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MQ-8B Fire Scout Program Support Analysis For Commander Helicopter Maritime Strike Wing Atlantic Fleet

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EMBA PROJECT REPORT

MQ-8B Fire Scout Program Support Analysis
For
Commander Helicopter Maritime Strike Wing Atlantic Fleet

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EXECUTIVE SUMMARY

MQ-8B Fire Scout Program Support Analysis

The Navy finds itself facing a period of increasing transformation as the second decade of the 21st century quickly approaches. Having been forced to shift its focus away from 'blue water' operations to the littorals to confront the emerging threats posed by global terrorism and rogue states, the Navy must accomplish this transformation with constrained fiscal resources and an aging fleet at home. New initiatives, such as Sea Power 21, will help the Navy adapt to this new environment, and will drastically change the way the Navy trains for, fights, and wins the nation's wars of the future.

A major tenant of Sea Power 21 is to acquire new weapons' systems to help the Navy adapt to its new role in the joint war fighting environment. In addition to manned systems, the Navy will also procure new, more complex, unmanned aerial vehicles (UAVs) to support a wide range of mission subsets. While Commander Helicopter Maritime Strike Wing Atlantic Fleet (COMHSMWINGLANT) and the LAMPS Mk III community are already transitioning to the MH-60R helicopter to replace the venerable SH-60B Seahawk, naval leadership has already begun proposing the incorporation of the MQ-8B Fire Scout Vertical Take-off/Landing Unmanned Aerial Vehicle (VTUAV) into existing HSM/HSL squadrons and detachments.

To test the feasibility of deploying the MQ-8B with a LAMPS detachment, the Navy has tasked Helicopter Anti-Submarine Squadron Light Four Two (HSL-42) Detachment SEVEN (DET 7) to deploy with two VTUAVs during a scheduled deployment in 2009 aboard USS McInerney (FFG-8). This detachment will operate and maintain the Fire Scout, and will help further refine the Navy's existing concept of operations (CONOPS) for the VTUAV. If successful, this testing could provide the Navy with the data necessary to help requisition further funding for Fire Scout incorporation on existing surface warships.

To aid COMHSMWINGLANT in risk mitigation and planning, Team Mayport identified potential impacts on required detachment manning levels, training needed, duration of training and its impact on readiness, necessary infrastructure, the impact on current detachment operational capabilities, and maintenance. While these factors will have a significant impact on HSM/HSL squadrons and existing warships, Team Mayport focused their efforts on factors affecting detachments only. Interviews were conducted with HSL-42, FFG-8 personnel, the VTUAV Fleet Integration Team (FIT), NAVAIR 1.2 Ship/Aviation Integration Team, and COMHSMWINGLANT staff to gather data necessary to achieve the Team's objectives. Extensive research was also conducted utilizing existing documentation regarding the Fire Scout including draft proposals, CONOPS, Manpower Estimation Reports (MERs), as well as information published commercially.

Team Mayport found that, while there may still be a great deal of uncertainty surrounding the VTUAV, the incorporation of the VTUAV into existing COMHSMWINGLANT force

structures will only improve the Wing's overall mission effectiveness. The Fire Scout will provide more flexibility and will complement existing wing capabilities. The incorporation of the Fire Scout will also help to reduce associated helicopter maintenance costs by reducing helicopter flight hours. It is possible, however, that the reduction in maintenance costs may be offset by a decrease in aircrew proficiency as expeditionary flight crews will certainly fly less, and will be required to be duel qualified in both the H-60 and MQ-8B.

Team Mayport recommends that COMHSMWINGLANT leadership consider the ramifications of reduced manning for LCS composite aviation detachments, and utilize the standard detachment construct for two-plane detachments aboard existing warships. The Team further recommends that leadership closely consider the cultural impacts of incorporating the MQ-8B into existing force structures. In addition, Wing leadership should conduct a sight survey of training facilities to determine their ability to support future VTUAV training. Team Mayport is confident that information gathered from HSL-42 Detachment 7's 2009 deployment will further support these findings, and will aid in the Wing's efforts toward successful incorporation of the Fire Scout VTUAV.

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LIST OF ACRONYMS AND ABBREVIATIONS

ASU	Anti-Surface Warfare
ASW	Anti-Submarine Warfare
AV	Air Vehicle
AVDET	Aviation Detachment
AVO	Air Vehicle Operator
AW	Aviation Warfare Systems Operator
BIT	Built in test
CG	Cruiser
CIC	Combat Information Center
CLSSA	Cooperative Logistics Supply Support Arrangements
CNATTU	Center of Naval Aviation Technical Training Unit
CO	Commanding Officer
COMHSMWINGLANT	Commander Helicopter Maritime Strike Wing Atlantic Fleet
CONOPS	Concept of Operations
CUSFFC	Commander United States Fleet Forces Command
DDG	Destroyer
DOD	Department of Defense
DRP	Direct Requisitioning Procedures
EO	Electro-Optical
ESM	Electronic Warfare Support
FCF	Functional Check Flight
FFG	Frigate
FIT	Fleet Integration Team
FLIR	Forward Looking Infrared
FRS	Fleet Replacement Squadron
GCS	Ground Control Station
HAC	Helicopter Aircraft Commander
HSC	Helicopter Combat Support
HSL	Helicopter Anti-Submarine Light
HSM	Helicopter Maritime Strike
I Level	Intermediate Level
IDRC	Inter-deployment Readiness Cycle
IETM	Interactive Electronic Technical Manual
IMRL	Individual Material Readiness List
IOC	Initial Operating Capability
ISAR	Intelligence, Surveillance, Attack, Reconnaissance
ISO	International Organization for Standardization

KSA	Knowledge, Skill, and Abilities
LAMPS	Light Airborne Multi-purpose System
LCS	Littoral Combat Ship
LMI	Logistics Management Information
MC	Mission Commander
MER	Manpower Estimate Report
MIO	Maritime Interdiction Operations
MIW	Mine Interdiction Warfare
MMP	Modular Mission Payload
MPEDD	Maintenance Personal Electronic Display Device
MPO	Mission Payload Operator
NAMP	Naval Aviation Maintenance Program
NAS	Naval Air Station
NATOPS	Naval Aviation Training and Operational Procedures
NAVICP	Naval Aviation Inventory Control Point
NS	Naval Station
NTSP	Naval Training System Plan
O Level	Organizational Level
OEM	Original Equipment Manufacturer
OpEval	Operational Evaluation
OT	Operational Testing
OTH	Over the Horizon
OTHT	Over the Horizon Targeting
PPE	Personal Protective Equipment
PUK	Pack-up kits
RDT	Remote Data Terminal
SE	Support Equipment
STIR	Separate Target Illumination Radar
TCDL	Tactical Common Data Link
TCS	Tactical Control Station
TEU	Twenty Foot Equivalent Unit
UAV	Unmanned Aerial Vehicle
UCARS	UAV Common Automatic Recovery System
VTUAV	Vertical Take-off and Landing Unmanned Aerial Vehicle
WRA	Weapon Replaceable Assembly
WWS	Wing Weapons School

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I. INTRODUCTION

A. INTRODUCTION

The MQ-8B is a VTUAV that was originally designed as a complementary intelligence, surveillance, attack, and reconnaissance (ISAR) UAV for the Littoral Combat Ship (LCS). Since the LCS program has experienced severe delays in its delivery schedule, however, naval planners have gone forward with planning to utilize the MQ-8B on existing surface combatants. A recent development in this planning has been the formulation of a detachment from HSL-42 to aid in the creation of a concept of operations for future use of the Fire Scout on existing warships during their upcoming deployment scheduled for late 2009 aboard USS McInerney (FFG-8). A COMHSMWINGLANT asset was chosen to perform this duty because existing LCS and VTUAV CONOPS identify LAMPS detachments as the primary operators and maintainers of this system.

To aid in risk mitigation and planning, COMHSMWINGLANT directed Team Mayport to conduct a support analysis of the proposed utilization of Wing detachments to operate and support the MQ-8B Fire Scout VTUAV for future shipboard use. Team Mayport found, however, that there were significant gaps in information available for the use of the VTUAV aboard existing warships. Most information available pertained to plans for use aboard LCS. Manning levels for LCS were based on a 23 man detachment that was primarily driven by the desire for reduced manning. Navy leadership arrived at this construct after careful risk/reward analysis, but Team Mayport believes that a two-plane manning construct would provide greater operational flexibility and safety compared to the 23 man detachment, without imposing any additional cost to the Navy.

Team Mayport further recommends that leadership give special consideration to the cultural impacts resulting from VTUAV introduction. Because the operation of the VTUAV does not require pilot input for flight control operation, leadership must consider what impact this will have on flight crews. Furthermore, flight crews will be required to be dual rated in both the VTUAV and H-60. This added responsibility may be exasperated with the introduction of the MH-60R because of its increased level of complexity over the SH-60B. These factors combined may have a detrimental effect on aircrew quality of service.

Team Mayport also identified a need for a sight survey to determine the wing's ability to absorb VTUAV training once fully introduced. This training will be primarily computer based in the future, and may become shorter in duration, but a requirement will exist for additional space for Ground Control Station simulator installation.

Upon completion of their 2009 deployment, HSL-42 Detachment 7 will provide information to supplement Team Mayport's findings. Team Mayport recommends Wing leadership conduct a mid-cruise and post-cruise evaluation of 'lessons learned' to determine the merits of detachment manning, operations, training, and maintenance practices.

B. BACKGROUND

The MQ-8B "Fire Scout" is a VTUAV that has been developed by Northrop Grumman, in conjunction with Lockheed Martin and the Schweitzer Aircraft Corporation, for the U.S. Navy to satisfy the military's joint requirement for an inexpensive air vehicle that is capable of performing the intelligence, surveillance, reconnaissance, and targeting (ISAR) mission. The MQ-8B is unique among second generation UAVs in that it is a rotary wing aircraft, based off the Schweitzer 333SP manned turbo-shaft helicopter design. The four bladed UAV weighs approximately 3,200 pounds, and will carry a wide array of mission sensors including RADAR, electronic warfare support (ESM) systems, forward looking infrared (FLIR), and electro-optical (EO) sensors, with room for future additions and armament. With a service ceiling of just over 20,000 feet, and a max airspeed of 125 knots, the Fire Scout will be able to stay on station in a hostile environment for nearly 8 hours, dramatically improving the naval war fighter's situational awareness.

The Navy had originally planned to deploy the Fire Scout aboard the LCS, but controversy surrounding the LCS program has created doubt as to whether or not this will be the case. The LCS program began as a design competition between Lockheed Martin and General Dynamics to produce a surface combatant optimized for operating in the complex littoral environment. This approach was thought to help reduce procurement costs, and to help further refine the new ship's concept of operations.[1] However, original proposed construction costs of $220 million per hull have risen steadily to approximately $450 million, not including the modular mission packages that are to accompany the vessels.[2] Cost overruns in both the General Dynamics and Lockheed Martin designs have forced the Navy to cancel planned hulls from each builder. It is currently unclear when construction will continue.

In February of 2000, the Department of Defense awarded Northrop Grumman an initial engineering and manufacturing development (EMD) contract (Milestone I&II), worth $93,721,957, to develop the VTUAV. This model was dubbed the RQ-8A "Fire Scout". The RQ-8A VTUAV system contained the following sub components: air vehicle (AV), ground control stations (GCSs), modular mission payloads (MMPs), data links, remote data terminals (RDTs), launch and recovery equipment, and tactical communications equipment.[3] Flight testing for the RQ-8A begun in 2002, and in December of 2003, the Fire Scout completed its 100th successful flight, accumulating nearly 75 flight hours.

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1 GlobalSecurity.org. Littoral Combat Ship Program. [Accessed on 15 February, 2009] Available from the World Wide Web @http://www.globalsecurity.org/military/systems/ship/lcs-program.htm

2 Defense Industry Daily. The USA's New Littoral Combat Ships. [Accessed on 15 February, 2009] Available from the World Wide Web @http://www.defenseindustrydaily.com/the-usas-new-littoral-combat-ships-updated-01343/

3 Pike, John. Vertical Take Off and Landing Unmanned Aerial Vehicle (VTUAV) Overview. Federation of American Scientists, 2000. [Accessed on 15 February, 2009] Available from the World Wide Web @http://fas.org/irp/program/collect/vtuav.htm

As the development for the VTUAV progressed, the RQ-8A was re-designated MQ-8B after a number of structural and mechanical changes were made to the airframe and mission systems. This change was driven by the RQ-8A's poor performance during initial testing, and subsequent withdrawal from the program by the Navy. To satisfy DoD requirements, Northrop Grumman redesigned the Fire Scout's airframe, power plant, and incorporated an additional rotor blade (for a total of four blades). These improvements dramatically increased the Fire Scout's range and on-station time. With these new modifications, Northrop Grumman re-designated the Fire Scout MQ-8B. This re-designation was an indicator of the improved multi-mission capability of the new VTUAV. In August of 2003, the Army selected the Fire Scout as its unmanned air system for its Future Combat System (FCS) program. The Navy subsequently regained interest in the program, which was initially supposed to reach IOC by Q4 FY 2003.[4]

The Fire Scout saw many firsts in its progression through the defense acquisitions framework in 2006. On 16 January, 2006, the MQ-8B reached its first major developmental milestone by autonomously completing nine launch and recovery cycles aboard the USS Nashville, the first such accomplishment of any DOD developmental UAV.[5] In February, the MQ-8B effectively demonstrated its ability to extend its communications range over the horizon (OTH) by using the system's Beyond Line-of-Sight tactical UAV communications relay. In August of 2006, the Navy awarded Northrop Grumman a $135.8 million modification to its earlier contract. This contract extension signified the Navy's continued commitment to the program, and solidified Northrop's continued progression through the program's Systems Development and Demonstration (SDD) phase.[6]

The MQ-8B, an ACAT IC program, reached Milestone C in the defense acquisition system on 31 May, 2007 signifying its entry into Low Rate Initial Production (LRIP), and is expected to reach Initial Operating Capability (IOC) in 2009 following successful Operational Evaluation (OpEval).[7] Deliveries of initial LRIP units are expected in FY 2009 with final delivery early in FY 2010, but delays in the procurement schedule for the Littoral Combat Ship could affect this timeline.

C. PROJECT OBJECTIVES

The goal of the this project was to identify the critical operational, cost mitigation, and human resource management issues associated with the potential manning of the Fire Scout by COMHSMWINGLANT detachments. We explored a number of factors in our analysis including: required detachment manning levels, training needed, duration of training and its impact on readiness, necessary infrastructure, and the impact on current

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4 Pike, John. MQ-8B Fire Scout. GlobalSecurity.org, 2007. [Accessed on 14 February 2009] Available from the World Wide Web @http://www.globalsecurity.org/military/systems/aircraft/mq-8b.htm

5 Ibid.

6 Freeland, Rene. MQ-8B Fact Sheet. Northrop Grumman, 2008 [Accessed on 14 February 2009] Available from the World Wide Web @http://www.is.northropgrumman.com/systems/system_pdfs/FS-Fact-Sheet.pdf

7 Ibid.

detachment operational capabilities. Our analysis addresses the benefits of the proposed MQ-8B implementation plan, and will provide COMHSMWINGLANT leadership with the information necessary to identify the most cost effective and operationally beneficial means of integrating the Fire Scout into existing Wing structures.

D. METHODOLOGY

The following represents a brief overview of the methodology used to meet our project objectives.

1. Background Research

The team initially gathered information regarding the Fire Scout VTUAV program. This included internet research of UAV programs and Northrop Grumman websites. Secondly, we initially contacted and gathered data from HSL-42, PMA-266, and the Fleet Integration Team (FIT).

2. Data Analysis

An initial team session was held to analyze what was known about VTUAV operations, current assumptions about its future use, plans for its upcoming deployment, and issues already identified by those charged with its operation aboard USS McInerney. From this analysis, assumptions were updated and questions were formulated for in-depth exploration with subject matter experts during one-on-one interviews.

3. Interview Process

Formal interviews were conducted with HSL-42 Detachment 7 personnel and senior leadership aboard USS McInerney. Subject matter experts at the VTUAV Fleet Integration Team, San Diego, California were also interviewed via telephone.

Informal interviews were conducted with numerous VTUAV experts at PMA-266 and NAVAIR. A hands on hanger discussion was attended at NS Mayport with members from VX-1 and Northrop Grumman in attendance.

4. Analysis

Using the information obtained from interviews and available documentation, Team Mayport looked for potential impacts on detachment operations, manning, training, and maintenance. In some instances, data collected by the Team was incomplete. This was in large part due to the lack of data available for VTUAV operations aboard existing surface combatants.

5. Project Feedback

Team Mayport will meet with their client, COMHSMWINGLANT, to provide feedback and recommendations regarding the VTUAV program. It is our hope that the results of the research will be used by subject matter experts to improve future VTUAV composite detachment operations.

E. SCOPE

Team Mayport's research examines the needs and priorities of our client and other stakeholders involved with the proposed operation of the Fire Scout. The primary focus was to identify the critical issues associated with HSM/HSL detachments operating the MQ-8B. The Team's analysis and findings will be offered to COMHSMWINGLANT to aid in the formulation of informed decisions regarding the future incorporation of the MQ-8B.

Since the future of LCS is currently in doubt, the conclusions and recommendations contained in this report are primarily focused on FFG operations. Assumptions were made on the impacts of aircrew training because aircrews have not currently received this training.

II. ANALYSIS AND RESULTS

A. INTERVIEWS

See Appendix A.

B. DATA COLLECTION

1. Concept of Operations

To effectively analyze the impacts of VTUAV integration on detachment operations, Team Mayport reviewed a recent draft VTUAV CONOPS obtained from the Fleet Integration Team (FIT), and VTUAV Manpower Estimate Reports (MER) obtained from NAVAIR. Team Mayport also interviewed representatives from the VTUAV FIT, HSL-42 Detachment 7 personnel, NAVAIR's Aviation/Ship Integration Team, and the current COMHSMWINGLANT VTUAV transition officer.

It is important to note that most of the documentation available on Fire Scout is focused on its use aboard the LCS. Team Mayport was unable to find any data that pertained to its use aboard existing surface combatants. This is in large part due to the fact that OpEval has not been conducted for the Fire Scout, and funding has not yet been received to reconfigure existing sea frames to support the VTUAV. OpEval for Fire Scout is currently scheduled to take place by the end of 2009. Team Mayport estimates that additional data will become available once OpEval is complete.

Crucial insight on aviation detachment (AVDET) manning on LCS was provided to Team Mayport from NAVAIR's Aviation/Ship Integration Team. Current planning indicates that the Navy is moving forward with a 23 man combined aviation detachment for LCS. This combined detachment will be responsible for operating and maintaining both the Fire Scout VTUAV and MH-60R.

a. System Description

Initial versions of the MQ-8B Fire Scout VTUAV system will be comprised of six essential subcomponents:

- Air Vehicle (AV)
- USN Tactical UAV Ground Control Station (GCS)
- UAV Common Automatic Recovery System (UCARS)
- Light Harpoon Landing Restraint System (LHLRS)
- Brite Star II FLIR/EO/LDRF
- Tactical Common Data Link (TCDL)

The air vehicle, as depicted in Figure 1, is based on the Schweitzer 333SP manned turbo-shaft design, and is a second generation, unmanned, single engine helicopter. The AV has an all-metal, four-blade, folding main rotor, a metal and composite two-blade tail rotor, and a metal airframe. The main rotor blades are fully articulated and can be folded for stowage and parking. The AV also utilizes aluminum landing gear skids mounted on the bottom of the fuselage.[8]

Figure 1 – MQ-8B Fire Scout VTUAV[9]

The Fire Scout can take-off and land autonomously from VTUAV configured surface combatants, and is designed to follow a preprogrammed path set by the Air Vehicle Operator (AVO). The AV will fly this preprogrammed path until ordered to land, or until it loses communication with its control station, at which point the AV will either attempt to reestablish communications, or divert to a pre-selected landing site. There is no flight control input available from the GCS. All flight control inputs are performed automatically by the AV as necessary to fly its preprogrammed flight path.

The Fire Scout utilizes a modular design. This enables the "plug and play" of various payloads for various operations. Initial variants of the Fire Scout are expected to utilize the Brite Star II EO/IR/LDRF system seen in Figure 2; however, future variants will be equipped with a wide variety of modular mission payloads (MMPs). These MMPs may include RADAR, ESM, communication relay equipment, and forward firing munitions.

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8 NAVAIR. VTUAV Concept of Operations (DRAFT). 16 May 2007.

9 Ibid.

Figure 2 – Brite Star II[10]

Like other UAV systems, the Fire Scout is operated by a GCS. The Fire Scout's GCS is designed to be housed on board the LCS in the Combat Information Center.[11] Installation of the GCS on the FFG-8 class warship will be in the STIR equipment room. The GCS, as depicted in figure 4, consists of two stations for the AVO and the Mission Payload Operator (MPO), but unlike other UAVs, the GCS for Fire Scout can operate multiple AVs simultaneously.[12]

The UCARS gives the Fire Scout autonomous take-off and landing capability. The UCARS tracking antenna is depicted below in Figure 4. The UCARS uses ship's motion sensor data to provide precise ship/AV position information to the AV to effect take-off and landing. The Fire Scout's recovery cycle is depicted in Figure 3. The UCARS tracking antenna tracks the AV's transponder signal to measure relative distance to the landing point, and is capable of allowing the AV to compensate for the ship's air-wake. Once in a position to land, the Fire Scout will use the LHLRS which consists of a moveable platform, and a hook and grid, harpoon restraining system.[13]

Another component of the Fire Scout system is the Tactical Control System (TCS). Working in conjunction with the TCDL, this system consists of the hardware and software that allows for various levels of control of the UAV. Other platforms, using TCS, will be able to control

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10 PMA 263. Manpower Estimate Report for the Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle (VTUAV). NAVAIR, March 2007.

11 Northrop Grumman. RQ-8B Fire Scout Vertical Takeoff Unmanned Air Vehicle. [Accessed 12 JAN 2009] Available from World Wide Web @http://www.is.northropgrumman.com/systems/system_pdfs/FireScout-New-Brochure.pdf

12 Jane's Unmanned Aerial Vehicles and Targets, Northrop Grumman, MQ-8 Fire Scout [Accessed 12 JAN 2009] Available from World Wide Web @http://juav.janes.com/ public/juav/index.html

13 NAVAIR. VTUAV Concept of Operations (DRAFT). 16 May 2007.

the Fire Scout. A demonstration of this capability was provided when a P-3C using the TCS system controlled and landed the Fire Scout in 2003.[14]

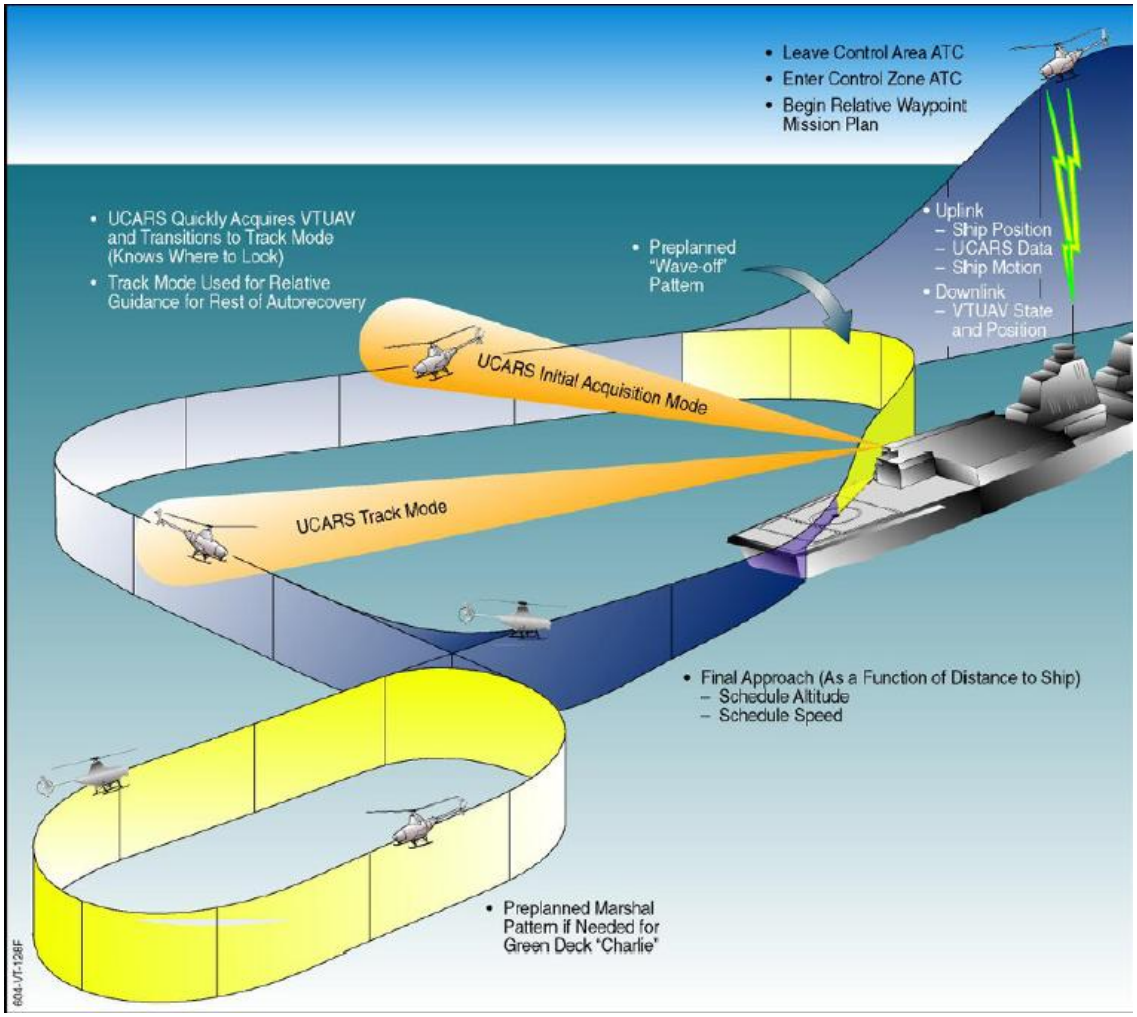

Figure 3 – VTUAV Recovery Cycle[15]

14 NAVAIR. NAVAIR Demonstrates UAV Control At Highest Level. [Accessed 12 January 2009] Available from World Wide Web @http://uav.navair.navy.mil/new_firescout/news/rotorhub(UK).pdf

15 NAVAIR. VTUAV Concept of Operations (DRAFT). 16 May 2007.

Figure 4 – Fire Scout UCARS Antenna/Ground Control Station[16]

b. Utilization

The MQ-8B Fire Scout VTUAV was designed as a complementary ISAR UAV that will support existing and future surface combatants. The Fire Scout, as depicted in Figure 5, will be capable of assisting surface combatants in Anti-Surface Warfare (ASU), Anti-Submarine Warfare (ASW), Mine-Interdiction Warfare (MIW), and limited Maritime Interdiction Operations (MIO).[17] Baseline models will be equipped with the BRITE Star II FLIR/EO device. Future models will be equipped with RADAR, the Coastal Battlefield Reconnaissance and Analysis (COBRA) system, mine detection unit, ESM, and possibly forward firing weapons.

The Fire Scout AV will be operated via GCS and TCDL by a two man crew derived from composite aviation detachments aboard the host ship. The AVO will be a dual rated MH-60/MQ-8B pilot, and will most likely act as the Mission Commander. The AVO will be responsible for monitoring AV status and controlling launch, flight, and recovery. The MPO will be a dual rated Aviation Warfare Systems Operator (AW), and will operate, evaluate, and monitor the AV's sensors.[18]

16 PMA 263. VTUAV Integrated Logistics Support Overview. NAVAIR, 2008.

17 NAVAIR. VTUAV Concept of Operations (DRAFT). 16 May 2007.

18 Ibid.

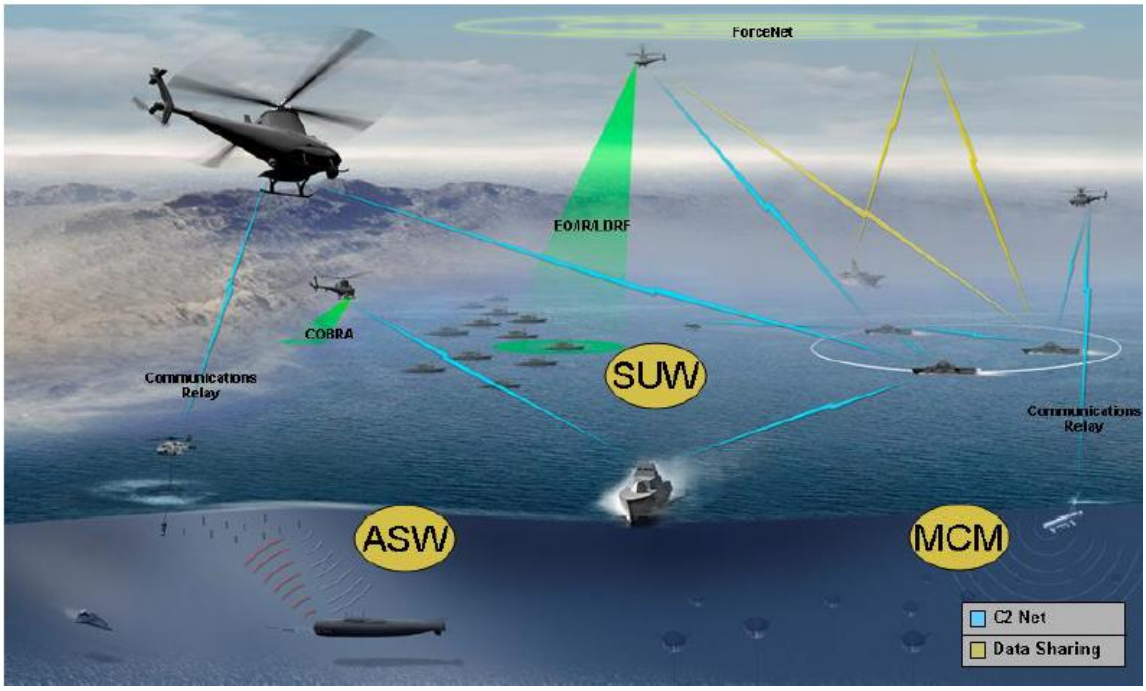

Figure 5 – VTUAV Operational View[19]

For LCS operations, composite AVDETS will be comprised of either HSM or HSC personnel depending on desired mission subset. HSM detachments will be deployed to support ASU and ASW missions, and will operate two AVs. HSC detachments will support the MIW mission, and will operate one AV.[20] It is unclear if this convention will be true for future operations aboard existing surface combatants.

c. Detachment Composition

The VTUAV CONOPS and MER both call for a composite aviation detachment comprised of 23 personnel. As stated previously, these documents only reflect manning for LCS as seen in Figure 6. The MER points out that the 23 man construct for LCS was developed from modeling and analysis conducted by NAVAIR 1.2, the results of which were published in *LCS/DD(X) Alternative Aviation Support Study*, dated 18 August 2005.[21] The major limiting factors for detachment size were berthing available aboard LCS, and the desire to reduce crew size to 75 personnel.[22] Risk Assessment contained in the MER suggests that the 23 man construct may be inadequate to support all aviation requirements as set forth in the LCS CONOPS. The MER further assigned a risk code of medium to

19 NAVAIR. VTUAV Concept of Operations (DRAFT). 16 May 2007.

20 PMA 263. Manpower Estimate Report for the Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle (VTUAV). NAVAIR, March 2007.

21 Ibid.

22 Rose, William. NAVAIR 1.2 Aviation/Ship Integration Team. Email dated 9 February, 2009.

detachment manning, and called for additional verification of manning levels once the VTUAV is fielded.

	MH-60R + 2 UAV		
	ROC POE	With VTUAV	Δ for VTUAV
Pilot	4	4	0
CPO	1	1	0
LCPO	1	1	0
AD	2	3	1
AE	2	3	1
AM	2	3	1
AO	1	1	0
AT	2	3	1
AW	2	3	1
AZ	1	1	0
Total	**18**	**23**	**5**

Figure 6 – LCS Composite Aviation Detachment Manning[23]

d. Detachment Operational Tempo

Figure 7 depicts proposed detachment flight hour ratios for LCS based on the number of VTUAVs embarked. This graphic was obtained from CNAF FIT briefs to CUSFFC, and was derived from NAVAIR 1.2 modeling to support the *LCS/DD(X) Alternative Aviation Support Study*. Based on NAVAIR's data, CUSFFC ultimately decided on the 23 man composite aviation detachment construct.[24] These ratios assume a 24 hour work day, utilizing two maintenance shifts, and maximum crew rest/day as delineated by OPNAV 3710.7T. They also assume flight operations are constrained by single spot aviation capable warships.[25]

Figure 7 effectively demonstrates that increased utilization of VTUAVs could dramatically reduce the number of flight hours achievable for use by aircrews. The ratio indicated by the star on Figure 7 reflects the projected nominal operating tempo for composite detachments. If this model proves consistent with actual operations, each pilot will be able to fly an average of 240 total helicopter hours during a six month deployment.

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23 PMA 263. Manpower Estimate Report for the Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle (VTUAV). NAVAIR, March 2007.

24 Rose, William. NAVAIR 1.2 Aviation/Ship Integration Team. Email dated 9 February, 2009.

25 NAVAIR. VTUAV Concept of Operations (DRAFT). 16 May 2007.

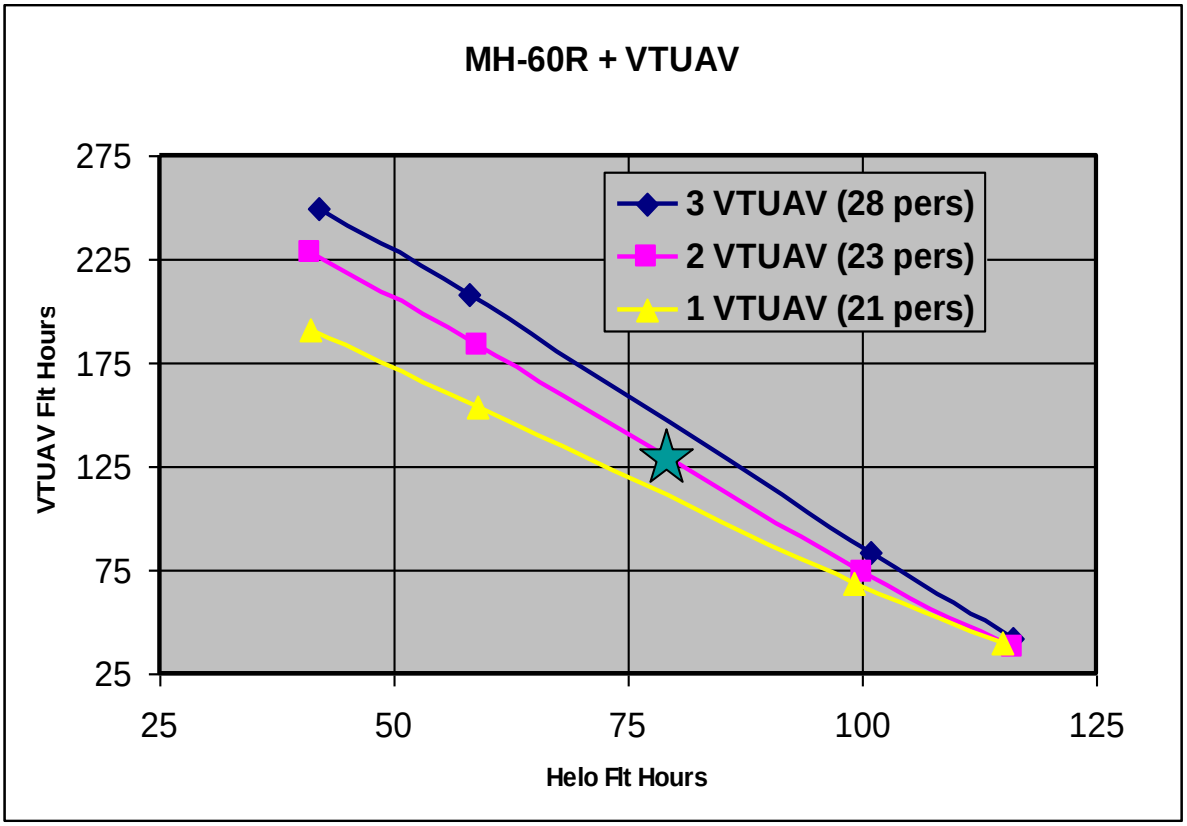

Figure 7 – LCS monthly flight hours[26]

2. Training and Readiness Considerations

AVDET personnel will receive VTUAV specific training in accordance with the VTUAV CONOPS and other associated naval directives. This training will take place prior to the AVDET-ship team workup cycle under the construct of "train as needed" for the mission specific deployment, much like other weapon systems that an operator may require.[27] Since VTUAV and HSM/HSL detachment personnel will operate, maintain, and train for both airframe system types, these personnel will be qualified H-60 aircrew and maintenance personnel. For the purpose of this analysis, aircrew personnel are those individuals who are directly responsible for the operation of the AV and its associated controls. Maintenance personnel are those members of the AVDET who are responsible for all Organizational level (O-level) upkeep and care of the AV itself.

The VTUAV Program Office (NAVAIR PMA 266) and the VTUAV FIT will lead the acquisition of the VTUAV training system. A systems approach has been applied to the analysis, design, development, implementation, and conduct of the training program, which

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26 Criger, Tom. Aviation Manning Aboard LCS. U.S. Fleet Forces Command, October 2006.

27 Naval Air Systems Command. VTUAV Concept of Operations (DRAFT). 16 May 2007.

will provide designated H-60/VTUAV composite squadron personnel with the knowledge, skills, and abilities (KSA) necessary to operate and employ the VTUAV system effectively.[28]

The Naval Training System Plan (NTSP) for the VTUAV, the N88-NTSP A-50-0004 May 2007 and DoD Instruction 3020.37, details the intent of the VTUAV training program and any applicable "mission essential" training requirements. The intent of the VTUAV program is to provide proficient AVO, MPO, and O-level maintenance personnel. New and evolving technologies and existing models that represent training requirements for the aviation communities will be used to improve the quality of training and make the training more affordable.[29]

a. Aircrew Level Training

Training for operators is currently being conducted by training teams from the primary contractor, Northrop Grumman Corporation at NAVAIR concentration facilities, Patuxent River Naval Base. This training currently lasts for approximately five weeks and is provided via instructor-led, paper-based courseware.[30] Estimated student throughput and instructor requirements, assuming a single training location, are summarized in Figure 8 below. The goal of the training program, once fully implemented into the fleet,

VTUAV Training Requirement	Course Length			Thru-put	Course Rqmt		Student IA		Instructors	
Position	Hours	Days	Weeks	Total Annual	Course Load	# of Courses	Officer	Enlisted	Officer	Enlisted
UAV AVO	180	23	5	72	8	9	8	0	4	
UAV MPO	96	12	3	68	8	9	0	5		4
UAV Mech Tec	180	23	5	68	12	6	0	8		4
UAV Elect Tech	120	15	3	68	12	6	0	5		4

Figure 8 – Estimated Annual Training Requirement for the VTUAV Program[31]

is to conduct training for operators at designated Fleet Replacement Squadron training facilities at NAS North Island, San Diego and NS Mayport, Florida. This training will comprise of post-FRS courses lasting from three to five weeks which will incorporate the development of interactive courseware and simulators/training devices. The goal is to have all aircrew training and proficiency events flown in the trainer.[32] There is no plan to conduct VTUAV AV training flights ashore. Exact course requirements and optimum delivery methods will be determined through analysis, as part of the Instructional Systems Development process. This training will fall under the cognizance of the FRS CO with

28 PMA 263. Manpower Estimate Report for the Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle (VTUAV). NAVAIR, March 2007.

29 NAVAIR. VTUAV Concept of Operations (DRAFT). 16 May 2007.

30 NAVAIR. VTUAV Program Integrated Logistics Support Overview. Dated January 2008.

31 PMA 263. Manpower Estimate Report for the Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle (VTUAV). NAVAIR, March 2007.

32 Fitzgerald, Chris. LCS Aviation HSL-42. CNAF VTUAV Fleet Integration Team, June 2008.

secondary cognizance authority resting with the WWS CO.[33] Training of operators will comprise of AVO/MC training for H-60 pilots and MPO training for H-60 AWs.

b. Maintenance Level Training

Initial VTUAV maintenance training will be provided by technical representatives from Northrop Grumman with future training to be completed at a Center of Naval Aviation Technical Training Unit (CNATTU).[34] The goal of PMA 266 and the FIT is to co-locate this training with the H-60 Expeditionary Squadron Fleet concentration areas. All current maintenance AVDET rates will play a role in the upkeep and care of the AV. Estimated maintenance manpower to account for VTUAV pipeline training is summarized above in Figure 8. As of the date of this report, there is currently no manpower training requirement for shipboard personnel. Until analysis is conducted to determine the impact to shipboard manpower requirements with interaction of VTUAV systems, AVDET maintenance personnel will be responsible for VTUAV subsystems to include Integrated GCS, TCDL Data Suite, UCARS, and Talon Landing Grid. A Northrop Grumman technical representative will be accompanying HSL-42 Detachment 7 on board USS McInerney to provide any on-sight technical training and assistance of this equipment as necessary.

c. Contractor Responsibilities

It is anticipated that Northrop Grumman will also be used to develop and conduct program familiarization training for government personnel involved in initial low-rate production and initial training of government personnel involved in Operational Testing (OT). It is further anticipated that Northrop Grumman will be used to provide initial Navy site activation training at any location, until such time as the Navy is capable of assuming such duties. Cost avoidance/reductions associated with sharing training curriculum and facilities, and reuse of pertinent existing aviation-related curricula, will be explored where commonality and applicability permit.[35]

3. Maintenance Requirements

The VTUAV system will be maintained by active duty personnel attached to composite H-60/VTUAV squadrons. Supportability is tailored to a two level maintenance concept: O-level and Depot or Original Equipment Manufacturer (OEM). O-level support includes scheduled and unscheduled maintenance, and on-AV repair at the unit level.[36] Depot/OEM maintenance consists of major repairs, overhauls, testing, and repairs to components beyond the capabilities of unit/organizational maintenance. The addition of

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33 Fitzgerald, Chris. LCS Aviation HSL-42. CNAF VTUAV Fleet Integration Team, June 2008.

34 NAVAIR. VTUAV Concept of Operations (DRAFT). 16 May 2007.

35 PMA 263. Manpower Estimate Report for the Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle (VTUAV). NAVAIR, March 2007.

36 NAVAIR. VTUAV Concept of Operations (DRAFT). 16 May 2007.

Intermediate level (I-level) maintenance may be appropriate based on the post-fielding analysis of Logistics Management Information (LMI) maintenance and repair data.[37] All maintenance will be performed in accordance with the guidelines and processes outlined in the COMNAVAIRFORINST 4790.2 series and the Naval Aviation Maintenance Program (NAMP) manuals.

a. AVDET Maintenance Concept

Preventive and corrective maintenance tasks will be accomplished onboard existing warships by composite AVDET personnel and could include but are not limited to:

- Flight launch and recover, handling, transportation readiness and emplacement
- Servicing turnaround and servicing to include refueling/de-fueling
- Daily inspections and light corrosion control
- Removal and replacement of Weapon Replaceable Assemblies (WRAs)
- MMP swap out
- Quality assurance[38]

Interactive Electronic Technical Manuals (IETM) organizational maintenance publications have been designed to display on portable electronic display devices that are used in lieu of technical manuals. Electronic data modules are provided for overall VTUAV system description and include all maintenance procedures, illustrated parts breakdown, system/functional description, maintenance requirement cards, wiring diagram manual, NATOPS and pocket checklists, and general series manuals.[39]

AVDET maintainers will have the availability of using a new tool that will help them during troubleshooting phases of the VTUAV. This computer hardware system is called Maintenance Personal Electronic Display Device (MPEDD) which looks similar to an IETMs computer laptop. The MPEDD is the primary tool used to perform routine AV maintenance functions and maintenance engine runs, run BIT checks to obtain AV and subsystem statuses, aid with actuator rigging, and interface with the vibration monitor to perform Rotor Track & Balance during Functional Check Flight (FCF) evolutions.[40] It also hosts the tech data library for easy access maintenance inquiries.

VTUAV maintenance record keeping, including IMRL and SE management, will be done electronically through NALCOMIS OOMA application. This system is the same currently being utilized for H-60 maintenance administration.

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37 PMA 263. Manpower Estimate Report for the Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle (VTUAV). NAVAIR, March 2007.

38 NAVAIR. VTUAV Concept of Operations (DRAFT). 16 May 2007.

39 NAVAIR. VTUAV Program Integrated Logistics Support Overview. January 2008.

40 Ibid.

b. Shipboard Support

Maintenance of organic shipboard equipment directly tied to the operation of the VTUAV is projected to be covered by shipboard personnel. This ship-installed equipment includes:

- Integrated GCS
- TCDL Data Suite
- UCARS
- Talon Landing Grid[41]

HSL-42 Detachment 7 maintenance personnel will be initially conducting all O-level maintenance on this ship-installed equipment while onboard USS McInerney. Analysis is currently being conducted to determine the impact to shipboard manpower with respect to these critical VTUAV systems. Until this analysis is complete, AVDET personnel will be responsible for maintaining this equipment.

c. Spare Parts

All maintenance spare parts for the VTUAV will be maintained in a similar fashion to those for the H-60 while onboard current surface combatants. AVDET maintenance personnel will have access to pack-up kits (PUKs) consisting of sufficient spares and support equipment for up to 30 days of operations (maintaining up to 24 hours continuous target coverage). The 30 day requirement is reviewed and updated annually and based on 125 flight hours per month, engineering changes, and maintenance data. The kits are easily transported in standard ISO shipping containers or twenty foot equivalent units (TEUs). Maintenance items included in these PUKs includes the following:

- Spares and repair parts
- Support equipment/common hand tools
- Electronic tech data library
- Bulk items
- Personnel protective equipment (PPE) – i.e., cranials, goggles, personnel flotation devices[42]

There is currently no process for allocating the spare VTUAV Rolls Royce 250-C20W engine within PUK inventories. These repairable items will only be available in theatre/main operating bases which will be commercially repaired.

Standard/non-standard parts support will be via Direct Requisitioning Procedures (DRP) case and Cooperative Logistics Supply Support Arrangements (CLSSA). Parts and inventory

41 PMA 263. Manpower Estimate Report for the Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle (VTUAV). NAVAIR, March 2007.

42 NAVAIR. VTUAV Program Integrated Logistics Support Overview. January 2008.

control will be promulgated through the Naval Aviation Inventory Control Point (NAVICP) process and procedures with provisioning integrated into predetermined procurement schedules.[43]

d. Aviation Facilities

Shipboard facilities, such as those found on CG, DDG, and FFG class ships, will be able to provide support services and protection and shelter from the elements. These facilities do not have to be manipulated or altered to store the VTUAV as they provide similar functions to those utilized by SH-60B AVDETs. Figure 9 below shows the standard storage dimensions of the VTUAV both in the full spread and folded positions. These facilities will be able to provide basic support for the VTUAV as well as 28 volt DC power, 115 VAC/three phase/60 Hz power, and ready fuel storage, nitrogen, and battery storage.[44]

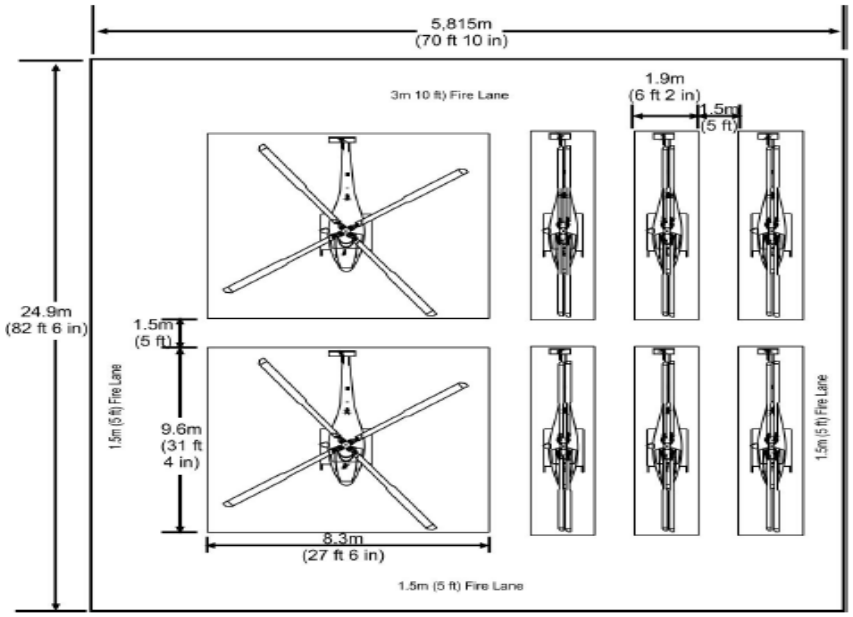

Figure 9 – VTUAV storage parameters[45]

43 NAVAIR. VTUAV Concept of Operations (DRAFT). 16 May 2007.

44 NAVAIR. VTUAV Program Integrated Logistics Support Overview. January 2008.

45 Ibid.

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III. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSIONS

The Fire Scout VTUAV represents a substantial leap into the future for the LAMPS community. The manning, training, and operation of the Fire Scout will provide a unique set of challenges and opportunities. Using data currently available, the following conclusions can be made regarding VTUAV operations by LAMPS detachments.

Team Mayport believes that the VTUAV manning provided under LCS operations will not be sufficient to operate under the current environment. The limitation of 4 Pilots and 3 Aircrew will not allow for continuous helicopter/VTUAV operations, or 24 hour coverage. Additionally, pilot flight hour requirements will need supervision. Flight hours for training and proficiency may be limited due to increased utilization of the VTUAV.

The requirement of training for AVO and MPO operators will require flexibility on the part of HSM/HSL squadrons. Training is currently conducted prior to crew work-up during the IDRC. In the future, training will most likely occur post FRS. Training times are expected to decrease, but more information is needed regarding future expectations. A need will exist to build additional training facilities. These facilities will likely be under the cognizance of the FRS per the VTUAV CONOPS.

The cultural impacts of introducing the VTUAV into fleet squadrons might also prove a challenge. Fire Scout is an extremely automated UAV, with little real flight control given to aviators. Many pilots may feel slighted if assigned to monitor continuous VTUAV operations. Furthermore, it is currently unclear what the ramifications of a VTUAV related mishap would be. With limited AV flight control capability, aircrews may be more reluctant to operate the AV.

There will be both positive and negative aspects to future VTUAV operations. Positive aspects may include added operational capability with improved sensor packages, risk reduction for aircrew, and potential cost savings. These cost savings may be derived from reduced helicopter fuel consumption and maintenance costs. Further cost savings could materialize from manpower reductions for LCS based detachments.

The associated negative impacts to VTUAV deployment include the limited sensor capability of the Fire Scout. Initial Fire Scout models will only contain the Brite Star II FLIR as its primary sensor. In the future VTUAV MMPS will include RADAR, ESM, and forward firing

munitions. It is currently unclear, however, when these new MMPs will be fielded. Fire Scout will also be limited to line of sight operations until other controlling platforms are available. Several safety of flight concerns arise from Fire Scout operations. These include airspace deconfliction, joint operations with multiple aircraft, and reduction in aircrew proficiency due to being dual qualified on separate platforms.

The potential pit-falls associated with the future deployment of the Fire Scout with LAMPS detachments are numerous, and this report only presents a small portion of the foreseeable impacts to manpower, operations, training, and maintenance. With increased experience, more challenges will undoubtedly develop. Team Mayport believes, however, that the potential benefits of VTUAV incorporation currently outweigh the system's short comings.

B. RECOMMENDATIONS

1. Utilize current two-plane manning construct for future composite aviation detachments.

Team Mayport believes that the maintenance manning will be sufficient to meet the needs of Detachment 7's upcoming deployment. The LCS model, however, uses a reduced aircrew manning structure of 4 pilots and 3 AWs for flight operations. Team Mayport believes that the LCS manning construct will result in operational limitations, including a lack of flexibility, and reduced coverage. Additionally, the lack of manning will reduce training opportunities, and will impact flight hour requirements for aircrew. HSL-42 Detachment 7 is currently planning to take 6 pilots and 3 AWs on their 2009 deployment. This is consistent with the current two-plane manning construct utilized by wing detachments, and Team Mayport believes this to be the correct model for future composite aviation detachments. Existing surface combatants do not possess the same manpower constraints as the LCS, and can easily accommodate the current two-plane detachment construct. This will provide greater operational effectiveness, flexibility, and safety.

2. Consider cultural shifts associated with VTUAV operations, and adjust detachment flight hour dispersion accordingly to allow for adequate training and proficiency.

The utilization of the Fire Scout will challenge the traditional roles of aircrew. Aircrews will be expected to be proficient in, and deploy with, dissimilar platforms for the first time. If not properly accounted for, over reliance on the Fire Scout could have the potential of reducing aircrew flight time and proficiency. Team Mayport recommends Wing leadership ensure helicopter/VTUAV flight hour combinations sufficiently account for these

potential shortfalls. The flight hour combinations depicted in our analysis provides an adequate benchmark for future operational planning, but needs to be revisited to ensure they provide aircrews with the flexibility to perform their mission and train. HSL-42 Detachment 7's 2009 deployment with the Fire Scout should provide the data necessary to further validate these combinations.

Team Mayport also recommends that COMHSMWINGLANT encourage further research into the use of enlisted rates as the primary operators of the Fire Scout. If found to be a viable alternative, the use of enlisted personnel should alleviate the need for dual rated aircrews, and could reduce the potential degradation of aircrew proficiency.

3. Recommend conducting a site survey of existing training facilities.

Team Mayport agrees with the recommendations of NAVAIR that training facilities for the Fire Scout program should be co-located with the Fleet Replacement Squadrons. This training can be conducted post traditional FRS, but remain under FRS cognizance. The training timeline for VTUAV is expected to shorten, thus reducing the impact on FRS resources, and alleviating the impact on detachment IDRC. CNATTU is scheduled to assume responsibility for administering maintenance training. Once maintenance training is turned over from Northrop Grumman, CNATTU should continue with this pipe line and routinely train maintenance personnel. Therefore, Team Mayport recommends that COMHSMWINGLANT conduct a sight survey of existing Wing training facilities to determine the feasibility of creating additional space for VTUAV training devices, to include computer based trainers and simulators.

4. Review VTUAV operations mid-deployment.

More data is needed regarding Fire Scout shipboard operations and HSM/HSL deployments. This data should be available following HSL-42 Detachment 7's deployment aboard USS McInerney. Team Mayport suggests a mid-deployment evaluation of manning, operations, training, and maintenance issues to determine the effectiveness of current detachment planning. This data will be vital for developing future iterations of the VTUAV CONOPS.

5. Create a Post Deployment Lessons Learned.

Team Mayport recommends developing a comprehensive list of lessons learned during and following Detachment 7's VTUAV deployment. This will provide COMHSMWINGLANT, and HSM/HSL detachments with valuable information for future Fire Scout incorporation.

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APPENDIX A: INTERVIEWS

The following represents a summary of interview questions and answers from AVDET and shipboard personnel.

How do you compare Fire Scout with LCS Manning vs. our manning levels?

Currently LCS is planning on using 4 pilots/2 HACs.
FFG CONOPS will use that same setup as a 2 plane detachment set-up; the plan is to use 6 Pilots with 2 as HACs.

Will detachment manning levels be an issue?

- Pilot manning is not a critical issue; AW numbers could be the only constraint.
- Berthing constraints are possible but we are not considering duration currently; we are going out to prove if the CONOPS will work.

What potential problems do you anticipate?

- Problems include restrictions to blue water ops, 6 hour cycles, RAS casualty, and corrosion
- The UAV will have FLIR/laser (Brite Star II).
- Reliability is unknown as well as parts, but a tech rep will be along for the cruise, reliability is probably the biggest unknown but it does its own FCF.
- Weather issues might be a problem; how will we avoid WX and what effect will it have on the Fire Scout?

Can you accommodate 3 UAVs?

- Probably not enough space for the 3 Fire Scouts when you include the PUK and HAZMAT; additionally not sure if why you would use 3 Fire Scouts.

How does the maintenance cycle affect your detachment?

- Engine life is an initial constraint, 300 hour limit (currently) but working on 600 hour increase.
- Basic maintenance phases are assumed and a tech rep will be along for this first deployment.
- Battlegroup ops are also a concern as well as the loading and unloading of parts and equipment.

Is the ship ready for Fire Scout?

- Currently the ship is outfitted with a COMMS package and should be ready for the UAV, this ship was set for decommissioning but after the waiver was granted it was picked for VTUAV.
- Again, Pilot manning should be good, probably a 3 section duty with overlap.

What role do you envision for Fire Scout?

- VTUAV will save a lot of time for shadowing targets and random launches on targets.
- Training should not be a factor, very limited time during training.
- Future Romeo will be flown less resulting in lower cost per hour (60-80hr/month).
- Planning for unforeseen events like medivac makes 6 pilots ideal.
- SOP generation is currently in the works.

What training changes should be done shipboard; what should be done concerning boat operations?

- Currently no operational necessity on the upcoming detachment giving greater flexibility to use Fire Scout.
- Lots of unknowns regarding how the Fire Scout will be used during the deployment
- Concerning VTUAV, an A-Sheet will get signed by a qualified AVO (pilot); authority can be transferred in flight. Feedback has been that AVO operations can be very fatiguing and this will impact the usable time of UAV operators.

Is the AVO role going to be seen as negative for pilots?

- AVO operations will probably not be as negative of a job for pilots as for AF pilots who fly only UAVs for a tour. The VTUAV is only a secondary aircraft to operate and pilots will still be flying the H-60, it will probably be a needed break from flight operations.

Will the PUK be an issue?

- No PUK issues currently, but some concerns regarding HAZMAT. Currently the H-60 and UAV are not using the same HAZMAT; this might create storage problems in a limited space HAZMAT locker. We are looking into what HAZMAT can be consolidated.
- No current planned UAV rotation; maintenance phases will probably determine cycle. The Fire Scout is not a marinized airframe; it could have major corrosion issues; it is not an all WX platform either.

How does this affect your training cycle? Work-ups?

- Current UAV training involves 40 days for an AVO and 12 days for a MPO at PAX River.
- Ship might be having manning issues regarding general personnel.

How will squadron training be affected?

- The test group has a very constrained training cycle. In the future it might be tough for 2Ps to balance A/C and UAV cycles; we will need more HACs for the upcoming deployment to allow for the steep learning curves for the UAV. This brings up a huge concern for training 2Ps, how pilots will handle learning two aircraft at the same time. With the new Romeo training anticipated to be more challenging.

Is a NATOPS available?

- Currently still writing NATOPS.

Where is the GCS?

- GCS is not in Hanger it is in the STIR equipment room; there seems to be plenty of room in this compartment for added personnel to observe and train on the equipment.

Can you envision shipboard personnel operating the equipment?

- AW/MPO role could be interchangeable with shipboard members probably not yet ready to replace the AVO position considering airspace knowledge and the OPNAV 3710 requirements.
- Crew rest for the UAV is the same as for the aircraft.
- Not very concerned that this will replace the aircraft in its current form. The laser role will be a major asset, and future sensor packages will be an even greater asset.

Will you have any issues accommodating manning for detachments with Fire Scout on the FFG?

- No issues with manning of FFG currently; there is space available for the detachment size, limitations will be female berthing arrangements

What problems are you currently anticipating with Fire Scout?

- Currently we anticipate fueling issues; the problem is with dissimilar pressure requirements of the Fire Scout and H-60, this is being discussed with PMA-266.
- Rotor arc and ground pad concerns are also a factor, maintenance and ship crew who are not familiar with these things; it will take time to adjust for the differences.

What are your biggest issues getting ready for Fire Scout?

- Desire to test and adapt new SOPs.
- Larger impacts to the crew will come during operational testing.

What operation impacts will the Fire Scout program have?

- Tactically this is a huge advancement.
- OTHT will be a key addition when added to the sensor package.
- 24 hour coverage is the current hope, but the mission and environment will dictate this.

Do you foresee any manning issues for the deployment?

- No manning issues currently for either air detachment or shipboard personnel.
- We anticipate a possible DDG integration in the future with unique manning concerns.
- Foresee in the future that pilots will not be necessary to operate the UAV because of automation; could easily see the use of shipboard personnel operating the UAV in the future.
- Use of the word “fly” is not necessary – paradigm shift.

How to you like the location of the GCS?

- No issues with GCS. The STIR equipment room provides an excellent space, well located and plenty of cooling for equipment; best space might be CIC, but this is a good second.

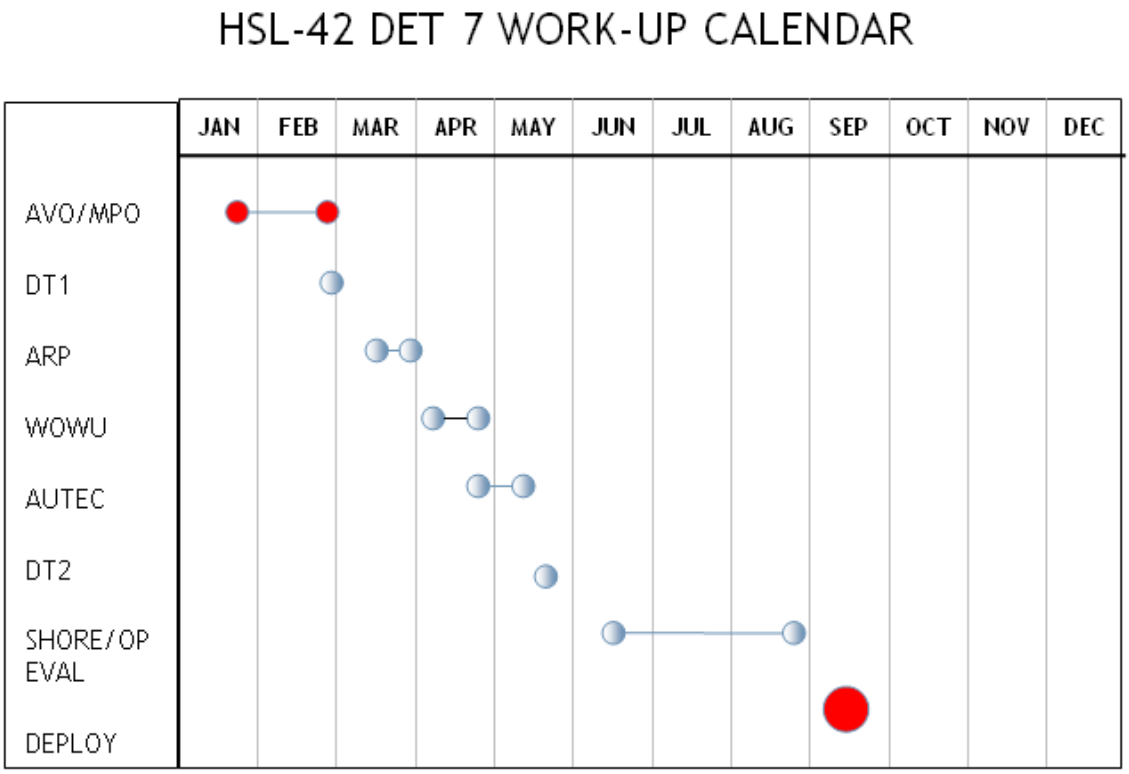
Do you have any concerns with HAZMAT or PUK storage?

- HAZMAT is not seen as an issue, probably over carrying current supply.
- The PUK is probably not a size problem but it will require creative storing; all the equipment might not be stowed in the same location.

Do you have any concerns with the location of the UCARS antenna or other equipment?

- The UCARS antenna is a single point failure and we are looking at putting another UCARS antenna aft to add redundancy; UAV recovery is less extreme; if the UAV loses the ship, it will meet up at location and try a UCARS capture-only. Issues will be coordination of a feasible recovery zone. More data points are needed and will be recorded on first watch.

APPENDIX B: HSL-42 DETACHMENT 7 WORK-UP CALENDAR



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