The LUH shall have an external useful load of no less than 2,200 pounds during High/Hot operations with three crew members and full mission fuel using not more than 100% MRP for takeoff.
Night Vision Goggles (NVG) Compatible	The aircraft and cockpit lighting shall be Class A compatible with image intensification devices and systems such as NVG.
Instruments Communications Suite	The LUH aircraft shall be net ready (voice) interoperable with military and civil Government and non-Government organizations. The LUH aircraft shall be very high frequency (VHF) - amplitude modulation (AM) radio compatible with International Civil Aviation Organization (ICAO) frequency and modulation schemes, to include 118-137 megahertz (MHz) with 25 kilohertz (KHz) U.S. and 8.33 KHz in Europe channel spacing. The LUH aircraft shall operate with extended frequency coverage for Military use (137-152 MHz, VHF-frequency modulation (FM); compatible communications with U.S. Coast Guard (maritime, 156-174 MHz, VHF-FM); Military (225-400 MHz, UHF- AM; and law enforcement, fire, and forestry (400-511 MHz FM).
Air Warrior Compatibility	The LUH shall allow for the aircrew to operate all flight controls through their full range of motion while wearing all components of the Air Warrior integrated safety and survivability gear including the flexible body armor, survival gear carrier, over water equipment carrier, Nuclear, Biological, or Chemical (NBC) gear, and the flotation collar assembly.
NBC Contamination Survivability	The LUH shall be capable of performing all missions in a NBC contaminated environment; be capable of decontaminating to negligible risk levels; and compatible with the Air Warrior ensemble.

Aircraft Growth Capability	The LUH shall have sufficient space, weight, and power to provide for future potential upgrades for User MEP to include items such as searchlights, FLIR, Secure Civil and Military radios, Moving Map, generators, converters, and antenna modifications.
Instruments Navigation Suite	The LUH aircraft shall have a global navigation satellite system receiver that provides protected, precise position, velocity, and time (PVT) information, for use in civil and military airway and non-precision approach structures. The LUH shall be capable of conducting Instrument Meteorological Conditions (IMC) recovery through an instrument landing system (ILS) or a VHF Omni-directional radio-range (VOR)/Tactical Air Navigation (TACAN)/ Global Positioning System (GPS) type system. The LUH aircraft shall have a Mode S transponder to operate in class B and C national airspace.
FAA Certification	The LUH aircraft shall be covered by a FAA Type Standard Certificate.
Transportability	The LUH shall possess lifting and tie-down provisions to render it capable of accommodating military air, ground (highway and rail) and naval sea transport without system damage or degradation in system performance. The LUH aircraft shall be capable of accommodating both United Sates (U.S.) U.S. and NATO highway limitations. The LUH shall be self-deployable to anywhere within the Continental United States (CONUS).
Operational Readiness Rate	The LUH shall achieve an operational availability rate of 80 percent (Objective of 90 percent).
Crashworthy	The LUH shall meet current FAA standards for crashworthiness, regardless of the year of certification of the proposed aircraft, to include crew and passenger seating and fuel tanks capable of containing fuel during a severe but survivable crash impact to reduce the possibility of fire.
Wire Strike Protection	The LUH shall include a wire strike protection system that will protect at least 90 percent of the frontal cockpit area without a significant effect on performance, control or crew functioning.
Operational Range	The LUH in standard mission configuration, shall be capable of achieving an operational range of no less than 217 nautical miles operating in the defined High/Hot environment (4000' / 95° Fahrenheit pressure altitude), with full crew, full mission fuel, using a 1-minute takeoff, cruise at 0.99 Velocity Best Range, with 30-minute reserve.
Operational Environment	The LUH aircraft shall be fully operable (functional) at ambient temperatures ranging from –40 to +55° C.
Hoist Capacity	The LUH shall be capable of lifting at least 600 pounds with at least 250 feet of useable cable utilizing an external hoist.
External Hook Capacity	Self explanatory.

Figure 10. LUH Attributes[80]

[80] Morris G. Hayes et al,. *Light Utility Helicopter (LUH) Analysis of Alternatives* (Fort Lee, VA; TRADOC, 2005), 20–24.

The SH-60 is also capable of handling all of NSHQ's requirements; however, they are more expensive to operate and would require a more expansive organic logistical footprint when compared to the CLS option associated with the LAKOTA. Though the UH-60 was found to exceed the LAKOTA in certain capabilities, weighing cost versus performance, the UH-60F performance gains were considered to be negligible.[81] NSHQ shares the Army's focus on cost effectiveness. The Army's selection of the cost effective LAKOTA over the UH-60 suggests NSHQ should also seriously consider the LAKOTA for their fundamentally similar performance requirements.

B. CONTRACTOR LOGISTICS SUPPORT

When conducting life cycle cost analysis, operation and sustainment can account for 60–75% of life cycle support costs.[82] Realizing this, DoD has pursued measures to reduce operation and sustainment costs for its programs. One measure that has been taken is to replace organic logistics support personnel and infrastructure with contracted logistics support. In many instances, industry can perform required logistics support functions less expensively than government, simultaneously easing government manpower requirements and speeding program implementation. The Defense Acquisition University defines contractor logistics support as, "The performance of maintenance and/or materiel management functions for a DoD system by a commercial activity. Current policy allows for the provision of system support by contractors on a long-term basis."[83]

Three logistics' metrics are central to the measurement and assessment of operation and sustainment program efficacy. These metrics are mission reliability, mean time to repair, and operational availability. Mission reliability is, "The probability that a

[81] Morris G. Hayes et al,. *Light Utility Helicopter (LUH) Analysis of Alternatives* (Fort Lee, VA; TRADOC, 2005).

[82] Department of Defense, *DoD Weapon System Acquisition Reform Product Support Assessment* (Washington, DC: Department of Defense, Under Secretary of Defense for Acquisition, Technology and Logistics, 2009).

[83] Defense Acquisition University (U.S.), *Glossary of Defense Acquisition Acronyms and Terms*, 14th ed. (Fort Belvoir, VA: Defense Acquisition University Press, 2011).

system will perform its required mission-critical functions for the duration of a specified mission under conditions stated in the mission profile."[84] Mean time to repair (MTTR) is:

> The total elapsed time (clock hours) for corrective maintenance divided by the total number of corrective maintenance actions during a given period. A basic technical measure of maintainability recommended for use in the research and development (R&D) contractual specification environment, where "time" and "repair" must be carefully defined for contractual compliance purposes.[85]

Operational Availability is:

> The degree (expressed as a decimal between 0 and 1, or the percentage equivalent) to which one can expect a piece of equipment or weapon system to work properly when it is required—or, the percent of time the equipment or weapon system is available for use.[86]

The Light Utility Helicopter program administered by the United States Army uses a firm fixed price contract to stipulate the following requirements:

1. 90% mission reliability threshold with a 95% mission reliability objective.
2. A mean time to repair (MTTR) threshold of two hours, and objective of one hour.
3. An Operational Availability threshold of 80% with a 90% objective.

The acquisition strategy for the Light Utility program asserts that primary sustainment will be through contractor logistics support. Tables 10 and 11 show the Operational Availability achieved through hybrid and full CLS.

[84] Defense Acquisition University (U.S.), *Glossary of Defense Acquisition Acronyms and Terms*, 14th ed. (Fort Belvoir, VA: Defense Acquisition University Press, 2011).

[85] Ibid.

[86] Ibid.

Table 10. Hybrid CLS Performance[87]

Hybrid CLS	FY08	FY09	FY10	FY11
Flight Hours	651	5,535	18,321	33,045
Operational Availability %	89%	88%	84%	80%
Parts Support Fill Rate %	**98%**	**98%**	**96%**	**95%**

Table 11. Full CLS Performance[88]

CLS	FY07	FY08	FY09	FY10	FY11
Flight Hours	1,264	5,688	14,130	25,846	53,225
Operational Availability %	**91%**	**95%**	**91%**	**90%**	**90%**

Contractor logistics support is beneficial in that it allows for the use of original equipment manufacturer (OEM) and commercial best practices. Under the U.S. Army's program, Sikorsky (the OEM), conducts full maintenance support for the LUH. This provides highly trained, platform specific maintainers with a comprehensive understanding of the airframe, its capabilities, limitations, and maintenance requirements, that is difficult to replicate with DoD organic maintenance personnel. The CLS contract also allows for single source parts requisition, which improves MTTR through a streamlined and professionally managed transportation pipeline. Additionally, the government is able to capitalize on commercial sector economies of scale if the OEM owns the entire supply chain.[89] Furthermore, the CLS environment provides a high continuity of maintenance personnel when compared to the Department of Defense, where service members transfer frequently. This continuity of support personnel

[87] "UH-72A Lakota Light Utility Helicopter" (presentation, Aviation Applied Technology Directorate, Ft. Eustis, VA, November 8, 2011)

[88] "UH-72A Lakota Light Utility Helicopter" (presentation, Aviation Applied Technology Directorate, Ft. Eustis, VA, November 8, 2011)

[89] Michael Boito, Cynthia R. Cook and John C. Graser, *Contractor Logistics Support in the U.S. Air Force* (Santa Monica, CA: RAND, [2009]).

improves maintenance program efficacy by reducing the cyclical learning curve inefficiencies characteristic of organically operated military maintenance programs.

The utilization of CLS has the potential to entirely eliminate the need for NSHQ to establish its own maintenance wing, depending upon the type of CLS contract established. Under a Full CLS Performance contract, the responsibility to man, train, and equip the maintainers is the sole responsibility of the contractor. It would eliminate the need for NSHQ to establish support infrastructure such as warehousing, billeting, and maintenance facilities. Furthermore, NATO participating nations would avoid the personnel lifecycle costs of recruiting, training, and supporting additional service members for their career and beyond. The counterpoint to these arguments is that organic maintenance would give NSHQ the maximum amount of control over maintenance. Additionally, NSHQ would directly benefit from any efficiency gained throughout the program lifecycle. Organic maintenance also improves the deployability of maintenance personnel to the possible range of semi-permissive and hostile environments. Deployability of contracted maintainers can be structured into the contract, but will still lack the complete flexibility of organic military personnel.

In an interesting subset of the Army's LUH program, there is a hybrid CLS approach being used in the Army National Guard (see Figure 10). This hybrid CLS contract provides some benefits of both organic and CLS sustainment. In this arrangement, the maintenance and logistics supply chain is still managed by the contractor with the exception of the field level aircraft maintenance person (i.e., the person turning the wrench), who is a military member. All other maintenance, including depot maintenance, is conducted exclusively with contractor personnel. Using contracted personnel for depot level maintenance retains many of the benefits associated with commercial best practices; while the use of military personnel for field level maintenance enables the full flexibility of deployment options if required.

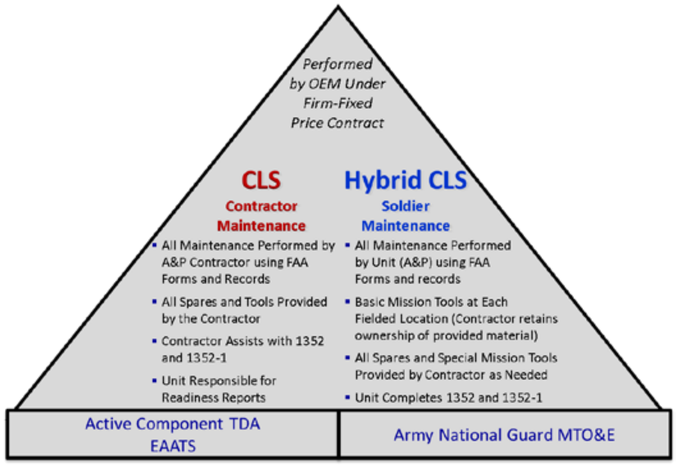

Figure 11. U.S. Army Hybrid CLS Work Structure for the LUH[90]

If NSHQ decides to use CLS, there is the potential for additional benefits and flexibility beyond that achieved by the U.S. Army. U.S. DoD works under the following constraints which would not be applicable to NATO:

- Title 10 USC 2466 which requires that 50 percent of depot level maintenance be conducted by organic government organizations
- Title 10 USC 2464 which requires that the government determine which logistics capabilities are "core" and these must be owned and operated by the government.

The determining factor for NSHQ on whether or not to use CLS may be the amount of control it would like to exercise over the maintenance process. Accordingly, there are two underlying factors that are critical in determining the potential benefits and drawbacks of decreased control of program maintenance. These factors are complexity/uncertainty and knowledge/understanding.[91] As the complexity and uncertainty of service delivery decreases, the activity requesting CLS can comfortably exercise less control over sustainment procedures. Using a CLS package with a proven

[90] "UH-72A Lakota Light Utility Helicopter" (presentation, Aviation Applied Technology Directorate, Ft. Eustis, VA, November 8, 2011).

[91] Wendell C. Lawther, *Contracting for the 21st Century a Partnership Model* (Arlington, VA: PricewaterhouseCoopers Endowment for the Business of Government, 2002).

successful performance history like the program administered by the Army, helps to mitigate these concerns. Additionally, the level of aircraft maintenance knowledge/expertise organically available in NSHQ is a contributing determinant. If NSHQ has the ability to easily source and assign competent military maintenance and logistics support personnel to the program, then the benefit of CLS is lessened. However, if maintenance/logistics personnel and infrastructure establishment is a concern, then CLS offers a simple solution. Training and knowledge transfer is another consideration. If NSHQ wants to train member nation maintenance personnel, it might favor a hybrid CLS arrangement whereby contractors would instruct a maintenance curriculum. However, if the intent is purely to have a platform with which to train pilots, it might be preferable to completely remove the requirement for NSHQ to conduct or manage maintenance, with the exception of a contracting officer's representative to advise the contracting office if the terms and conditions of the contract are being met. Under the U.S. Army's contract, there is a firm fixed price per flight hour.

A final point to be made about the LUH CLS is the airframe worthiness certificate. In addition to the previously mentioned benefits of OEM CLS, the OEM has the proper training and certification to maintain the aircraft in accordance with Federal Aviation Administration (FAA) regulations. This provides additional options for demilitarization and disposal when the NSHQ rotary training wing mission is complete. Since the aircraft have been maintained within FAA standards, they can easily be resold in the commercial sector when the military no longer requires them.

C. THE MI-17 (EXPORT VERSION OF THE MI-8 HIP)

The MI-17 is a Russian made aircraft currently being produced at facilities in Kazan and Ulan-Ude. It is a ubiquitous aircraft around the world and is used by some newer NATO member nations in Eastern Europe.[92] Since it is flown by a number of NATO nations, its inclusion in the NATO SOF rotary wing could be beneficial in training and skill transfer. Conducting SOF training in the same airframe that participants will fly upon return to their home country would maximize the effectiveness

[92] Joris Janssen Lok, "MI-17 Upgrade Aims to Fill NATO Helo Gap." *Aviation Week*, March 23, 2008.

of skill transfer to those participating nations. However, reliable cost/price data was difficult to acquire. Kazan helicopters did not respond to requests for price information. Honeywell International, a U.S. based conglomerate, teamed with LOM Praha from the Czech Republic to provide MI-17 logistics support.[93] However, Honeywell also did not respond to requests for pricing data. Attempts to obtain procurement, operation and support data from the U.S. military were also unsuccessful. With the lack of reliable pricing data, the decision was made to exclude the MI-17 from quantitative analysis. However, a number of issues were discovered during initial research of the airframe that may be useful for consideration in any subsequent analysis of the MI-17 for procurement and operation.

The MI-17 is considered to be a low-cost, capable medium lift aircraft. However, the increased demand for these airframes has driven up costs in recent years.[94] The 2001 price for refurbished M-17s was between $1.2 million and $1.7 million, while new MI-17s sold for $3 million. By 2009, vendors were quoting $7.5 million for new MI-17s. However, the U.S. paid between $13 and $16 million per aircraft when purchasing MI-17s for Iraq,[95] and approximately $20 million per aircraft for Afghanistan.[96] Lest this cost inflation be considered unique to U.S. DoD acquisition processes, the Indian military recently experienced a similar sticker shock. The Indian Air Force (IAF) purchased eight MI-17v5s in 2008 that were delivered in 2011 for a cost of $16.75 million per helicopter,[97] this price was roughly double the price originally quoted in 2006 of $8.275 million per aircraft.[98]

Purchasing used/refurbished aircraft can be significantly less expensive for initial procurement, but that too, presents certain risks. The maintenance history and records of

[93] Shephard News Team, "Czech Republic: Honeywell and LOM PRAHA Announce Teaming Agreement for Helicopter Maintenance Services," *Rotorhub,* September 9, 2008.

[94] Maxim Pyadushkin, "Strong Mi-17 Demand Boosts Prices," *Aviation Week & Space Technology,* September 21, 2010.

[95] Sharon Weinberger, "Problems for U.S. Russian Helicopter Order," *Aviation Week,* June 1, 2009.

[96] Craig Whitlock, "U.S. Military Criticized for Purchase of Russian Copters for Afghan Air Corps." *Washington Post,* June 19, 2010.

[97] Indo-Asian News Service, "India to Induct Latest Russian Military Chopper Mi-17V5," *The Economic Times,* February 16, 2012.

[98] "India to Buy 80 Mi-17v5 Helicopters," *Defense Industry Daily,* December 10, 2008.

used MI-17s can be difficult to verify. Recently, Iraq purchased used MI-17s from a Polish company. Upon receipt, they discovered that the helicopters were either beyond their service life or uneconomical to refurbish and overhaul.[99] The older models that are more economical to procure are also less capable, having less powerful engines that limit their ability to operate in some environments. The newer versions are highly sought for their ability to operate in high and hot environments like those found in Afghanistan, and as a result, are simply unavailable on the pre-owned market.[100] An additional concern is that MI-17s are made to meet Russian airworthiness certifications, rather than U.S. FAA or European EASA standards. Acceptance (or not) of Russian airworthiness certification is a consideration, though the Russian certificate has been accepted by the U.S. Army for their program management.[101]

The U.S. Army originally procured MI-17s through Kazan Helicopters, and then contracted for Return to Service (RTS) modifications in the UAE to militarize the aircraft and bring them into airworthiness standards equivalent to other Army aviation platforms. This same RTS program was utilized when used MI-17s were donated to Afghanistan from other countries.[102] This represents added financial and administrative burden. However, in 2010, the Russian Federation notified DoD that purchasing commercial Russian aircraft for subsequent military modification violated Russian Law. Government intervention was required to facilitate an agreement to purchase from the Russian Federation. This eliminated the need for the RTS program and changed the procurement from commercial to foreign military sales.[103] This type of arrangement has political implications and complications that must be considered from NATO's perspective.

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[99] Sharon Weinberger, "Problems for U.S. Russian Helicopter Order," *Aviation Week*, June 1, 2009.

[100] Maxim Pyadushkin, "Strong Mi-17 Demand Boosts Prices," *Aviation Week & Space Technology*, September 21, 2010.

[101] Andrew Drwiega, "Non-Standard Rotary Wing Aircraft: Aiding the Transition," *Rotor and Wing*, October 1, 2011.

[102] Ibid.

[103] US Fed News Service, "U.S. Equipping Afghan Army with Russian-Built Mi-17," September 22, 2011.

An additional consideration is that, as a medium lift aircraft, the MI-17 is significantly larger than the SH-60 or the EC-145. The positive side of this is the ability to move significantly more passengers. The downside is that some O&S costs will be higher, particularly fuel (though exact data was not found).

Though reliable O&S costs were not found, based upon the open source information discussed above, using solely MI-17s would be significantly more expensive than free SH-60s or LAKOTAs based solely upon procurement and retrofit costs. The O&S costs are unlikely to improve this, and may result in even higher comparative costs. Though a wing of MI-17s does not appear desirable from an administrative standpoint or feasible from a financial standpoint, it might be beneficial to the goals of training and skill transfer (especially for certain Eastern European member nation personnel) to have an MI-17 for SOF training. If the benefit to skill transfer is deemed sufficient perhaps purchasing a single refurbished aircraft for training of those particular SOF personnel could be worthwhile. This is a potential area for further research.

VI. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSIONS

The LAKOTA (militarized variant of the EC-145) is a capable general purpose helicopter that meets the operational requirements of NSHQ. A LAKOTA program can be rapidly initiated, since the aircraft are available commercially. Conversely, SH-60s would require potentially expensive and time-consuming overhaul and testing to be made fully operational. LAKOTAs are also more cost effective than SH-60s in almost every possible scenario.

- The cost of EDA SH-60s will be more than double the cost of LAKOTAs if NSHQ is responsible for all of the SH-60 EDA associated costs of refurbishment, repair, transportation, and program development (comparable to the NAVAIR grant delineated in the Appendix).
- The cost of EDA SH-60s will still exceed the cost of LAKOTAs if NSHQ is responsible for any (even a small portion) of the EDA grant associated costs mentioned above.
- Even if there is zero cost to NATO for EDA SH-60 acquisition, they will still be more expensive than LAKOTAs if the program extends beyond 2019, because of the higher O&S costs of the SH-60.
- For SH-60s to be equivalent in cost to LAKOTAs, there must be zero cost to NATO for acquisition, and the program must end in 2019. Even if this is considered likely, procurement of LAKOTAs may still be preferable, as it provides the flexibility of extending the program without any significant additional costs.

Factors other than cost also favor the LAKOTA. Establishing a wing of SH-60s would require an extensive organic maintenance and logistics footprint with significant associated costs and managerial complexity for facilities, parts support, manning, etc. Conversely, the LAKOTA's available CLS package would eliminate the requirement for

NSHQ to establish any organic maintenance and logistics capacity at all. This would make program establishment and administration dramatically less complex, by providing NATO a simple turn-key aircraft operation, requiring only pilots and flight crew.

If the one-time procurement expense for six LAKOTAs were prohibitive, then a gradual replacement of SH-60s by LAKOTAs would still be likely to generate some savings, when compared to a pure SH-60 program. In this scenario, program duration would be a factor. Financial analysis using the procedure delineated in the quantitative section of this project would be required to determine the most cost-effective solution.

B. RECOMMENDATIONS

NSHQ should investigate options for LAKOTA procurement prior to seeking an EDA SH-60 grant from the U.S. DoD. NSHQ should contact EADS to determine if a cost-effective solution meeting NSHQ requirements could be negotiated. This could dramatically ease NSHQ's efforts in developing their program. It may also be possible for NSHQ to work out an arrangement with the U.S. Army, to leverage their existing LAKOTA contract for six additional helicopters. This will require direct liaison with the U.S. Army LUH program management to determine if it is practicable. Even if an acceptable agreement is not made with EADS or the U.S. Army, the cost-effectiveness of the Army's LUH program suggests that further market research into COTS aircraft is warranted, prior to accepting an EDA grant of SH-60s.

C. RECOMMENDATIONS FOR FURTHER RESEARCH

Consideration should be given to the utility of having an MI-17 available to NSHQ. Having even one aircraft may be beneficial. It would improve training and skill transfer effectiveness for Eastern European member nation personnel by enabling them to train on an airframe that they are likely to operate after their tour with NSHQ. Cost, complexity, and program risk will need to be researched, analyzed and balanced against the likely benefits.

APPENDIX. NAVAIR SH-60 COST ESTIMATES

Generated by the directhit P&A Module

Then Year Dollars **United States of America** **DEVELOPMENT**

Price and Availability (P&A) Data 01/27/2012 09:42:58

Terms of Sale:

This LOA data expires: 31 December 2010

(1) Itm Nbr	(2) Description/Condition		(3) Qty, Unit of Issue	(4) Costs (a) Unit	(b) Total	(5) SC/MOS/ TA	(6) Ofr Rel Cde	(7) Del Trm Cde
001	A4S 15200000SH60F HELICOPTER SH-60F (Note(s) 1)	(Y)(M)(R) (VIII)	2 EA	$4,932,810.00	$9,865,620	E() TA3	Z	4
002	A9B 2840013185538 ENGINE TURBO T700-GE-401C (Note(s) 2)	(Y)(N)(R) (VIII)	XX		$6,957,534	P(30) TA5	A	4
003	L1C 016600ACFERSV AIRCRAFT FERRY, FMS SERVICE ONLY (Note(s) 3)	(N)(N)(R) ()	XX		$682,715	()		
004	M1E 0205000TTECHA OTHER TECHNICAL ASSISTANCE (Note(s) 4)	(N)(N)(R) (VIII)	XX		$223,707	X(60) TA4	A	4
005	M1G 020500ENGTECA ENGINEERING TECHNICAL ASSISTANCE (Note(s) 5)	(N)(N)(R) (VIII)	1 XX	$10,000,000.00	$10,000,000	X() TA4	A	4

Estimated Cost Summary:

Net Estimated Cost	$27,729,576
Packing, Crating, and Handling	$0
Administrative Charge	$673,724

Transportation	$0
Other	$0
Total Estimated Cost	$28,403,300

To assist in fiscal planning, the USG provides the following anticipated costs of this LOA:

ESTIMATED PAYMENT SCHEDULE

The following note(s) were used or pertain to the LOA Data provided:

Note 1:

Line Item 001 provides for two (2) SH-60F Multi-Mission Naval Helicopters. These helicopters are being offerred as Excess Defense Articles (EDA) at no cost under Section 516 of the Foreign Assistance Act (FAA) of 1961, as amended. The helicopters will be delivered in "as is, where is" condition. Line item 001 does not include T700-401C engines. Condition code G-7(unserviceable, incomplete, repairable) applies. At the time of the aircraft transfer, the US Government (USG) will not be responsible for the functioning of any onboard systems or equipment. Transfer of aircraft will require inspection and repaint of aircraft with Purchaser's markings.

Item	Quantity	Location	Condition Code	RCN
SH-60F Helicopters	2	CONUS	A-4	

Estimated Delivery Schedule:

Calendar Year:	2012				2013			
Quarter	1	2	3	4	1	2	3	4
SH-60F				2				

EXCESS DEFENSE ARTICLES. ACQUISITION VALUE IS XXXXXXXXXXX
CURRENT VALUE IS XXXXXXXXXXXXX
Excess Defense Articles (EDA) Value Is $0.00

Note 2:

Line Item 002 provides for four (4) new procurement T700-GE-401C engines and four (4) Containers. Four (4) of the engines will be installed in the two (2) aircraft and four (4) engine with containers are spares.

Estimated Delivery Schedule:

Calendar Year:	2010	2011	2012
Quarter			

Note 3:

Line item 006 provides for the movement of aircraft to Purchaser's in-country location. All aircraft will be transported/towed to the designated departure site and undergo PMI one (1) and two (2) before in-country delivery. Limited Maintenance Test Flight will be performed when the aircraft arrive in-country.

a. In order to carry out the purpose of this LOA, the Purchaser grants the USG possession of the aircraft. The title to the aircraft will remain with the Purchaser.

b. The aircraft will be marked with the appropriate USG markings. The Purchaser is liable for the cost of placing such markings on the aircraft and is responsible for removing such markings.

c. The USG will not be subject to or held liable for any import fees, duties, or other charges levied by the Purchaser.

d. Date of delivery to destination will be contingent upon the receipt of necessary transport clearances.

e. The Purchaser is liable for all enroute costs including, but not limied to, any maintenance required to ensure that the aircraft are in a safe condition in accordance with current USG regulations, prior to transport.

Note 4:

(none)

Note 5:

Line item 012 provides for Engineering Technical Assistance for one (1) engineer for a period of five (5) years. This line also provides for assistance for two (2) contractor support personnel for a period of five (5) years. The services for this line include support with Engineering Change Proposals, Engineering Investigations (EIs), Hazard Reports, Software and Flight Clearance Support.

Generated by the directhit P&A Module

United States of America Price and Availability (P&A) Data

Development: 01/27/12 09:55 AM

Line Item Summary

Line Item	Description	FY2010	FY2013
001	HELICOPTER SH-60F	$10,240,514	$10,240,514
002	ENGINE TURBO T700-GE-401C	$6,864,006	$7,221,920
003	AIRCRAFT FERRY, FMS SERVICE ONLY	$672,480	$708,658
004	OTHER TECHNICAL ASSISTANCE	$225,944	$232,208
005	ENGINEERING TECHNICAL ASSISTANCE	$10,000,000	$10,000,000
	Total:	**$28,002,944**	**$28,403,300**

Line Item: 001 HELICOPTER SH-60F

Item Description	Qty	Unit Cost	FY2010	FY2013
SH-60F Helocopter (EDA)	2	$4,932,810	$9,865,620	$9,865,620
		Line Item 001: Total Cost	**$10,240,514**	**$10,240,514**

Line Item: 002 ENGINE TURBO T700-GE-401C

Item Description	Qty	Unit Cost	FY2010	FY2013
T700-401C Installed Engines	4	$783,339	$3,282,157	$3,453,261
T700-GE-401C Spare Engine	4	$783,339	$3,282,157	$3,453,261
Spare Engine Container	4	$12,000	$48,408	$51,012
		Line Item: 002 Total Cost	**$6,864,006**	**$7,221,920**

Line Item: 003 AIRCRAFT FERRY, FMS SERVICE ONLY

Item Description	Qty	Unit Cost	FY2010	FY2013
In-Country Flight Support	1	$3,000	$3,046	$3,209
Tow to Gate	1	$38,286	$38,861	$40,951
Air Transportation and Surface Movement	1	$525,000	$532,874	$561,543
Ground Transportation	6	$12,000	$73,080	$77,012
		Line Item: 003 Total Cost	**$672,480**	**$708,658**

Line Item: 004 OTHER TECHNICAL ASSISTANCE

Item Description	Qty	Unit Cost	FY2010	FY2013
CY11 Government Civilian			$90,659	$92,681
CY11 Government DBOF			$76,780	$78,493
CY12 Government Civilian			$27,198	$28,443
CY12 Civilian DBOF			$23,035	$24,090
		Line Item: 004 Total Cost	**$225,944**	**$232,208**

Line Item: 005 ENGINEERING TECHNICAL ASSISTANCE

Item Description	Qty	Unit Cost	FY2010	FY2013
Software and Flight Clearance Support	1	$10,000,000	$10,000,000	$10,000,000
		Line Item: 005 Total Cost	**$10,000,000**	**$10,000,000**

Generated by the directhit P&A Module

Then Year Dollars **United States of America**
Price and Availability (P&A) Data

DEVELOPMENT
01/27/2012
09:27:13

Terms of Sale:

This LOA data expires: 1 October 2010

(1) Itm Nbr	(2) Description/Condition		(3) Qty, Unit of Issue	(4) Costs (a) Unit	(4) Costs (b) Total	(5) SC/MOS/ TA	(6) Ofr Rel Cde	(7) Del Trm Cde
001	A4S 15200000SH60F HELICOPTER SH-60F (Note(s) 1)	(Y)(M)(R) (VIII)	0	$0.00	$0	E() TA3	Z	4
002	A9B 2840013185538 ENGINE TURBO T700-GE-401C (Note(s) 2)	(Y)(N)(R) (VIII)	XX		$11,251,310	P(30) TA5	A	4
003	M1R 02070000LGTAT LOGISTICS TECHNICAL ASSISTANCE TEAM US GOVERNMENT PERSONNEL TEAM PROVIDING IN-COUNTRY TECHNICAL ASSISTANCE (TAT) (Note(s) 3)	(N)(N)(R) (XXI)	XX		$176,175	X(18) TA4	A	4

(1) Itm Nbr	(2) Description/Condition		(3) Qty, Unit of Issue	(4) Costs (a) Unit	(4) Costs (b) Total	(5) SC/MOS/ TA	(6) Ofr Rel Cde	(7) Del Trm Cde
004	J7Z 9J7Z0TSUPEQHT OTHER SUPPORT EQUIPMENT (Note(s) 4)	(N)(N)(R) (VIII)	XX		$7,191,881	()		
005	A9C 9A9C00ACPARTS A/C COMP, PARTS, ACCESSORIES (Note(s) 5)	(N)(N)(R) (VIII)	XX		$29,417,966	()		
006	L1C 016600ACFERSV AIRCRAFT FERRY, FMS	(N)(N)(R) ()	XX		$647,863	()		

	SERVICE ONLY							
	(Note(s) 6)							
007	A6B 9A6B0MAJ0RM0D MAJOR MOD/CLASS V	(N)(N)(R) ()	XX		$31,953,177	()		
	(Note(s) 7)							
008	N0O 000000FMSTRNG TRAINING	(N)(N)(R) ()	XX		$4,650,785	(20)		
	(Note(s) 8)							
009	J8A 768ZUNCLBOOKS Unclassified Publications	(N)(N)(R) (XXI)	XX		$3,393,117	X() TA4	A	
	(Note(s) 9)							

(1) Itm Nbr	(2) Description/Condition		(3) Qty, Unit of Issue	(4) Costs (a) Unit	(b) Total	(5) SC/MOS/ TA	(6) Ofr Rel Cde	(7) Del Trm Cde
010	M1R 02070000L0GTA LOGISTICS TECHNICAL ASSISTANCE	(N)(N)(R) (VIII)	XX		$1,357,977	X(60) TA4	A	4
	(Note(s) 10)							
011	M1E 0205000TTECHA OTHER TECHNICAL ASSISTANCE	(N)(N)(R) (VIII)	XX		$3,505,855	X(60) TA4	A	4
	(Note(s) 11)							
012	M1G 020500ENGTECA ENGINEERING TECHNICAL ASSISTANCE	(N)(N)(R) (VIII)	XX		$2,599,162	X() TA4	A	4
	(Note(s) 12)							
013	M1P 020500000CETS CONTRACTOR ENGINEERING TECHNICAL SERVICES (CETS)	(N)(N)(R) (VIII)	0	$0.00	$2,436,000	X() TA4	A	4
	(Note(s) 13)							

Estimated Cost Summary:	
Net Estimated Cost	$98,581,268
Packing, Crating, and Handling	$0
Administrative Charge	$3,746,089
Transportation	$0
Other	$0
Total Estimated Cost	$102,327,357

To assist in fiscal planning, the USG provides the following anticipated costs of this LOA:

ESTIMATED PAYMENT SCHEDULE

The following note(s) were used or pertain to the LOA Data provided:

Note 1:

Line Item 001 provides for six (6) SH-60F Multi-Mission Naval Helicopters. These helicopters are being offerred as Excess Defense Articles (EDA) at no cost under Section 516 of the Foreign Assistance Act (FAA) of 1961, as amended. The helicopters will be delivered in "as is, where is" condition. Line item 001 does not included T700-401C engines. Condition code A-4 (serviceable, used - good) applies. At the time of the aircraft transfer, the US Government (USG) will not be responsible for the functioning of any onboard systems or equipment. Transfer of aircraft will require inspection and repaint of aircraft with Purchaser's markings.

Item	Quantity	Location	Condition Code	RCN
SH-60F Helicopters	6	CONUS	A-4	

Estimated Delivery Schedule:

Calendar Year:	2012				2013			
Quarter	1	2	3	4	1	2	3	4
SH-60F				2		1	1	2

EXCESS DEFENSE ARTICLES. ACQUISITION VALUE IS XXXXXXXXXXX
CURRENT VALUE IS XXXXXXXXXXXXX
Excess Defense Articles (EDA) Value Is $0.00

Note 2:

Line Item 002 provides for fourteen (14) new procurement T700-GE-401C engines and two (2) Containers. Twelve (12) of the engines will be installed in the six (6) aircraft and one (2) engines with containers are spares.

Estimated Delivery Schedule:

Calendar Year:	2010	2011	2012
Quarter			

Note 3:

Line item 003 provides for Logistics Conferences and Program Definition that represents the means by which trained and experienced USN personnel together with in-country personnel evaluate the total in-country integrated logistics support capability to operate and support this weapon system. The objective is to compare exissting incountry capabilities and assets with the USN total program recommendation to establish the net program reaquirements, which must be procured and/or established. Development of specifics for logistics and related support line items are contingent upon the satisfactory completion of the logistics conferences. On completion of the logistics conference, the Program and Support Plan (P and SP) is finalized and signed by both countries. The P and SP documents the results of the conferences and establishes the base line for the Purchaser's support planning.

Note 4:

Line item 004 provides for one (1) land base organizational ("O") level support equipment (SE) set. This effort also includes spares and calibration standards at one (1) main base site. All support equipment will be new, unused and from procurement or provided from RFI stock.

The selection of items to be provided under this line was based on the aassumption tha tthe Purchaser will require a complete logistics package suitable to support the aircraft in the same manner as the USN. At the Logistics Conference and Program Definition (LCPD) and similar meetings, items and quanitites will be further defined to match the Purchaser's specific program objectives. Adjustments in cost estimates will be reflected after these meetings.

Note 5:

Line item 005 provides for aircraft spares and repair parts to support six (6) SH-60F aircraft. This level of support is istimated to provide twenty-four (24) month initial support with flying hour rate of twenty (20) hours per month per aircraft during peacetime, "O" level support at one (1) main operation base (MOB) plus detachment for two (2) years.

The selection of items to be provided under this line is based on the Purchaser's request for a limited logistics package. At the Logistics Conference and Program Definition (LCPD) and similar meetings, items and quantities will be further defined to match the Purchaser's specific program objectives. Adjustments in cost estimates will be reflected after these meetings.

Services are included within this line item to provide procedures and techniques necessary to determine the requirements to acquire, catalog, receive, store, transfer, issue and dispose of spares, repair parts and supplies for the aircraft, include any obsolete items.

Note 6:

Line item 006 provides for the movement of aircraft to Purchaser's in-country location. All aircraft will be transported/towed to the designated departure site and undergo PMI one (1) and two (2) before in-country delivery. Limited Maintenance Test Flight will be performed when the aircraft arrive in-country.

a. In order to carry out the purpose of trhis LOA, the Purchaser grants the USG possession of the aircraft. The title to the aircraft will remain with the Purchaser.

b. The aircraft will be marked with the appropriate USG markings. The Purchaser is liable for the cost of placing such markings on the aircraft and is responsible for removing such markings.

c. The USG will not be subject to or held liable for any import fees, duties, or other charges levied by the Purchaser.

d. Date of delivery to destination will be contingent upon the receipt of necessary transport clearances.

e. The Purchaser is liable for all enroute costs including, but not limied to, any maintenance required to ensure that the aircraft are in a safe condition in accordance with current USG regulations, prior to transport.

Note 7:

Line item 007 provides for aircraft modification. 'As is, Where is' Aircraft will be Moved to the Modification Site and will receive all inspections as Defined in the Integrated Maintenance Plan (IMP) Specification, install new engines and equipment replacement, software changes and testing, and performance of ground and flight checks.

Note 8:

Line item 008 provides for aircrew and "O" level maintenance training. Aircrew and maintenace training will be conducted in the United States (US) and in the Purchaser's country in the English Language by the US Navy and utilizing US Navy aircraft, and is based on the intended use of Purchaser aircraft. All in country classroom accommodations are to be provided by the Purchaser.

A Training Plan Conference will be convened after this LOA is implemented to specifically define the operational and maintenance training package based on the training tracks in the Logistics Conference and Program Definition report or other program management meeting minutes. The costs for the actual training program will be determined upon approval of the training plan by both governments.

Estimates are based on the following assumptions:
a. The U.S. Government's Security Assistance Organization (SAO) assigned responsbility for assisting the U.S. Diplomatic Mission in country will provide services and technical assistance in preparing students to receive training in the United States. SAOs will coordinate scheduling with appropriate agencies and assist in selection of students to ensure they meet security, medical, English language, and technical requirements for training provided under this LOA. SAOs will ensure all students are briefed before their departure from home country and prepare necessary administrative documents related to training, including Invitational Travel Orders (ITOs), medical records, and arrival messages.

b. Approximately six (6) pilots will be trained. All of the pilots should be qualified Helicopter Aircraft Commanders with two hundred (200) hours flight time and operational experience, including day ship landings. Training will include tactical equipment operation. Selected pilots will receive transitional, maintenance test pilot and instructor courses. The pilots will receive initial training in the United States in navy schools, with the balance in-country. The pilots will receive maintenance test flight training, Instructional Flight training, CAT V transition training, Calibration, SE Operations and maintenance training as required. The pilots receiving this training must be previously designated Instructor Pilots and/or functional Check Pilots. Instrument flight experience of a minimum of seventy five (75) hours of documented instrument flight time is required previous to the start of this training. These hours may be under either actual or simulated instrument conditions. The maximum training track is approximately twelve (12) weeks.

c. There will be Maintenance Training for "O" Level Cadre Training, Maintenance Training Transition Team and Difference Training for approximately ten (10) organization maintenance personnel. Students should have formal aviation maintenance training and organizational level experience and be qualified aircraft technicians. The maintenance personnel will receive the initial training in the U.S. in Navy schools with the balance in-country. The maximum training track is approximately eighty (80) days.

d. The English Comprehension Level (ECL) requirements are provided for reference and are consistent with the level of English language performance the Purchaser must demonstrate to complete the training program. Current Flight Crew ECL requirements are eighty (80) percent for Pilot and Flight Engineer, Naval Flight Officer (NFO), Acoustic/Non-Acoustic Operator, and In-Flight Technical, and seventy (70) percent for most maintenance training. Pilot traning requires Oral Proficiency Interview (OPI) of 2/2, Specialized Enllish Terminology (SET) and be able to pass USN flight physical and survival training.

This line includes procurement and reproduction of course material consisting of curriculum outlines, instructor guides, student guides, slides, transparencies, training publications, and Personnel Qualification Standards (PQS) products. One (1) copy of the courseware will be provided to the Purchaser at the completion of the training program.

Billeting, messing, and transportation costs for students are not included and are the responsibility of the Purchaser.

Costs to be expended for petroleum, oil, and lubricants (POL) for in-country training are not included and are the responsibility of the Purchaser.

NAVYIPOINST 4950.1 of 6 April 2004 applies to contractor provided training.

Note 9:

Line item 009 provides for one (1) copy each of "O" level publications and Interactive Electronic Technical Manuals (IETM). All material will be unclassified and provided in the English language.

- Common "O" manuals
- "O" Level Interactive electronic Technical Manuals (IETMs) (Platform specific) along with three (3) Portable Electronic Maintenance Devices for each aircraft.
- Management Support to Procurement, Delivery and Update the Publications.

This line also provices for updates of the IETMs/Publications for two (2) years.

Note 10:

Line item 010 provides for logistic technical assistance that is essential to the introduction of the Multi-Mission Naval Helicopter for the Purchaser.

Services consist of assistance with aircraft modification efforts and replacement parts including interim contractor logistics support, coordination of Government Furnished Equipment (GFE), management of spare and repair parts, processing of Quality Deficiency Reports (QDRs), subcontractor program management for logistics elements, and maintaining the electronic support measures database. It also includes the Naval Air Systems (NAVAIR) Headquarters Integrated Logistics Support efforts and NAVAIR field activities to review and test, as needed, the GFE before providing to the contractors and processing QDRs.

Note 11:

(none)

Note 12:

Line item 012 provides for Engineering Technical Assistance for one (1) engineer for a period of five (5) years. This line also provides for assistance for two (2) contractor support personnel for a period of five (5) years. The services for this line include support with Engineering Change Proposals, Engineering Investigations (EIs), Hazard Reports, Software and Flight Clearance Support.

Note 13:

Line item 013 provides for one (1) airframe/engine representative for a period of twenty-four (24) months and one avionics/elecrical representative for a period of twenty-four (24) months. This service includes on the job training on maintenance and operation techniques pertaining to adjustment, calibrations, trouble-shooting, bench check, routine maintenance inspection and repair of the equipments/systems/subsystems.

This service also includes technical guidance in resolving difficult and unusual maintenance issues and guidance and investigation techniques in documenting quality deficiencies.

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United States of America Price and Availability (P&A) Data

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Line Item Summary

Line Item	Description	FY2010	FY2015
001	HELICOPTER SH-60F	$0	$0
002	ENGINE TURBO T700-GE-401C	$11,678,860	$11,678,860
003	LOGISTICS TECHNICAL ASSISTANCE TEAM US GOVERNMENT PERSONNEL TEAM PROVIDING IN-COUNTRY TECHNICAL ASSISTANCE (TAT)	$182,875	$182,875
004	OTHER SUPPORT EQUIPMENT	$7,349,593	$7,465,171
005	A/C COMP, PARTS, ACCESSORIES	$30,346,368	$30,535,846
006	AIRCRAFT FERRY, FMS SERVICE ONLY	$672,482	$672,482
007	MAJOR MOD/CLASS V	$33,167,398	$33,167,398
008	TRAINING	$4,820,383	$4,827,513
009	Unclassified Publications	$3,500,243	$3,522,056
010	LOGISTICS TECHNICAL ASSISTANCE	$1,350,825	$1,409,580
011	OTHER TECHNICAL ASSISTANCE	$3,451,894	$3,639,078
012	ENGINEERING TECHNICAL ASSISTANCE	$2,590,067	$2,697,930
013	CONTRACTOR ENGINEERING TECHNICAL SERVICES (CETS)	$2,528,568	$2,528,568
	Total:	**$101,639,556**	**$102,327,357**

Line Item: 001 HELICOPTER SH-60F

Item Description	Qty	Unit Cost	FY2010	FY2015
		Line Item 001: Total Cost	**$0**	**$0**

Line Item: 002 ENGINE TURBO T700-GE-401C

Item Description	Qty	Unit Cost	FY2010	FY2015
T700-401C Spare Engines	14	$765,000	$11,226,950	$11,226,950
Spare Engine Containers	2	$12,000	$24,360	$24,360
		Line Item: 002 Total Cost	**$11,678,860**	**$11,678,860**

Line Item: 003 LOGISTICS TECHNICAL ASSISTANCE TEAM US GOVERNMENT PERSONNEL TEAM PROVIDING IN-COUNTRY TECHNICAL ASSISTANCE (TAT)

Item Description	Qty	Unit Cost	FY2010	FY2015
Sub-Line Item 1: Logisitcs Conference & Program Definition				
Sub-Sub-Line Item 1: Labor CSS (3)				
CSS			$48,213	$48,213
Transportation (CSS)	1	$9,350	$9,491	$9,491
		Sub-Sub-Line Item 1: Total Cost	**$59,897**	**$59,897**
Sub-Sub-Line Item 2: Per Diem				
Program Manager	1	$2,884	$2,884	$2,884
DAPML	1	$2,884	$2,884	$2,884
Facilities	1	$2,884	$2,884	$2,884
Manpower & Personnel Training	1	$2,884	$2,884	$2,884
Supply Support/P,H,S	1	$2,884	$2,884	$2,884
Repair of Repairables	1	$2,884	$2,884	$2,884
Support Equipment	1	$2,884	$2,884	$2,884
SE ILS	1	$2,884	$2,884	$2,884
Calibration Support	1	$2,884	$2,884	$2,884

Technical Data	1	$2,884	$2,884	$2,884
CSS Administration			$8,781	$8,781
Transportation			$2,884	$2,884
	Sub-Sub-Line Item 2: Total Cost		**$42,049**	**$42,049**
Sub-Sub-Line Item 3: Travel				
CSS Administrative	1	$4,500	$4,567	$4,567
Program Manager	1	$1,500	$1,500	$1,500
DAPML	1	$1,500	$1,500	$1,500
Facilities	1	$1,500	$1,500	$1,500
Manpower & Personnel/Training	1	$1,500	$1,500	$1,500
Supply support / P,H,S	1	$1,500	$1,500	$1,500
ROR	1	$1,500	$1,500	$1,500
Support Equipment	1	$1,500	$1,500	$1,500
SE ILS	1	$1,500	$1,500	$1,500
Calibration Support	1	$1,500	$1,500	$1,500
Technical Data	1	$1,500	$1,500	$1,500
Tranpsportation (CSS)	1	$1,500	$1,523	$1,523
	Sub-Sub-Line Item 3: Total Cost		**$21,892**	**$21,892**
	Sub-Line Item 1: Total Cost		**$123,838**	**$123,838**
Sub-Line Item 2: Provisioning Conference				
Sub-Sub-Line Item 1: Per Diem				
DAPML	1	$4,326	$4,326	$4,326
Facilities	1	$4,326	$4,326	$4,326
Supply Support / P,H,S	1	$4,326	$4,326	$4,326
ROR	1	$4,326	$4,326	$4,326
Support Equipment	1	$4,326	$4,326	$4,326
Technical Data	1	$4,326	$4,326	$4,326
	Sub-Sub-Line Item 1: Total Cost		**$26,940**	**$26,940**
Sub-Sub-Line Item 2: Travel				
DAPML	1	$1,500	$1,500	$1,500
Facilities	1	$1,500	$1,500	$1,500
Supply Support / P,H,S	1	$1,500	$1,500	$1,500
ROR	1	$1,500	$1,500	$1,500
Support Equipment	1	$1,500	$1,500	$1,500
Technical Data	1	$1,500	$1,500	$1,500
	Sub-Sub-Line Item 2: Total Cost		**$9,342**	**$9,342**
	Sub-Line Item 2: Total Cost		**$36,282**	**$36,282**
Sub-Line Item 3: Training Plans Conference				
Sub-Sub-Line Item 1: Per Diem				
DAPML	1	$2,884	$2,884	$2,884
Manpower & Personnel / Training	1	$2,884	$2,884	$2,884
Calibration Support	1	$2,884	$2,884	$2,884
Technical Data	1	$2,884	$2,884	$2,884
SE ILS			$2,884	$2,884
	Sub-Sub-Line Item 1: Total Cost		**$14,970**	**$14,970**
Sub-Sub-Line Item 2: Travel				
DAPML	1	$1,500	$1,500	$1,500
Manpower & Personnel / Training	1	$1,500	$1,500	$1,500
SE ILS	1	$1,500	$1,500	$1,500
Calibration Support	1	$1,500	$1,500	$1,500
Technical Data	1	$1,500	$1,500	$1,500
	Sub-Sub-Line Item 2: Total Cost		**$7,785**	**$7,785**
	Sub-Line Item 3: Total Cost		**$22,755**	**$22,755**
	Line Item: 003 Total Cost		**$182,875**	**$182,875**

Line Item: 004 OTHER SUPPORT EQUIPMENT

Item Description	Qty	Unit Cost	FY2010	FY2015
"O" Level Maintenance (New Procurement Items)	1	$2,277,067	$2,311,223	$2,311,223
"O" Level Maintenance (Stock Items)	1	$340,252	$340,252	$340,252
Calibrations	1	$2,000,000	$2,030,000	$2,030,000
GOVERNMENT SE LABOR FY11			$328,000	$333,216
GOVERNMENT SE LABOR FY12			$328,000	$339,086
GOVERNMENT SE LABOR FY13			$328,000	$345,187
GOVERNMENT SE LABOR FY14			$328,000	$351,419
GOVERNMENT SE LABOR FY15			$328,000	$357,717
SEPO CSS FY11			$91,350	$92,903
SEPO CSS FY12			$91,350	$94,557
SEPO CSS FY13			$91,350	$96,264
SEPO CSS FY14			$91,350	$97,992
SEPO CSS FY15			$91,350	$99,755
Sub-Line Item 15: Travel In-Country PMR's				
Support Equipment (CIV)	1	$14,710	$14,710	$14,710
Support Equipment (CSS)	1	$14,710	$14,931	$14,931
Calibration Support (CIV)	1	$14,710	$14,710	$14,710
Calibration Support (CSS)	1	$14,710	$14,931	$14,931
Support Equipment ILS (CIV)	1	$14,710	$14,710	$14,710
Support Equipment ILS (CSS)	1	$14,710	$14,931	$14,931
	Sub-Line Item 15: Total Cost		**$92,301**	**$92,301**
Sub-Line Item 16: USN Quarterly Reviews (CONUS)				
Support Equipment (CIV)	1	$35,300	$35,300	$35,300
Support Equipment (CSS)	1	$35,300	$35,829	$35,829
Calibration Support (CIV)	1	$35,300	$35,300	$35,300
Calibration Support (CSS)	1	$35,300	$35,829	$35,829
Support Equipment ILS (CIV)	1	$35,300	$35,300	$35,300
Support Equipment ILS (CSS)	1	$35,300	$35,829	$35,829
	Sub-Line Item 16: Total Cost		**$221,496**	**$221,496**
	Line Item: 004 Total Cost		**$7,349,593**	**$7,465,171**

Line Item: 005 A/C COMP, PARTS, ACCESSORIES

Item Description	Qty	Unit Cost	FY2010	FY2015
"O" Level Spares at Major Operating Base plus detachment for 2 years (USG)	1	$3,920,000	$3,920,000	$3,920,000
"O" Level Maintenance Spares for MOB plus Detachment for 2 years (Contractor)	1	$15,680,000	$15,915,200	$15,915,200
ROR	1	$5,000,000	$5,075,000	$5,075,000
Flight Gear	1	$15,000	$15,226	$15,226
SE SPARES & REPAIR PARTS - (GFE)	1	$111,773	$111,773	$111,773
SE SPARES & REPAIR PARTS (CFE)	1	$447,096	$453,802	$453,802
USG SPARES SUPPORT FY11			$270,000	$274,294
USG SPARES SUPPORT FY12			$270,000	$279,126
USG SPARES SUPPORT FY13			$270,000	$284,148
USG SPARES SUPPORT FY14			$270,000	$289,278
USG SPARES SUPPORT FY15			$270,000	$294,462
SPARES CSS SUPPORT FY11			$411,076	$418,063
SPARES CSS SUPPORT FY12			$411,076	$425,503
SPARES CSS SUPPORT FY13			$411,076	$433,191
SPARES CSS SUPPORT FY14			$411,076	$440,961
SPARES CSS SUPPORT FY15			$411,076	$448,895
Sub-Line Item 17: Travel In-Country PMRs				
Computer Resources (CSS)	1	$14,710	$14,931	$14,931
Configuration Mgmt (CSS)	1	$14,710	$14,931	$14,931
Facilities (CIV)	1	$14,710	$14,710	$14,710
Supply Support, P,H,S (CIV)	1	$14,710	$14,710	$14,710

Supply Support & P,H,S (CSS)	1	$14,710	$14,931	$14,931
ROR (CIV)	1	$14,710	$14,710	$14,710
ROR (CSS)	1	$14,710	$14,931	$14,931
Transportation (CIV)	1	$14,710	$14,710	$14,710
Transportation (CSS)	1	$14,710	$14,931	$14,931
Facilities (CSS)	1	$14,710	$14,931	$14,931
		Sub-Line Item 17: Total Cost	**$154,064**	**$154,064**
Sub-Line Item 18: Travel USN Quarterly Reviews (CONUS)				
Computer Resources (CIV)	1	$6,000	$6,000	$6,000
Computer Resources (CSS)	1	$6,000	$6,090	$6,090
Configuration Mgmt (CIV)	1	$6,000	$6,000	$6,000
Configuration Mgmt (CSS)	1	$6,000	$6,090	$6,090
Facilities (CIV)	1	$6,000	$6,000	$6,000
Supply Support & P,H,S (CIV)	1	$35,300	$35,300	$35,300
Supply Support and P,H,S (CSS)	1	$35,300	$35,829	$35,829
ROR (CIV)	1	$35,300	$35,300	$35,300
ROR (CSS)	1	$35,300	$35,829	$35,829
Transportation (CIV)	1	$6,000	$6,000	$6,000
Transportation (CSS)	1	$6,000	$6,090	$6,090
Sub-Sub-Line Item 12: Facilities (CSS)				
Facilities (CSS)	1	$6,000	$6,090	$6,090
		Sub-Sub-Line Item 12: Total Cost	**$6,321**	**$6,321**
		Sub-Line Item 18: Total Cost	**$197,860**	**$197,860**
		Line Item: 005 Total Cost	**$30,346,368**	**$30,535,846**

Line Item: 006 AIRCRAFT FERRY, FMS SERVICE ONLY

Item Description	Qty	Unit Cost	FY2010	FY2015
In-Country Flight Support	1	$3,000	$3,046	$3,046
Tow to Gate	1	$38,286	$38,861	$38,861
Air Transportation and Surface Movement	1	$525,000	$532,876	$532,876
Ground Transportation	6	$12,000	$73,080	$73,080
	Line Item: 006 Total Cost		**$672,482**	**$672,482**

Line Item: 007 MAJOR MOD/CLASS V

Item Description	Qty	Unit Cost	FY2010	FY2015
Software Development (ASN-150 MISSION COMPUTER)	1	$420,000	$420,000	$420,000
Software Regression Testing	1	$104,200	$104,200	$104,200
PMI 1 & 2 Labor	6	$824,538	$4,947,228	$4,947,228
PMI 1 & 2 materials	6	$4,131,732	$25,162,249	$25,162,249
GFE Replacement	1	$1,300,000	$1,319,500	$1,319,500
	Line Item: 007 Total Cost		**$33,167,398**	**$33,167,398**

Line Item: 008 TRAINING

Item Description	Qty	Unit Cost	FY2010	FY2015
Pilot Training	1	$3,355,135	$3,355,135	$3,355,135
DLI/GENERAL ENGLISH TRAINING (GET) MAINTENANCE TRAINING	1	$208,300	$208,300	$208,300
OTHER AIRCREW TRAINING	1	$500,000	$500,000	$500,000
SURVIVAL/SWIM QUALIFICATION	1	$15,000	$15,000	$15,000
IASCO (SUPPLY OFFICERS)	1	$24,000	$24,000	$24,000
DLI Specialized English Terminology (SET) for Supply Officer Training	1	$16,000	$16,000	$16,000
COURSEWARE SANITIZATION	1	$125,000	$125,000	$125,000
COURSEWARE REPRODUCTION	1	$100,000	$100,000	$100,000
MEDICAL EMERGENCY FUND	1	$30,000	$30,000	$30,000
PMA 205 GOVERNMENT SALARIES FY11			$57,279	$58,557

PMA 205 GOVERNMENT SALARIES FY12			$57,279	$59,902
PMA 205 CSS FY11			$57,095	$58,064
PMA 205 CSS FY12			$57,095	$59,096
Sub-Line Item 14: In-Country PMR's				
Manpower & Personnel / Training (CIV)	1	$14,710	$14,710	$14,710
manpower & Personnel / Training (CSS)	1	$14,710	$14,931	$14,931
		Sub-Line Item 14: Total Cost	**$30,767**	**$30,767**
Sub-Line Item 15: USN Quarterly Reviews (CONUS)				
Manpower & Personnel / Training (CSS)	1	$6,000	$6,090	$6,090
Manpower & Personnel / Training	1	$6,000	$6,000	$6,000
		Sub-Line Item 15: Total Cost	**$12,549**	**$12,549**
		Line Item: 008 Total Cost	**$4,820,383**	**$4,827,513**

Line Item: 009 Unclassified Publications

Item Description	**Qty**	**Unit Cost**	**FY2010**	**FY2015**
"O" LEVEL PUBS/NATOPS	1	$313,979	$313,979	$313,979
2 YEARS SANITIZATION	1	$2,500,000	$2,500,000	$2,500,000
2 YEARS OF UPDATES (FDRL & ITEMS)	1	$40,000	$40,000	$40,000
PORTABLE ELECTRONIC MAINTENANCE DEVICES (PEMDs)	18	$6,500	$118,756	$118,756
GOVERNMENT SALARIES FOR FY11			$32,314	$33,035
Sub-Line Item 7: Travel In-Country PMR's				
Technical Support (CIV)	1	$14,710	$14,710	$14,710
Technical Data (CSS)	1	$14,710	$14,931	$14,931
		Sub-Line Item 7: Total Cost	**$30,767**	**$30,767**
Sub-Line Item 8: Travel USN Quarterly Review (CONUS)				
Technical Data (CIV)	1	$35,300	$35,300	$35,300
Technical Data (CSS)	1	$35,300	$35,829	$35,829
		Sub-Line Item 8: Total Cost	**$73,832**	**$73,832**
GOVERNMENT SALARIES FY12			$32,314	$33,794
GOVERNMENT SALARIES FY13			$32,314	$34,570
GOVERNMENT SALARIES FY14			$32,314	$35,365
GOVERNMENT SALARIES FY15			$32,314	$36,180
NATEC CSS FY11			$27,406	$28,015
NATEC CSS FY12			$27,406	$28,661
NATEC CSS FY13			$27,406	$29,319
NATEC CSS FY14			$27,406	$29,992
NATEC CSS FY15			$27,406	$30,681
		Line Item: 009 Total Cost	**$3,500,243**	**$3,522,056**

Line Item: 010 LOGISTICS TECHNICAL ASSISTANCE

Item Description	**Qty**	**Unit Cost**	**FY2010**	**FY2015**
NWCF SALARIES (FY11)			$102,000	$103,622
NWCF SALARIES (FY12)			$102,000	$105,448
NWCF SALARIES (FY13)			$102,000	$107,345
NWCF SALARIES (FY14)			$102,000	$109,283
NWCF SALARIES (FY15)			$102,000	$111,241
LTA CSS (FY11)			$109,620	$111,484
LTA CSS (FY12)			$109,620	$113,469
LTA CSS (FY13)			$109,620	$115,518
LTA CSS (FY14)			$109,620	$117,590
LTA CSS (FY15)			$109,620	$119,706
Sub-Line Item 11: Travel In-Country PMR's				
DAPML Travel (CIV)	1	$14,710	$14,710	$14,710
DAPML (CSS) PMR Travel	1	$14,710	$14,931	$14,931
FRC (CIV) PMR Travel	1	$29,420	$29,420	$29,420

FRC (CSS) PMR Travel	1	$29,420	$29,861	$29,861
		Sub-Line Item 11: Total Cost	**$92,301**	**$92,301**
Sub-Line Item 12: Travel USN Quarterly Reviews				
DAPML (CIV)	1	$6,000	$6,000	$6,000
DAPML (CSS)	1	$6,000	$6,090	$6,090
FRC (CSS)	1	$70,600	$71,659	$71,659
FRC (CIV)	1	$70,600	$70,600	$70,600
		Sub-Line Item 12: Total Cost	**$160,214**	**$160,214**
		Line Item: 010 Total Cost	**$1,350,825**	**$1,409,580**

Line Item: 011 OTHER TECHNICAL ASSISTANCE

Item Description	Qty	Unit Cost	FY2010	FY2015
Other Technical Assistance - Government FY 11			$348,094	$355,859
OTHER TECHNICAL ASSISTANCE - GOVERNMENT fy 12			$319,454	$334,084
OTHER TECHNICAL ASSISTANCE - GOVERNMENT FY 13			$395,828	$423,455
OTHER TECHNICAL ASSISTANCE - GOVERNMENT FY 14			$271,720	$297,371
OTHER TECHNICAL ASSISTANCE - GOVERNMENT FY 15			$99,989	$111,948
OTA - CSS FY 11			$342,563	$348,386
OTA - CSS FY 12			$342,563	$354,587
OTA - CSS FY 13			$342,563	$360,993
OTA - CSS FY 14			$342,563	$367,467
OTA - CSS FY 15			$342,563	$374,079
PMD (5 YEARS)	5	$35,000	$177,626	$177,626
		Line Item: 011 Total Cost	**$3,451,894**	**$3,639,078**

Line Item: 012 ENGINEERING TECHNICAL ASSISTANCE

Item Description	Qty	Unit Cost	FY2010	FY2015
ENGINEERING TECHNICAL ASSISTANCE (FY11)			$225,000	$228,578
ENGINEERING TECHNICAL ASSISTANCE (FY12)			$225,000	$232,605
ENGINEERING TECHNICAL ASSISTANCE (FY13)			$225,000	$236,790
ENGINEERING TECHNICAL ASSISTANCE (FY14)			$225,000	$241,065
ENGINEERING TECHNICAL ASSISTANCE (FY15)			$225,000	$245,385
CSS ENGINEERING SUPPORT (FY11)			$913,500	$929,029
CSS ENGINEERING SUPPORT (FY12)			$114,187	$118,196
CSS ENGINEERING SUPPORT (FY13)			$114,187	$120,332
CSS ENGINEERING SUPPORT (FY14)			$114,187	$122,488
CSS ENGINEERING SUPPORT (FY15)			$114,187	$124,694
		Line Item: 012 Total Cost	**$2,590,067**	**$2,697,930**

Line Item: 013 CONTRACTOR ENGINEERING TECHNICAL SERVICES (CETS)

Item Description	Qty	Unit Cost	FY2010	FY2015
Contractor Engineering Technical Support			$2,436,000	$2,436,000
		Line Item: 013 Total Cost	**$2,528,568**	**$2,528,568**

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