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Littoral Combat Ship (LCS) Civilian Aviation Alternative Support Study:
Report of Findings and Recommendations

30 July 2006

by

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Prepared for: Naval Air Systems Command, Aviation/Ship Integration AIR 1.2 FY-03/04 LCS Logistics Footprint Assessment Program and Naval Postgraduate School, Monterey, California 93943

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Abstract

In response to a request by NAVAIR Aviation/Ship Integration AIR 1.2, this study performed a Civilian Contractor Workforce and Skill/Qualification Assessment for an LCS Composite Aviation Detachment. The Chief of Naval Operations (CNO) Human Capital's transformation vision mandates that the total number of personnel required to operate a Littoral Combat Ship (LCS) not exceed 75. However, the projected personnel requirements for the three principal components of the LCS deployment profile, i.e., the ship's crew, the aviation detachment and the Focused Mission Package detachment, combine for a significantly higher number. An in-depth analysis of collected data and information indicates that employing contractor personnel to conduct or support combat missions on board LCS or any other Navy combatant is impracticable and contrary to the international laws of armed conflict. However, contact with Navy aviation civilian contractors and US Coast Guard helicopter personnel indicates that significantly fewer active duty personnel might be required to operate and support embarked aircraft within the LCS aviation operations & maintenance profiles using NAVAIR's preliminary assumptions and "Sea Base" concept as delineated in the LCS concept of operations.

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About the Authors

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James Loadwick, a civilian contractor, is a graduate of Purdue University, with a degree in Metallurgical Engineering, and holds a Master's of Science in Education from Old Dominion University. While on active duty, he was the Assistant Deputy Director, Surface Ship/Staff Manpower Requirements (Code 41) at

NAVMAC. There he earned a designation as a proven Manpower Sub Specialist. Prior to that, he was Executive Officer on USS Caloosahatchee (AO 98). Subsequent to his retirement, he co-authored with the AmerInd team lead a DDG 51 Class Manpower Optimization Study for PMS 400F, assisted in development of the Navy's revised OPNAV 3500 Series Required Operational Capabilities and Projected Operational Environment (ROC & POE) instructions for: amphibious class (LHA, LHD, LSD, LPD, LST), combatant class (CG 16, CG 47, DD 963, DDG 51, FFG 7, PHM 1, PG 1), command class (LCC 19 & 20, CG 26, AGF 3), and CV/CVN class ships; assault craft units (ACU 2, ACU 4 & 5/LCAC); and select staffs (TACGRU 2, NAVSPECWARCOM, BCHGRU 2, EOD 2, MDSU); served as a principal analyst on AmerInd team conducting staffing studies of Joint Interagency Task Force East (JIATF East), Key West, FL and JIATF South, Howard AFB, Panama Canal Zone and acquisition support on-site as a member of Team 17 for LPD 17.

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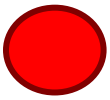
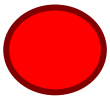
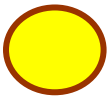
Executive Summary

During the course of the NAVAIR Littoral Combat Ship (LCS) Alternative Aviation Study (LCS AAS), NAVAIR/1.2–2004/004 dated 28 May 2004, a recommendation was made to pursue LCS aviation-related concept of operations (CONOPS) alternatives. In an effort to explore "out-of-the-box" aviation alternative-support profiles, NAVAIR commissioned the Naval Postgraduate School (NPS) to provide a manpower study based on civilian configurations for aircrew and maintenance/administration support for a composite LCS aviation detachment. NPS was also tasked to identify legal and institutional constraints to implementing this option. This study provides the assessment of viability for various alternative arrays:

Table 1. Feasibility Summary

Configuration	Risk	Viability
Contractor Aircrew Contractor Maintainers		Not Feasible
Military Aircrew LCS Contractor Aircraft Maintainers		Not Feasible
Sea Base Contractor Aircraft Maintainers		Possible

Primary references are listed in Appendix A. The basis for this study are the data analysis, conclusions and recommendations contained in the NAVAIR LCS Alternative Aviation Study (LCS AAS), NAVAIR/1.2–2004/004 dated 28 May 2004, the NAVAIR Littoral Combat Ship (LCS) Aviation Logistics Footprint Assessment, NAVAIR/1.2 – 2004/001 (Rev 0) dated 3 November 2003 and various meetings and

contact with activities that could provide material on civilian aviation operations and support in a military environment. As stated in those references, and, in view of lack of actual operational maturity of the MH-60 S/R Type/Model/Series (TMS) helicopters, RQ-8 VTUAV, Focused Mission Package (FMP) equipment, and inability to directly correlate contractor operations and maintenance skills to military MH-60 Series aircraft from empirical data, a confidence factor for the number/quality of proposed alternative full or partial detachment manpower is 80%. This confidence factor is based on the subjectivity of experience possessed by the surveyed personnel and their consistent success in maintaining A_0 approaching or at 100%.

Because of the scope of the contract tasking and urgency for completion, this study utilized a standard Operational Audit (OPAUDIT) approach, wherein a comparative analysis process was employed during on-site visits to collate data from various aviation organizations. The NAVAIR LCS AAS Military Detachment manpower study results were compared to the following Navy helicopter contractor support and United States Coast Guard helicopter aviation activity:

- Geo-Seis Helicopter, Inc. forward-deployed detachment support to Military Sealift Command (MSC), Vertical Replenishment (VERTREP) logistics operations, operating SA330J PUMA Transport helicopters.
- L-3 Vertex Aerospace. TH-57 Sea Ranger helicopter aircraft maintenance support for Chief of Naval Air Training, Training Air Wing 5 Command, Naval Air Station Whiting Field, Milton, FL.
- United States Coast Guard (USCG), HH-65, ATC Mobile, AL helicopter aviation detachment operations in support of USCG cutter underway operations.

Oaths & Other Legal Constraints

Paramount to this study are existing differences in both the legal and mission arenas for aviation detachment combat mission support for the three LCS Focused Mission Packages (FMP) to conduct littoral ASU, ASW and MIW operations. Military officer and enlisted personnel serve under oath and are not subject to contract stipulations or clauses that enable contractors to “resign/quit” on short notice. Applicable military oaths are:

- Officer Oath: I, ___, do solemnly swear (or affirm) that I will support and defend the Constitution of the United States against all enemies, foreign and domestic; that I will bear true faith and allegiance to the same; that I take this obligation freely, without any mental reservation or purpose of evasion; and that I will well and faithfully discharge the duties of the office on which I am about to enter. So help me God.[1]
- Enlisted Oath: I, ___, do solemnly swear (or affirm) that I will bear true faith and allegiance to the United States of America; that I will serve them honestly and faithfully against all their enemies whomsoever; and that I will obey the orders of the President of the United States and the orders of the officers appointed over me, according to regulations and the Uniform Code of Military Justice.[2]

This statute was the first post–World War II legislation on the oath, establishing the Uniform Code of Military Justice to unify, consolidate, revise, and codify the Articles of War, the Articles of Government of the Navy, and the Disciplinary Laws of the Coast Guard. Section 8 identified a standard oath for all enlisted personnel.[3]

These oaths may be the biggest roadblocks to the use of contractor aircrew and/or maintainers to perform or support military combat missions. Contractor personnel would not be subject to military law, discipline and punishment.

The Geneva Convention and the applicable Hague Conventions tend to address a dichotomy of military and "civilian" personnel. As warfare is now evolving,

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[1] Congress, *Officer Oath,* 40th Congress, 2nd Session, 11 July 1868, Chapter 139.

[2] Congress, *Enlisted Oath*, 81st Congress, 2nd Session, 5 May 1950, Chap. 169 (Public Law 506).

[3] Lt Col Kenneth Keskel, "The Oath of Office—A Historical Guide to Moral Leadership," *USAF Air & Space Power Journal* (Winter 2002): http://www.airpower.au.af.mil/airchronicles/apj/apj02/win02/keskel.html.

"contractor" personnel seem to fall into an ambiguous zone between those two definitions. That is, in some cases, personnel may be acting as "Contractor Warriors" as opposed to civilian non-combatants or belligerents in rebellion or self-defense. These new Contractor Warriors may not be afforded any protection under the conventions. For instance, according to the OPNAV Judge Advocate General's office,[4] if personnel currently operating the Central Intelligence Agency (CIA) Predator armed unmanned aerial vehicles (UAV) are contractor civilians and were captured by the enemy, they could be tried as spies rather than held as prisoners of war (POW). If a similar status applied to contractor aircrews for an LCS, it would inhibit recruitment/hiring of employees. Furthermore, so as to not indicate that the "civilians" in this report may be government employees, all personnel will be referred to as either "military" or "contractor."

The JAG further indicated that the Civilian Mariner (CIVMAR) Deck, Engineering and Supply Departments on board or scheduled for manning the number fleet commander command ships has necessitated that "*the Navy pursue legislation that would make reserve affiliation a condition of employment such that the mariners could be activated during armed conflict*." It is assumed that this legislation is only for Military Sealift Command (MSC) CIVMARs and will not be applicable to contractor civilians. Therefore, JAG's conclusion that:

> Per DoD policy and guidance, civilians are an integral component of the DoD total force structure and may be deployed. That said, civilians who directly or actively participate in hostilities do not have combatant immunity and may be prosecuted for crimes under the domestic laws of foreign nations. Civilian mariners and aircrew could also be considered unlawful combatants and could be prosecuted for violations of the law of armed conflict, coupled with their aforementioned findings, negates any immediate potential for employing civilian contractors in either the operator or maintenance roles onboard a

[4] Office of the Judge Advocate General (International and Operational Law Division), "LCS Civilian Aviation Support Study; Responses to Questions Posed," 12 August 2004.

LCS. However, these findings may leave the door open for contractor civilians to provide logistics and maintenance support in a Sea Base as long as that Sea Base is not embedded within the CSG or ESG onboard warships.

Ordnance/Weapons

Also significant is the performance/certification to handle and employ ordnance in support of the LCS FMPs:

- Aircrew release/use of weapons during offensive and defensive operations will have to be within the Rules of Engagement (ROE) and independent of direct control of a separate military entity. That is, the pilots and other aircrew members will be shooters. Discussion with civilian pilots currently under a Navy logistics contract indicated they would be most reluctant to engage in this type of tasking. There are no apparent skill qualifications/certifications in the Federal Aviation Administration-Federal Aviation Regulations (FAA/FAR)-certified Air Transport Pilots (ATP) process for weapons employment.

- Flight deck weapons/ordnance evolutions. The aviation detachment must prepare/secure and load/offload helicopters/VTUAV weapons and other ordnance, which is usually performed by aviation ordnancemen (AO). Aircraft mission weapons/ordnance configuration changes may be required when FMPs change for the MH-60 R helicopters. There are no apparent skill qualifications/certifications in the FAA/FAR Airframe and Powerplant (A&P)-certified mechanic process for ordnance preparation and handling. While it is possible that a contractor could hire previously Navy-certified personnel (retired or recently discharged), they would essentially be the same as active duty AOs in the sense that they would not be able or authorized to perform any of the A&P mechanic's functions/tasks; therefore, there would be no billet/position savings.

Aircraft Types

The MH-60S aircraft associated with LCSs will probably be dedicated MIW aircraft in squadrons HM-14/15 that are likely to deploy on ship classes other than the LCS, particularly the LPD-17 class (in lieu of amphibious operations). The MH-60R will be a multi-mission aircraft that will support missions launched from LCS, DDG or CG classes. The MH-60R squadrons will be force providers that will furnish detachments to all of the aviation-capable surface ships. In these operational

contexts, it is unlikely that a MH-60S or MH-60R squadron would/could have a mix of contractor and military crews that would support multiple platform types. The VTUAV elements, which are supposed to be capable of autonomous operations from all air-capable ships, will be part of each MH-60R/S composite squadron. This study makes no effort to determine what squadron manpower requirements would be for any squadron type, but offers these scenarios up as another "sanity-check" consideration.

Contracting

Using a "contracted" organization poses addition considerations for a combatant. An industry firm could choose to simply abandon the contract and pay any penalties associated with that action. Or it could go bankrupt or out of business. It could also fail to perform in accordance with the contract specifications, particularly if it grossly underbid the contract and had to hire sub-standard personnel to meet costs. If there were difficulties or disagreements among aviation detachment, the FMP element and the crew, those matters might have to be referred to the contracting officer's technical representative (COTR), contracting officer, officers of the firm and, possibly, the respective military and industry legal staffs for resolution.

Security Clearances

Current contractor flight crews flying on MSC ships require SECRET clearances because the aircraft carry SECRET IFF code transponders. This has not posed any difficulty for execution of that particular support contract, even with some foreign citizen pilots included in the contractor detachments. However, flying combat missions on LCS will demand TOP SECRET clearance for the aviation detachment OINC and perhaps the pilots, particularly to support Force Protection operations.

Cultural/Organizational Change

There do not appear to be any significant cultural or organizational roadblocks to mixing active duty military and contractor civilians other than those mentioned in

the squadron employment discussion above. Existing mixes of military and civilian appear to be working very well from both parties' perspectives.

There may be some benefit to exploring the cultures used by GSH and the Coast Guard to support their respective aircraft in similar scenarios to that envisioned for LCS. That is, both of these organizations embarked fully ready aircraft with two pilots and two mechanics for each aircraft, but for very limited missions. (The Coast Guard's aviation detachment requirements are rapidly evolving upwards as Homeland Defense missions are beginning or are maturing. Coast Guard experience cannot be readily extrapolated to an LCS-like profile because of the lack of experience with FMP mission intensity and complexity.) They then conduct operations ranging from several weeks to several months relying on augmented help from shore when emergent problems are encountered. It is recognized that the aircraft scheduled for LCS are more complex both in their equipment, missions and ordnance requirements than Coast Guard aircraft, but one would think that the general maintenance personnel requirements actually on the LCS could be somewhat reduced using similar organizations and cultures.

Conclusions

- Legal constraints for employment of Contractor Warriors in combat or combat support roles on a combatant (warship) will preclude their use.
- There may be an opportunity to use civilian contractor personnel at the Sea Base to support aviation maintenance.
- Another avenue to reduce aviation maintenance support manpower requirements may be to employ Sea Warrior consolidation of aviation skills/ratings in combination with robust, readily available support from the Sea Base.

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I. PRINCIPAL ENTERING SUPPOSITIONS

1. All aircraft are provided by the Navy.

2. The maintenance and support workload is the same as in the NAVAIR study, i.e., a contractor maintenance element would have to perform the same maintenance procedures and associated maintenance administration as a military element.

3. All parts and material (including pack-up kits (PUK)) will be furnished by the Navy.

4. The MH-60 R/S helicopters will not have any inherent design flaws that create exorbitant maintenance loads.

5. All maintenance other than routine daily, weekly and corrosion control will be performed by the Sea Base (whether it be a Carrier Strike Group (CSG), Expeditionary Strike Group (ESG), shore-based support, or a yet-to-be-designed floating support base).

6. All helicopters and vertical take-off unmanned aerial vehicles (VTUAV) will launch with ordnance for all FMP mission flights.

7. Force Protection intelligence material will require operational personnel to have TOP SECRET (TS) security clearances. The CONOPS also indicates that the LCS may have a Sensitive Compartmented Information Facility (SCIF) to support non-FMP missions. That capability could portend a requirement for the aircrew pilots to have TS SI clearances, though that seems unlikely at this time.

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II. GEO-SEIS HELICOPTER, INC. 8-9 JUNE 2004 MANAGEMENT OPAUDIT ASSESSMENT

This preliminary Contractor Workforce and Skill/Qualification Assessment used the NAVAIR LCS Alternative Aviation Study (LCS AAS), NAVAIR/1.2–2004/004 dated 28 May 2004 report as a baseline, employed the OPAUDIT comparative process, and was conducted during an on-site visit 8-9 June 2004 to Geo-Seis Helicopter, Inc. (GSH) headquarters in Fort Collins, CO. Additional material was collected from Geo-Seis before and after the visit by e-mail. In view of the GSH contract with Military Sealift Command (MSC) and AmerInd contract support of this NPS/NAVAIR LCS Civilian Alternative Aviation Support study, a prior Non-Disclosure Agreement (NDA) was established, and the meeting was approved by both MSC and NPS. GSH was provided advanced copies of both the November 2003 and May 2004 NAVAIR LCS aviation studies. Appendix B is a detailed synopsis of the information exchanged and overview of GSH support to MSC at-sea VERTREP operations. CDR William Hatch, NPS COTR, joined AmerInd analysts during the June 8th portion of the survey. Based on all original NAVAIR LCS AAS assumptions and additional qualifying statements, data obtained is subjective in nature. Appendix C details occupational/skill standards from the Federal Aviation Regulations (FAR).

1. Survey Objectives:

- Discuss Contractor Aviation Detachment support for Military Sealift Command (MSC), Combat Logistics Force (CLF) operations.
- Discuss certification requirements and US Law for combat-support missions.
- Obtain a Geo-Seis estimate of manpower requirements for a LCS Aviation Detachment based on operating/mission criteria in references (a) and (b).
  - **Option 1—**Full Contractor Air Crew and Contractor Support Detachment
  - **Option 2—**Contractor Aviation Maintenance Detachment, Military Air Crew

2. MSC Contract Support Summary (JAN 00 – DEC 03 extended to end FY04)

A. Equipment: Two French SA330J Puma's forward deployed to MSC ships.

- One standby Puma is available and is held in reserve to replace deployed asset if required. Replacement occurred once during contract period
  - No personnel casualties
  - No cargo lost
  - No impact to operational availability (A_o)
- Puma capable of lifting four-pallet external loads—for a maximum ≤ 6,000 lbs. Number of pallets per lift dependent on weight. Puma certified for internal mail and passenger transport. Designed for maximum of 19 passengers, standard per contract is 9. Contracting Officer can waive for full capacity.

  Note: Puma maximum design on-hook load is 7,000 lbs.

B. Manpower: Fifteen-person detachment supports deployments, comprised of two seven-man aircrews plus one avionics-certified mechanic (floater).

Note: Contractor manpower is based on experience from multi-tasking skills obtained over a period of years.

- Four pilots (Chief + three) per crew:
  - Federal Aviation Administration/Federal Aviation Regulations (FAA/FAR)-certified Air Transport Pilot (ATP)
  - All current pilots certified Pilot-in-Command (PIC)
  - ***Note: Second-in-Command (SIC) ATP pilots can be used as co-pilots to sustain multiple detachments. SICs qualify as PICs within six months of their initial deployment.***
  - Certified/trained in USN/MSC VERTREP
  - Average 10,000-12,000 flight hours (Chief ~20,000 hrs)
  - Average 3,000-4,000 hours external VERTREP Load time
  - Passenger & mail certified
- Three mechanics (Lead mechanic, + two) per crew:

- FAA/FAR Airframe and Powerplant (A&P) certified
- All A&P mechanics Helicopter Control Officer (HCO) and Landing Signal Enlisted (LSE)
- One A&P (avionics-certified mechanic) per two aircrews.

- No weapons or ordnance-handling certifications currently allowed by MSC based on legal interpretation of US and International law.
- All employees must obtain a SECRET-level clearance in accordance with MSC/USN criteria.
  - Outsource foreign nationals for some pilot and mechanic jobs

C. Operations: Aircrews rotate every six weeks to operate and maintain embarked helicopters.

- 14-hour duty day for pilots and mechanics
- Actual flight crew comprised of two pilots ONLY
  - Pilots electrically control Hook/Cargo release, with manual cable back-up and explosive device for emergency release (if required).
  - Installed mirrors assist pilots in cargo placement.
- Single A&P (avionics-certified mechanic) embarks every other rotation (routine maintenance) or as required (corrective maintenance)
- HCO (ship-certified HCO is as-required back-up), LSE, chock and chain handlers provided for all operations and safety.
- All maintenance performed aboard ship inclusive of engine, rotor, and other equipment change when required. Factory support provided if necessary. ***Note: Pumas have operated entire four+ years with all maintenance performed afloat. No phase maintenance to date.***
- Detachment flight hours average 25-30 hours per month versus USN active detachment ~50 hours per month. Delta based on two factors:
  - Only one civilian detachment contracted to fly. Provide 4 of 12 USN helicopter missions/capabilities as annotated below:
    - Contracted:
      - Search & Rescue (SAR)
      - VERTREP/VOD

        - IFR
        - Passengers and mail
      - Not contracted:
        - Anti-Terrorism/Force Protection (AT/FP)
        - Mine Warfare (MIW)
        - Surface Warfare (SUW)
        - Undersea Warfare (USW)
        - Missions of State (MOS)
        - Naval Special Warfare (NSW)
        - Non-combatant Operations (NCO)
        - Night Vision Goggle (NVG)
      - USN expends hours for flight training and proficiency.
        - Contractor pilots' average experience is 10,000-12,000 flight hours; they are highly proficient in T/M/S. VERTREP proficiency attained quickly based on transference of industry skills (oil platform, forest fire, civilian SAR, etc.) and pairing ATP pilots with former military pilots.
  - Surge Capability—Standby detachments provide the surge while additional pilots and mechanics on a waiting list are hired and trained for Puma operations and maintenance.
- <u>Detachment Operations, Safety, and Maintenance Reports</u>:
  - Daily Flight Sheets
    - All maintenance performed
    - Fuel & oil samples taken/results
  - Weekly Rest and Duty Report
  - Weekly Flight Hours for Pilots and All Operations
  - Weekly Safety Report—Summarizes daily safety meetings on operations, maintenance planned, and issues arising for entire detachment
  - End-of-the-Month Report
    - Hours flown
    - Maintenance hours flown

        - Tonnage, passengers and mail transferred
    - Anomaly Reports—As occurring for any abnormal operation.
- Pilot Training:
    - Federal Aviation Regulations (FAR) 135 for passenger operations and 133 for cargo operations
        - Annual pilot FAR 135 IFR flight and ground school refresher
        - Proficiency training with "standby" Puma based in Colorado—employed for fire fighting in western states
    - Weekly pilot proficiency in/out of cockpit on deck
    - Semi-annual pilot IFR proficiency flight
    - Onboard computer for IFR proficiency training.
- Mechanic Training: Mechanics average 15 years of experience, are proficient in repair of several types of aircraft and are capable of performing field maintenance without supervision.
    - Mechanic indoctrination and qualification
    - Three-week factory school in the SA330J Puma
    - Mechanics are signed-off for all maintenance procedures by the lead mechanic onboard the ship (on-the-job training)
    - Maintenance procedures manual (training)
    - General knowledge tests

3. Estimate of Manpower Requirements for an LCS Aviation Detachment

A. Contractor Maintenance Function Only Suppositions:

- One MH-60 R/S helicopter provided by USN
- Three R-8 Fire Scout (or similar VTUAVs) provided by USN
- Pack-up Kits (PUK) provided by USN—complete with parts A & P-certified mechanics able to maintain or repair (Requires separate determination of any variation from USN)
- All parts readily available when needed (Comparison of contractor logistics support vs. USN recommended)

- USN-provided MH-60 airframe, powerplant, avionics training
- Mechanics' wages are commensurate with industry standards; plus, they receive a performance bonus.

Table 2. Maintenance Support Only

Type Mechanic	Single MH-60 R or S	Three RQ-8 VTUAVs	Comments
A & P	2	2	Certified in type aircraft or VTUAV
A & P w/ Avionics	2	2	Certified for type aircraft avionics
Sub Total	**4**	**4**	
Grand Total	**8**		

B. Contractor Detachment Pilots and Maintenance Suppositions:

- Legal Constraint: Contractor pilots authorized to fly armed helicopters, release ordnance authorized by military chain of command. ***Note: Possible option of military for ordnance release and civilian PIC for search missions.***
- USN maintains and loads all ordnance for Focused Mission Packages (FMP) ***Note: Civilian technicians with prior military experience could be certified for ordnance handling and loading—USN would retain storage and build-up responsibility at ship/shore locations.***
- One MH-60 R/S helicopter provided by USN
- Three R-8 Fire Scout or similar VTUAVs provided by USN
- Pack-up Kits (PUK) provided by USN complete with parts A & P-certified mechanics able to maintain or repair (Requires separate determination of any variation from USN)
- USN-provided flight training for MH-60 R/S airframe
- USN-provided flight training for RQ-8 Ground Control Unit (GCU) operation of VTUAV
- USN-provided training for all MH-60 airframe, propulsion and avionics maintenance

- Pilots' wages are commensurate with industry standards; plus, they receive a performance bonus
- Mechanics' wages are commensurate with industry standards; plus, they receive a performance bonus
- Hiring and use of former or retired aviation ordnancemen (AO) feasible

Table 3. Aircraft Operation and Maintenance

Air Crew Functions	Single MH-60 R or S	Three RQ-8 VTUAVs	Comments
ATP Pilot	4	N/A	Certified MH-60 R&S
ATP Pilot	N/A	5	Certified R-8 GCU
A & P	2	2	Certified in type aircraft or VTUAV
A & P w/ Avionics	2	2	Certified for type aircraft avionics
Sub Total	**8**	**9**	
Ordnancemen	**2**		Former/retired AOs
Grand Total	**19**		

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III. L-3 VERTEX 25 AUGUST 2004 MANAGEMENT OPAUDIT ASSESSMENT

A second Contractor Workforce and Skill/Qualification Assessment, using the OPAUDIT comparative process, was conducted during an on-site visit 25 August 2004 to L-3 Vertex Aerospace, Inc. at the company's TH-57 Sea Ranger maintenance facility, NAS Whiting Field, Milton, FL. L-3 Vertex Aerospace had executed the maintenance-support contract for the TH-57 aircraft inventory for the past five years and is currently awaiting late release of the RFP for a new contract. A Non-Disclosure Agreement and Visit Clearance Request were executed prior to the visit.

The Sea Ranger provides advanced IFR-level training to several hundred USN/USMC and USCG aviation students a year under COMTRAWING 5, Chief of Naval Air Training (CNATRA).

1. Objectives:

   A. Discuss Contractor maintenance support for CNATRA.
   B. Discuss certification requirements, US Law for combat support missions.
   C. Obtain Vertex estimate of manpower requirements for an LCS Aviation Detachment, based on operating/mission criteria in references (a) and (b). Option 2—Navy Aircrew, Contractor-Provided Maintenance Support

2. Summary of on-site data exchange:

Basis:	CNO-driven LCS Total Manpower	= 75
	Crew	~ 45 currently
	MIW	~ 35
	Composite Air Det	~ 34
	Total	= 114
	Excess	= 114 – 75 = 39

Manpower analyses separate for three segments (Ship, Focused Mission Packages (FMP), Av Det) using traditional “stovepipe” studies.

Overview of GSH visit, observations and Vertex comments:

- OJAG validated that contractors cannot provide Combat Mission aircrew.
  - Pilot Navy CIVMAR manning of USS Coronado engineering, supply and deck departments possesses potential conflict if the ship’s role as SEVENTHFLT Flag Ship takes her into combat.
- Vertex: Civilians can support armed aircraft in the maintenance-only role. Legal aspect of a ship being in an active combat role differs from current Iraq War support outside of combat zones for Army. Vertex has provided short-duration maintenance support afloat for aviation operation qualifications in a peacetime non-combat environment.
- LCS CONOPS indicates that operations are likely to include a minimum of two ships up to a maximum of six in division-level operations.
- Contract Costs: GSH maintenance-only manpower, with USN providing aircrew and ordnance functions, may result in ROM with higher direct costs then a military-only option.
  - Indirect costs for insurance, etc., may drive contract too high.
  - History shows contractor costs less in the long run. Cannot use cost of deployment only—must look at system lifecycle cost.
  - For 2-to-6-ship operation, benefits would be achieved—rotation of personnel from port base would be optional.
- Vertex: Contractor must utilize Defense Base Act, Longshoreman and Harbor Worker’s Compensation Act, Hardship Differentials and Danger pay.
- Vertex: L-3COM has contract personnel in Iraq; mechanics starting at $40K in CONUS would be offered about $80K; higher amount “incentive”

pay to obviate insurance, etc., to some degree. Government should consider self-insurance for contractor's indemnification—to lower insurance cost. Also, add Clause 252.228-7000 Capture and Detention, and Clause 252.225-7043 Antiterrorism/Force Protection for Defense Contractors outside the United States.

3. Use of LCS contract civilian operators and/or maintainers for the MH-60R would likely have Navy-wide impact since the MH-60R squadrons will support cruiser- and destroyer-type ships as well as LCS.
4. 100 hours for an MH-60 and 150 hours for 3 RQ-8 VTUAVs over 14 days is an intense level of operations.
5. Ordnance certification requires a technical team leader and QA/SO.
6. L3 to provide: "High-level estimate of maintainers to support both aircraft during 14-day period. Assuming aircraft are 100% ready at the start."
7. Vertex – airframe maintenance supportable and is not the manpower driver. Major driver is 12-on/12-off schedule. Contractor unionization is possible issue.
8. Military vs. contractor civilian "gripe" resolution considered minimal, due to ISO 9001:2000 effectively fused into TH-57 organization and processes.
9. Attendees endorsed idea of having Navy COTR, similar to the Army approach, available remotely or embedded at LCS squadron or division level.
10. ROM estimate of Maintenance-Only Manpower Requirements—Based on H-60/TH-57 maintenance support expertise (Army at Fort Rucker, Navy at NAS North Island, and NASWF).

    A. H-60/VTUAV 14-Day LCS Deployment.

    - Single H-60 aircraft: 100 flight hours/14 days, 7.14 flight hours per day
    - 3 VTUAV aircraft: 150 flight hours/14 days, 10.71 flight hours per day

Assumptions based on a 12-hr fly day and notional deck cycle typical of flight operations (FOPS) aboard air-capable ships. Start/end of FOPS day is flexible. Shipboard scheduled maintenance limited to OEM/PMA special inspection requirements up to 7-day inspection (14 +- 3 days scheduled maintenance performed prior to embarkation).

- 3.5 hour per flight (cycle times can be adjusted as required)
- 1 Blade-spread aircraft maximum on-deck
- H-60 hot refuel and crew change SOP
- 2 VTUAV per day to complete 3 flights
- T&L is 30 minute period to turn-up aircraft, perform pre-launch checks and launch or for H-60 hot refuel and crew switch
- VTUAV preflight and stores wire checks complete prior to bringing on deck
- VTUAV re-launch assumes 2-hour post-flight, refuel, maintenance (if required), stores replenish/reconfigure, pre-launch checks and launch. If VTUAV is non-airworthy, vehicle must be folded, hangared and replacement brought on deck and launched within same timeframe.
- Contractor will not provide manpower to assist ship's company in H-60 or VTUAVs weapons assembly.
- Weapons upload/download and wire checks performed by contractor.
- Contractor will not provide support personnel for Ship's Company fire team or incidental support of compartment cleaning, messing etc.

H-60 support level-of-effort estimates are based on L-3 Vertex experience maintaining Navy H-60 aircraft. Lacking VTUAV-specific maintenance requirements, this maintenance level-of-effort is based on L-3 Vertex experience maintaining and supporting Navy TH-57 aircraft (similar size and complexity to Schweitzer 330 airframe on which the VTUAV is based). Manning estimates assume no phase, corrosion inspections, NDI or scheduled component removals will be performed aboard ship.

B. Below estimated composite detachment manning assumes cross training on both airframes in each billet.

SIXTEEN-PERSON COMPOSITE MAINTENANCE DETACHMENT

- Consists of a 9-person Flight Operations (FOPS) (usually day) crew and a 7-person maintenance crew with each shift working 12 hrs on/12 hrs off.

Table 4. L-3 Vertex Support Estimate

Position	Shift	Certifications and Qualifications
Team Lead	FOPS	Release Safe for Flight, Logs and Records
A&P Troubleshooter	FOPS	Release Safe for Flight, CDQAR, Plane Captain, Turn Qual
A&P	FOPS	CDI, Plane Captain, Load Team Member, Turn Qual
Avionics Technician	FOPS	Plane Captain, Load Team Member
Electrical Technician	FOPS	Plane Captain, CDI, Load Team Member
Aviation Ordnance	FOPS	CDI, Load Team Leader, QASO
Aviation Ordnance	FOPS	Load Team Leader, QASO
Plane Captain	FOPS	Plane Captain, Load Team Member
Plane Captain	FOPS	Plane Captain, Load Team Member
A&P IA	Maint.	Maintenance Lead, CDQAR, Turn Qual
A&P	Maint.	CDI, Plane Captain, Load Team Member, Turn Qual
A&P	Maint.	Plane Captain, Load Team Member, Turn Qual
Avionics Technician	Maint.	CDI, Plane Captain, Load Team Member
Avionics Technician	Maint.	Plane Captain, Load Team Member
Electrical Technician	Maint.	CDI, Plane Captain, Load Team Member
Electrical Technician	Maint.	Plane Captain, Load Team Member

- All assumptions and manning estimations are based on L-3 Vertex experience and data analysis and are the intellectual property of L-3 Communications Vertex Aerospace, Inc. The methodology and assumptions discussed may only be used for the specific purpose of estimating the LCS Aviation Logistics Footprint and may not be distributed outside of the US Government.

Tables 5 and 6 below portray the manpower estimates:

- NAVAIR Medium Risk
- Geo-Seis
- TH-57 (Support only)

Table 5. Summary Composite Air Crew Comparison

	All Navy	GSH		VERTEX	
		Civilians	Navy	Civilians	Navy
Pilots	8	4			8
Aircrew	5		5		5
Operators	3	5		2*	3
Maintainers	18	10**		14**	
Sub Total	34	19	5	16	16
Total	34	19 + 5 = 24		16 + 16 = 32	

* Plane captains/loaders

** Each number includes two former/retired AOs.

Table 6. Detailed Composite Air Crew Comparison

	Flight Crews						Maintainers		
USN Work Center	Single MH-60S Pilots and Aircrew			Three RQ-8 VTUAV Pilots and Operators			Composite Maintainers		
	USN	GSH	VERTEX	USN	GSH	VERTEX	USN	GSH	VERTEX
Pilots	5	4	5	3 Officers	5	3 Officers			
Air Crew	5 AW	5 AW	5 AW	3 Enl		3 Enl			2 Plane Capts/Loaders
	DAY SHIFT								
W/C 020							1 CPO 1 AZ	1 Lead A&P Mech	1 Lead 1 T/S
W/C 040									
W/C 110							2 AD	3 A&P Mechs - Avionics	1 A &P Mech
W/C 120							2 AM		
W/C 210							2 AT		1 A&P Avionic
W/C 220							1 AE		1 A&P Elec
W/C 230							1 AO	1 AO (ret)	1 AO (ret)
W/C 300									
	NIGHT SHIFT								
W/C 020									1 A&P Lead
W/C 040									
W/C 110							1 AD	4 A&P Mechs - Avionics	2 A&P Mech
W/C 120							2 AM		
W/C 210							2 AT		2 A&P Avionic
W/C 220							2 AE		2 A&P Elec
W/C 230							1 AO	1 AO (ret)	1 AO (ret)
W/C 300									
Total Navy	10	5	10	6		6	18		
Total Civs		4			5			10	16

	MH-60	RQ-8	Maint	Total AvDet
All Navy	10	6	18	34
GSH Total	4 + 5	5	10	5 + 19 = 24
Vertex Total	10	6	16	16 + 16 = 32

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IV. LEGAL AND INSTITUTIONAL CONSTRAINTS

1. Legal. As previous stated, paramount to this study are legal and mission-arena constraints that preclude contractors from performing in aviation detachment combat-mission or combat-mission support billets for the three primary LCS Focused Mission Packages (FMP) of ASU, ASW and MIW operations. It is reemphasized that military officer and enlisted personnel oaths are the fundamental essence for effective military operations in a combat environment and are not required for contractors. Under existing policies and business rules, contractors are only subject to the written contract stipulations or clauses and only verbal direction related to contract work, unless that direction could be construed as an illegal or unsafe action.

There are several challenges to replacement of a Sailor by contractors in combat roles. Per this study's research, no legislation or United States Code (USC) explicitly governs employment of contractor personnel in a combat role. Contractors have been and continue to be primarily utilized for technical support of equipment and systems (HW/SW), administrative, logistics, general security and other purely support roles governed by business practices. Specific constraints were gleaned from United States DoD Directives, Title Code, International law and conventions, and basic review of the LCS Civilian Aviation Support Study (CASS) concept by Office of Judge Advocate General (OJAG).

2. Civilians/contractors are not subjected to the uniform code of military justice (UCMJ) like regular Navy crewmembers except in time of a "Congressionally declared" war. They would need to be subjected to the UCMJ, as clearly stated in the fourth article of the seventh section of the Hague Conference. The crew must be subject to military discipline.[5]

[5] Available from http://www.yale.edu/lawweb/avalon/lawofwar/lawwar.htm, 3.

A. DoD Directive No. 1400.25 “DoD Civilian Personnel Management System” provides overarching policy. It references all Title 5, 10, 32, etc., United States Codes and regulations to govern Civil Service, and is indirectly applicable to contractors. Contractors filling or directly supporting Civil Service functions would be governed in principle (although not literally) by Code or Regulations, based on the level-of-effort contracted. It is complex, cumbersome and fuels the cost of for contract services. This, in turn, provides a vague but defined linkage to the seventh section of the Hague Conference. Therein is dictated the distinctions of a merchant vessel and a warship. In keeping with The Hague conference’s articles, the US is trying to exercise “states practice” to allow the employment of civil service personnel onboard warships to provide supporting services.

3. Convention (III) from the 1949 Conventions and 1977 Protocols of the International Humanitarian Law clearly delineates the Treatment of Prisoners of War (Geneva, 12 August 1949). Excerpts are summarized below regarding this study’s reference to “Contractor Warriors” taken Prisoner of War:

Article 4

A. Prisoners of war, in the sense of the present Convention, are persons belonging to one of the following categories, who have fallen into the power of the enemy:

4. Persons who accompany the armed forces without actually being members thereof, such as civilian members of military aircraft crews, war correspondents, supply contractors, members of labor units or of services responsible for the welfare of the armed forces, provided that they have received authorization, from the armed forces which they accompany, who shall provide them for that purpose with an identity card similar to the annexed model.

Article 5

The present Convention shall apply to the persons referred to in Article 4 from the time they fall into the power of the enemy and until their final release and repatriation.

Should any doubt arise as to whether persons, having committed a belligerent act and having fallen into the hands of the enemy, belong to any of the categories enumerated in Article 4, such persons shall enjoy the protection of the present Convention until such time as their status has been determined by a competent tribunal.6

Note: Equating contractors as "civilian members of military" is a possibly contentious issue, but if contractors are issued ID's per Article 4 above, convention articles should apply.

4. Summary of Appendix D Naval Postgraduate School (NPS) query and Office of Judge Advocate General (OJAG) response[7] regarding civilian contractor support for Combat Operations:

A. <u>What, if any, congressional/legislative law or policy prevents or limits civilian personnel from engaging in combat operations?</u>

OJAG explained that, as per DoD policy and guidance, civilians are an integral total-force component and "may be deployed." However, civilians actively participating in hostilities do not have combatant immunity.[8] Civilian mariners and aircrew could also be considered unlawful combatants[9] and could

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[6] Available from http://www.icrc.org/ihl.nsf/7c4d08d9b287a42141256739003e636b/6fef854a3517b75ac125641e004a9e68?OpenDocument, 1.

[7] LCDR David E. W. Dow, JAGC, USN Law of Armed Conflict Branch

International & Operational Law Division Navy OJAG, Code 10 Pentagon 5E793, Office of the JAG (Inter. and Ops Law Division), e-mail with CDR Hatch, NPS, 18 August 2004.

[8] Department of Defense, *DoD Civilian Work Force Contingency and Emergency Planning Guidelines and Procedures,* Department of Defense Instruction 1400.32, para. 4, 24 April 1995. See also Department of Defense, *DoD Civilian Work Force Contingency and Emergency Planning and Execution,* Department of Defense Instruction 1400.32, para. D.1, 28 April 1995.

[9] Unlawful combatants are those who do not meet the criteria for lawful combatant status under the law of armed conflict. Such criteria may be traced to Annex Art. 1 of the Hague Convention

be prosecuted for violations of the law of armed conflict. Commanders/Commanding Officers are also at risk if they employ civilians in ways that are not permitted under the law of armed conflict.[10,11]

A Navy pilot program is currently being tested on USS Coronado (AGF 11), SEVENTHFLT flagship. OJAG advised:

> in order to resolve the international law issues concerning such manning, the Navy is pursuing legislation that would make reserve affiliation a condition of employment such that the mariners could be activated during armed conflict. The current version of the legislation will apply to certain ships including those supporting amphibious operations. This legislation would place the civilian mariners under an armed forces disciplinary system and would give them the highest level of protection as combatants under the Third Geneva Convention; without the legislation, the plans for manning will be problematic.

The flagship CIVMAR pilot experiment shares a fundamental issue with LCS civilian aircrew support for manned MH-60R/S and Fire Scout VTUAV: to what extent can civilians provide support without direct participation in hostilities? It is more problematic for LCS aviation, since there are fewer, if any, traditional support

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Respecting the Laws and Customs of War on Land, with Annex of Regulations, 36 Stat. 2277, T.S. No. 539, 18 October 1907. These criteria are echoed in the Geneva Conventions of 1949:

1. To be commanded by a person responsible for his subordinates;
2. To have a fixed distinctive emblem recognizable at a distance;
3. To carry arms openly; and
4. To conduct their operations in accordance with the laws and customs of war.

See GPW, supra note 3, at Art. 4.

[10] Command responsibility is recognized under the law of armed conflict as well as the Uniform Code of Military Justice.

[11] See Geneva Convention *Relative to the Protection of Civilian Persons in the Time of War*, 6 U.S.T. 3516, T.I.A.S. No. 3365, 12 August 1949.

functions for LCS aircraft that do not directly support employment of a weapons system (thereby apparently requiring military personnel).

B. What is the line of demarcation discriminating between support operations and combat operations for civilians?

OJAG's suggests the answer to this question is "more gray than black and white."[12] The Office explained, "The pertinent criterion is what constitutes an active or direct part in hostilities. Direct participation in hostilities implies a direct causal relationship between the activity engaged in and the harm done to the enemy at the time and place where the activity takes place." Yet, enactment of reserve affiliation legislation as condition for employment would obviate risk of adverse consequences during traditional armed conflicts. Focal to this aspect of the OJAG review is assessment of permissible support functions for civilians, regardless of DoD mission.

OJAG lists:

> examples of capabilities […] permissible regardless of civilian manning:
>
> (1) Command and control of humanitarian or non-combat related missions, including permissive non-combatant evacuation operations (non-permissive NEOs will have to be assessed on a case-by-case basis, since, although they may not normally involve international armed conflict, there can be circumstances when the requirement arises to conduct such an operation during international armed conflict).
>
> (2) Conducting independent operations in a secure or benign environment such as providing humanitarian assistance, disaster relief missions or other non-combat related missions.

[12] In order to ensure that the conduct of military operations is not only lawful, but is perceived by others as lawful, activities which fall into gray areas are sensibly reserved to members of the armed forces.

(3) Providing logistics support for all operations, such as maintenance, lighterage capability, cargo handling, and serving as a conduit for logistics support and sustainment.

(4) Conducting operations against non-state participants that do not involve international armed conflict.

C. In what instances are civilians currently involved in combat operations either in Iraq or Afghanistan, or under what policy/rules/laws do they perform their functions?

OJAG asserted that the current state of conflict in both countries is no longer international armed conflict in the traditional sense, where hostilities exist between the forces of two or more nations. President Bush declared an end to major combat in Iraq on 2 May 2003, and the US occupation of Iraq ended 28 June 2004. The interim government of Afghanistan has been in place since 19 June 2002.

US military operations are being conducted at the invitation of the host governments. Civilians are fulfilling support roles or private security functions, some associated with the DoD and some not.

Per DoD policy, civilians who accompany US military forces in combat operations anywhere in the world (civil servants or contractors) not actively or directly participating in hostilities, are considered "civilians accompanying the force," and are entitled to protections of the Geneva Conventions as prisoners of war.

D. Can a civilian person in an aircraft be directed by a military person to deploy a weapon to neutralize a weapon (e.g., mine neutralization)?

OJAG explains, "Mine neutralization is a combat operation. Civilians who actively or directly participate in combat and in belligerent operations do not have combatant immunity and may be prosecuted for crimes under the domestic laws of foreign nations."

E. Can a civilian person in an aircraft be directed by a military person to deploy a weapon in offensive operations (e.g., torpedo against a submarine)? What about the deployment of sonobuoys?

OJAG responded, "Deploying a weapon offensively is clearly a combat operation." Sonobuoys assist in locating subsurface military assets or targets; employment of such is likely to be viewed as a combat operation. Civilians who actively or directly participate in this operation would likely not have combatant immunity.

F. What is the implication of weapons release authority for an enlisted person? Is it that we have always done it that way or some actual law or mandate that signifies an officer as having weapons release authority? Either way, why cannot a civilian person have such authority?

OJAG illustrates:

> From an international law perspective, there are no implications of weapons release authority for an enlisted member. Regardless of whether the member is serving subject to an enlistment contract or a commission, s/he is a member of the regular armed forces and, as such, has combatant immunity under the laws of armed conflict. At what level in the chain of command weapons release authority rests is a matter of training and responsibility determined by command and/or Navy policy, not international law. For reasons discussed previously, civilians cannot have weapons release authority.

G. From observing the newspaper and CNN in regard to the use of the Predator or one of the other UAVs that carry the Hellfire missile, who has weapons release authority? Who actually pulls the trigger?

OJAG responds, "civilians who actively or directly engage in hostilities do not have combatant immunity. […] we have recommended that the individual 'pulling the trigger' be a lawful combatant, a member of the regular armed forces of the United States."

4. Contracting. The equitable trade of functions and jobs is not considered difficult to quantify for aviation contractors. Quantifying the work that a Sailor performs and how to translate the work into particular functions that are comparable and easily transferable to their contractor counterpart is considered achievable for maintenance functions. In most cases, a single contract A&P mechanic will replace two and sometimes more Sailors. Other institutional concerns relevant to Navy manpower impacts follow: Job transfers will impact the Navy force structure. While transfer of jobs away from Navy sailors will potentially have a significant effect on the Navy's force structure, the civilian/contractor force structure will be affected very little. Navy personnel are faced with reduced promotion and shore rotation opportunities along with other less-known impacts on their quality of life and service.

V. FINDINGS AND RECOMMENDATIONS

1. OJAG has essentially determined that current US and international law would not support the employment of Contractor Warriors or support personnel onboard Navy Combatants/Warships. Therefore, the use of contractors onboard LCSs appears to be an issue resolved as not feasible for the foreseeable future.

2. Contract and insurance costs for civilians employed onboard an LCS as part of the aviation detachment in a combat zone could be significant.

3. Conceptual design is underway for the Sea Base. This design should include robust integration of aviation support for LCS (as well as other ship classes that will be supported by the Sea Base). Part of this support could include Contractors if the Sea Base is considered to be "behind the lines" and not onboard a warship.

4. There is still some lack of integration among the established expectations required of the aviation detachment, ship's crew, and FMP detachment. The LCS CONOPS explicitly states that the embarked detachments will provide service personnel to augment the ship's crew. However, it appears that no service personnel are being planned for either the LCS aviation or FMP MIW detachments. Also, NAVAIR expects the ship to provide for weapons maintenance and assembly. It appears that no provision is being made to establish any AO billets in the crew configuration. It is recommended that the LCS Program Manager establish a process to mediate this type of conflict.

5. GSH and Coast Guard are conducting missions similar to the profile projected for the LCS. That is, GSH and Coast Guard start with a fully ready aircraft and are expected to conduct operations for a relatively short period. Maintenance support beyond the daily/weekly requirements comes from their de facto sea/shore bases. It is recommended that the activities developing Aviation Sea Warriors closely explore the underway accomplishments of GSH and Coast Guard.

6. The level of the FMP operations will be more intensive and complex than those for the activities that were visited for this study. Projections have been made by very

experienced personnel to account for those differences. However, it will ultimately take putting a prototype detachment on each LCS variant with prototype Sea-Base support groups to make the aviation functional element of LCS work. To that end, it is recommended that the total, integrated aviation requirement set be investigated because it appears that an LCS detachment of the needed size will not be able to support extended operations as an independent entity.

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APPENDIX A. GEO-SEIS SUMMARY OF MSC OPERATIONS

1 January 2004

SA33OJ Puma Capabilities Narrative

The SA33OJ Puma Transport helicopter has been operating with MSC for the last four continuous years and is operated by Geo-Seis Helicopters, Inc. The SA33OJ Puma helicopter has passed all required US Navy DIT and Wind-over-the-deck testing required to operate with MSC and US Navy Fleet Ships. The SA33OJ Puma helicopters operated currently for the MSC are in exact conformity with the current on-going MSC VERTREP contract. This conformity also includes the ability for both SA33OJ Puma helicopters with their main rotor blades folded to be stored in the ship's hangers at the same time (with the hanger doors closed) without modification to the hangers.

In the last four years, the 5A330J PUMA has provided VERTREP service for MSC with no breakage of cargo hauled and 100% availability for all ordered or requested flights. In addition, the 5A330J Puma helicopters have flown the following with MSC:

- Total External Tons Hauled: 35,379 tons or 70,758,000 lbs.
- Total External Lifts: 16,217 lifts with only one dropped US Navy/MSC load (soft drinks);
- Total Internal Tons Hauled: 58.2 tons or 116,400 lbs;
- Total Passengers Carried: 915;
- Total individual US Navy Ships supported: 108 (list available upon request);
- Total individual Foreign Navy Ships supported: 14 (list available upon request).

The SA33OJ Puma helicopter has proven to be a most reliable, safe and productive helicopter for the VERTREP mission over the last four years. An extreme advantage the SA33OJ Puma has over the vast majority of other helicopters which may be offered to MSC for this mission is the ability to "double stack" the deck during VERTREP missions as well as "fit" in the ships' hangers. In addition, when on a ship's deck, the main rotor blades are high enough to prevent any accidental incursion into the blades by persons on the deck.

Geo-Seis Helicopters Inc.
116 N. Raquette Drive
Ft. Collins, CO 80524-2757

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APPENDIX B. FAA/FAR AIRFRAME & PROPULSION (A&P) MECHANIC CERTIFICATION REQUIREMENTS SUMMARY

References: (a) Geo-Seis Helicopter, Inc. On-site study, 6-8 June 2004.
(b) Title 14 of the Code of Federal Regulations (14 CFR), United States Federal Aviation Regulations (US FAR) Part 65-15, 17 MAR 2000.

Attachments: (1) US FAR Part 65-15, Subpart D—Mechanics
(2) Applicable sections US FAR Part 43—Maintenance, Preventive Maintenance, Rebuilding and Alteration

1. This appendix constitutes the minimum FAA/FAR Airframe & Propulsion (A&P) Mechanic requirements to perform maintenance on rotary wing operations equipment for transport of cargo, passengers and mail, as identified during the reference (a) **Civilian Workforce and Skill/Qualification Assessment** related to the **Littoral Combat Ship (LCS) Composite Aviation Detachment**.

2. Attachment 1 is an extract of the reference (b) US FAR Part 65-15, Subpart D—Mechanic certification requirements for Airframe and Propulsion (A&P), applicable to any Type/Model/Series (T/M/S) fix wing or rotary civilian aircraft. Attachments 2 and 3 contain Part 43 and Part 91 sections, except inspection tasks related to A&P mechanics that are referenced in Part 65-15. For clarity, all original and amendment date references have been removed.

3. Similar to military certification (e.g., F-14 ratings will retrain for F/A-18 models), basic A & P training achieved for entry-level mechanic on a specific T/M/S aircraft is applied to multiple certifications, with addition of training specific to a new T/M/S. Concurrently, retaining multiple T/M/S certifications is directly linked to maintaining proficiency in all applicable T/M/S.

Realigning Naval Aviation training to mirror FAA/FAR training will necessitate a detailed comparison of differences in pipelines, since currently Navy aviation rates

train and maintain separate skills in engine or airframe, etc. A&P obtain certification in both areas. Both Navy and civilian mechanics receive T/M/S Avionics training.

APPENDIX B. ATTACHMENT 1. US FAR 65-15 AIRFRAME & PROPULSION (A&P) MECHANIC CERTIFICATION REQUIREMENTS SUMMARY

Electronic Code of Federal Regulations (e-CFR) data current as of 16 September 2004.

Title 14: Aeronautics and Space

PART 65—Certification: Airmen other than Flight Crewmembers

Subpart D—Mechanics

§ 65.71 Eligibility requirements: General.

(a) To be eligible for a mechanic certificate and associated ratings, a person must—

(1) Be at least 18 years of age;

(2) Be able to read, write, speak, and understand the English language, or in the case of an applicant who does not meet this requirement and who is employed outside of the United States by a US air carrier, have his certificate endorsed "Valid only outside the United States";

(3) Have passed all of the prescribed tests within a period of 24 months; and

(4) Comply with the sections of this subpart that apply to the rating he seeks.

(b) A certificated mechanic who applies for an additional rating must meet the requirements of §65.77 and, within a period of 24 months, pass the tests prescribed by §§65.75 and 65.79 for the additional rating sought.

§ 65.73 Ratings.

(a) The following ratings are issued under this subpart:

(1) Airframe.

(2) Powerplant.

(b) A mechanic certificate with an aircraft or aircraft engine rating, or both, that was issued before, and was valid on, June 15, 1952, is equal to a mechanic certificate with an airframe or powerplant rating, or both, as the case may be, and may be exchanged for such a corresponding certificate and rating or ratings.

§ 65.75 Knowledge requirements.

(a) Each applicant for a mechanic certificate or rating must, after meeting the applicable experience requirements of §65.77, pass a written test covering the construction and maintenance of aircraft appropriate to the rating he seeks, the regulations in this subpart, and the applicable provisions of parts 43 and 91 of this chapter. The basic principles covering the installation and maintenance of propellers are included in the powerplant test.

(b) The applicant must pass each section of the test before applying for the oral and practical tests prescribed by §65.79. A report of the written test is sent to the applicant.

§ 65.77 Experience requirements.

Each applicant for a mechanic certificate or rating must present either an appropriate graduation certificate or certificate of completion from a certificated aviation maintenance technician school or documentary evidence, satisfactory to the Administrator, of—

(a) At least 18 months of practical experience with the procedures, practices, materials, tools, machine tools, and equipment generally used in constructing, maintaining, or altering airframes, or powerplants appropriate to the rating sought; or

(b) At least 30 months of practical experience concurrently performing the duties appropriate to both the airframe and powerplant ratings.

§ 65.79 Skill requirements.

Each applicant for a mechanic certificate or rating must pass an oral and a practical test on the rating he seeks. The tests cover the applicant's basic skill in performing practical projects on the subjects covered by the written test for that rating. An applicant for a powerplant rating must show his ability to make satisfactory minor repairs to, and minor alterations of, propellers.

§ 65.80 Certificated aviation maintenance technician school students.

Whenever an aviation maintenance technician school certificated under part 147 of this chapter shows to an FAA inspector that any of its students has made satisfactory progress at the school and is prepared to take the oral and practical tests prescribed by §65.79, that student may take those tests during the final subjects of his training in the approved curriculum, before he meets the applicable experience requirements of §65.77 and before he passes each section of the written test prescribed by §65.75.

§ 65.81 General privileges and limitations.

(a) A certificated mechanic may perform or supervise the maintenance, preventive maintenance or alteration of an aircraft or appliance, or a part thereof, for which he is rated (but excluding major repairs to, and major alterations of, propellers, and any repair to, or alteration of, instruments), and may perform additional duties in accordance with §§65.85, 65.87, and 65.95. However, he may not supervise the maintenance, preventive maintenance, or alteration of, or approve and return to service, any aircraft or appliance, or part thereof, for which he is rated unless he has satisfactorily performed the work concerned at an earlier date. If he has not so performed that work at an earlier date, he may show his ability to do it by performing it to the satisfaction of the Administrator or under the direct supervision of a certificated and appropriately rated mechanic, or a certificated repairman, who has had previous experience in the specific operation concerned.

(b) A certificated mechanic may not exercise the privileges of his certificate and rating unless he understands the current instructions of the manufacturer, and the maintenance manuals, for the specific operation concerned.

§ 65.83 Recent experience requirements.

A certificated mechanic may not exercise the privileges of his certificate and rating unless, within the preceding 24 months—

(a) The Administrator has found that he is able to do that work; or

(b) He has, for at least 6 months—

(1) Served as a mechanic under his certificate and rating;

(2) Technically supervised other mechanics;

(3) Supervised, in an executive capacity, the maintenance or alteration of aircraft; or

(4) Been engaged in any combination of paragraph (b) (1), (2), or (3) of this section.

§ 65.85 Airframe rating; additional privileges.

(a) Except as provided in paragraph (b) of this section, a certificated mechanic with an airframe rating may approve and return to service an airframe, or any related part or appliance, after he has performed, supervised, or inspected its maintenance or alteration (excluding major repairs and major alterations). In addition, he may perform the 100-hour inspection required by part 91 of this chapter on an airframe, or any related part or appliance, and approve and return it to service.

(b) A certificated mechanic with an airframe rating can approve and return to service an airframe, or any related part or appliance, of an aircraft with a special airworthiness certificate in the light-sport category after performing and inspecting a major repair or major alteration for products that are not produced under an FAA

approval provided the work was performed in accordance with instructions developed by the manufacturer or a person acceptable to the FAA.

§ 65.87 Powerplant rating; additional privileges.

(a) Except as provided in paragraph (b) of this section, a certificated mechanic with a powerplant rating may approve and return to service a powerplant or propeller or any related part or appliance, after he has performed, supervised, or inspected its maintenance or alteration (excluding major repairs and major alterations). In addition, he may perform the 100-hour inspection required by part 91 of this chapter on a powerplant or propeller, or any part thereof, and approve and return it to service.

(b) A certificated mechanic with a powerplant rating can approve and return to service a powerplant or propeller, or any related part or appliance, of an aircraft with a special airworthiness certificate in the light-sport category after performing and inspecting a major repair or major alteration for products that are not produced under an FAA approval, provided the work was performed in accordance with instructions developed by the manufacturer or a person acceptable to the FAA.

§ 65.89 Display of certificate.

Each person who holds a mechanic certificate shall keep it within the immediate area where he normally exercises the privileges of the certificate and shall present it for inspection upon the request of the Administrator or an authorized representative of the National Transportation Safety Board, or of any Federal, State, or local law enforcement officer.

§ 65.91 Inspection authorization.

(a) An application for an inspection authorization is made on a form and in a manner prescribed by the Administrator.

(b) An applicant who meets the requirements of this section is entitled to an inspection authorization.

(c) To be eligible for an inspection authorization, an applicant must—

(1) Hold a currently effective mechanic certificate with both an airframe rating and a powerplant rating, each of which is currently effective and has been in effect for a total of at least 3 years;

(2) Have been actively engaged, for at least the 2-year period before the date he applies, in maintaining aircraft certificated and maintained in accordance with this chapter;

(3) Have a fixed base of operations at which he may be located in person or by telephone during a normal working week, but it need not be the place where he will exercise his inspection authority;

(4) Have available to him the equipment, facilities, and inspection data necessary to properly inspect airframes, powerplants, propellers, or any related part or appliance; and

(5) Pass a written test on his ability to inspect according to safety standards for returning aircraft to service after major repairs and major alterations and annual and progressive inspections performed under part 43 of this chapter.

An applicant who fails the test prescribed in paragraph (c) (5) of this section may not apply for retesting until at least 90 days after the date he failed the test.

§ 65.92 Inspection authorization: Duration.

(a) Each inspection authorization expires on March 31 of each year. However, the holder may exercise the privileges of that authorization only while he holds a currently effective mechanic certificate with both a currently effective airframe rating and a currently effective powerplant rating.

(b) An inspection authorization ceases to be effective whenever any of the following occurs:

(1) The authorization is surrendered, suspended, or revoked.

(2) The holder no longer has a fixed base of operation.

(3) The holder no longer has the equipment, facilities, and inspection data required by §65.91(c) (3) and (4) for issuance of his authorization.

(c) The holder of an inspection authorization that is suspended or revoked shall, upon the Administrator's request, return it to the Administrator.

§ 65.93 Inspection authorization: Renewal.

(a) To be eligible for renewal of an inspection authorization for a 1-year period an applicant must present evidence annually, during the month of March, at an FAA Flight Standards District Office or an International Field Office that the applicant still meets the requirements of §65.91(c) (1) through (4) and must show that, during the current period that the applicant held the inspection authorization, the applicant—

(1) Has performed at least one annual inspection for each 90 days that the applicant held the current authority; or

(2) Has performed inspections of at least two major repairs or major alterations for each 90 days that the applicant held the current authority; or

(3) Has performed or supervised and approved at least one progressive inspection in accordance with standards prescribed by the Administrator; or

(4) Has attended and successfully completed a refresher course, acceptable to the Administrator, of not less than 8 hours of instruction during the 12-month period preceding the application for renewal; or

(5) Has passed on oral test by an FAA inspector to determine that the applicant's knowledge of applicable regulations and standards is current.

(b) The holder of an inspection authorization that has been in effect for less than 90 days before the expiration date need not comply with paragraphs (a) (1) through (5) of this section.

§ 65.95 Inspection authorization: Privileges and limitations.

(a) The holder of an inspection authorization may—

(1) Inspect and approve for return to service any aircraft or related part or appliance (except any aircraft maintained in accordance with a continuous airworthiness program under part 121 of this chapter) after a major repair or major alteration to it in accordance with part 43 [New] of this chapter, if the work was done in accordance with technical data approved by the Administrator; and

(2) Perform an annual, or perform or supervise a progressive inspection according to §§43.13 and 43.15 of this chapter.

(b) When he exercises the privileges of an inspection authorization, the holder shall keep it available for inspection by the aircraft owner, the mechanic submitting the aircraft, repair, or alteration for approval (if any), and shall present it upon the request of the Administrator or an authorized representative of the National Transportation Safety Board, or of any Federal, State, or local law enforcement officer.

(c) If the holder of an inspection authorization changes his fixed base of operation, he may not exercise the privileges of the authorization until he has notified the FAA Flight Standards District Office or International Field Office for the area in which the new base is located, in writing, of the change.

APPENDIX B. ATTACHMENT 2. PART 43—MAINTENANCE, PREVENTATIVE MAINTENANCE, REBUILDING AND ALTERATION

§ 43.1 Applicability.

(a) Except as provided in paragraphs (b) and (d) of this section, this part prescribes rules governing the maintenance, preventive maintenance, rebuilding, and alteration of any—

(1) Aircraft having a US airworthiness certificate;

(2) Foreign-registered civil aircraft used in common carriage or carriage of mail under the provisions of Part 121 or 135 of this chapter; and

(3) Airframe, aircraft engines, propellers, appliances, and component parts of such aircraft.

(b) ***N/A to LCS CASS***

(c) ***N/A to LCS CASS***

(d) ***N/A to LCS CASS***

§ 43.3 Persons authorized to perform maintenance, preventive maintenance, rebuilding, and alterations.

(a) ***N/A to LCS CASS***

(b) The holder of a mechanic certificate may perform maintenance, preventive maintenance, and alterations as provided in Part 65 of this chapter.

(c) The holder of a repairman certificate may perform maintenance, preventive maintenance, and alterations as provided in part 65 of this chapter.

(d) A person working under the supervision of a holder of a mechanic or repairman certificate may perform the maintenance, preventive maintenance, and alterations that his supervisor is authorized to perform, if the supervisor personally observes the work being done to the extent necessary to ensure that it is being done properly and if the supervisor is readily available, in person, for consultation. However, this paragraph does not authorize the performance of any inspection required by Part 91 or Part 125 of this chapter or any inspection performed after a major repair or alteration.

(e) The holder of a repair station certificate may perform maintenance, preventive maintenance, and alterations as provided in Part 145 of this chapter.

(f) ***N/A to LCS CASS***

(g) ***N/A to LCS CASS***

(h) Notwithstanding the provisions of paragraph (g) of this section, the Administrator may approve a certificate holder under Part 135 of this chapter, operating rotorcraft in a remote area, to allow a pilot to perform specific preventive maintenance items provided—

(1) The items of preventive maintenance are a result of a known or suspected mechanical difficulty or malfunction that occurred en route to or in a remote area;

(2) The pilot has satisfactorily completed an approved training program and is authorized in writing by the certificate holder for each item of preventive maintenance that the pilot is authorized to perform;

(3) There is no certificated mechanic available to perform preventive maintenance;

(4) The certificate holder has procedures to evaluate the accomplishment of a preventive maintenance item that requires a decision concerning the airworthiness of the rotorcraft; and

(5) The items of preventive maintenance authorized by this section are those listed in paragraph (c) of Appendix A of this part.

(i) Notwithstanding the provisions of paragraph (g) of this section, in accordance with an approval issued to the holder of a certificate issued under part 135 of this chapter, a pilot of an aircraft type-certificated for 9 or fewer passenger seats, excluding any pilot seat, may perform the removal and reinstallation of approved aircraft cabin seats, approved cabin-mounted stretchers, and when no tools are required, approved cabin-mounted medical oxygen bottles, provided—

(1) The pilot has satisfactorily completed an approved training program and is authorized in writing by the certificate holder to perform each task; and

(2) The certificate holder has written procedures available to the pilot to evaluate the accomplishment of the task.

(j) ***N/A to LCS CASS***

§ 43.5 Approval for return to service after maintenance, preventive maintenance, rebuilding, or alteration.

N/A to LCS CASS

§ 43.7 Persons authorized to approve aircraft, airframes, aircraft engines, propellers, appliances, or component parts for return to service after maintenance, preventive maintenance, rebuilding, or alteration.

(b) The holder of a mechanic certificate or an inspection authorization may approve an aircraft, airframe, aircraft engine, propeller, appliance, or component part for return to service as provided in Part 65 of this chapter.

(e) ***N/A to LCS CASS***

§ 43.9 Content, form, and disposition of maintenance, preventive maintenance, rebuilding, and alteration records (except inspections performed in accordance with part 91, part 125, §135.411(a)(1), and §135.419 of this chapter).

(a) *Maintenance record entries.* Except as provided in paragraphs (b) and (c) of this section, each person who maintains, performs preventive maintenance, rebuilds, or alters an aircraft, airframe, aircraft engine, propeller, appliance, or component part shall make an entry in the maintenance record of that equipment containing the following information:

(1) A description (or reference to data acceptable to the Administrator) of work performed.

(2) The date of completion of the work performed.

(3) The name of the person performing the work if other than the person specified in paragraph (a) (4) of this section.

(4) If the work performed on the aircraft, airframe, aircraft engine, propeller, appliance, or component part has been performed satisfactorily, the signature, certificate number, and kind of certificate held by the person approving the work. The signature constitutes the approval for return to service only for the work performed.

(b) ***N/A to LCS CASS***

(c) ***N/A to LCS CASS***

(d) ***N/A to LCS CASS***

§ 43.11 Content, form, and disposition of records for inspections conducted under parts 91 and 125 and §§135.411(a)(1) and 135.419 of this chapter.

(a) *Maintenance record entries.* The person approving or disapproving for return to service an aircraft, airframe, aircraft engine, propeller, appliance, or component part after any inspection performed in accordance with Part 91, 123, 125, §135.411(a)(1), or §135.419 shall make an entry in the maintenance record of that equipment containing the following information:

(1) The type of inspection and a brief description of the extent of the inspection.

(2) The date of the inspection and aircraft total time in service.

(3) The signature, the certificate number, and kind of certificate held by the person approving or disapproving for return to service the aircraft, airframe, aircraft engine, propeller, appliance, component part, or portions thereof.

(4) Except for progressive inspections, if the aircraft is found to be airworthy and approved for return to service, the following or a similarly worded statement—"I certify that this aircraft has been inspected in accordance with (insert type) inspection and was determined to be in airworthy condition."

(5) Except for progressive inspections, if the aircraft is not approved for return to service because of needed maintenance, noncompliance with applicable specifications, airworthiness directives, or other approved data, the following or a similarly worded statement—"I certify that this aircraft has been inspected in accordance with (insert type) inspection and a list of discrepancies and unairworthy items dated (date) has been provided for the aircraft owner or operator."

(6) For progressive inspections, the following or a similarly worded statement—"I certify that in accordance with a progressive inspection program, a routine inspection of (identify whether aircraft or components) and a detailed inspection of (identify components) were performed and the (aircraft or components) are (approved or disapproved) for return to service." If disapproved, the entry will further state "and a list of discrepancies and unairworthy items dated (date) has been provided to the aircraft owner or operator."

(7) If an inspection is conducted under an inspection program provided for in part 91, 123, 125, or §135.411(a)(1), the entry must identify the inspection program, that part of the inspection program accomplished, and contain a statement that the inspection was performed in accordance with the inspections and procedures for that particular program.

(b) *Listing of discrepancies and placards.* If the person performing any inspection required by part 91 or 125 or §135.411(a)(1) of this chapter finds that the aircraft is unairworthy or does not meet the applicable type certificate data, airworthiness directives, or other approved data upon which its airworthiness depends, that person must give the owner or lessee a signed and dated list of those discrepancies. For those items permitted to be inoperative under §91.213(d)(2) of this chapter, that person shall place a placard, that meets the aircraft's airworthiness certification regulations, on each inoperative instrument and the cockpit control of each item of inoperative equipment, marking it "Inoperative," and shall add the items to the signed and dated list of discrepancies given to the owner or lessee

§ 43.13 Performance rules (general).

(a) Each person performing maintenance, alteration, or preventive maintenance on an aircraft, engine, propeller, or appliance shall use the methods, techniques, and practices prescribed in the current manufacturer's maintenance manual or Instructions for Continued Airworthiness prepared by its manufacturer, or other methods, techniques, and practices acceptable to the Administrator, except as noted in §43.16. He shall use the tools, equipment, and test apparatus necessary to assure completion of the work in accordance with accepted industry practices. If special equipment or test apparatus is recommended by the manufacturer involved, he must use that equipment or apparatus or its equivalent acceptable to the Administrator.

(b) Each person maintaining or altering, or performing preventive maintenance, shall do that work in such a manner and use materials of such a quality that the condition of the aircraft, airframe, aircraft engine, propeller, or appliance worked on will be at least equal to its original or properly altered condition (with regard to aerodynamic function, structural strength, resistance to vibration and deterioration, and other qualities affecting airworthiness).

(c) ***N/A to LCS CASS***

§ 43.15 Additional performance rules for inspections.

(a) *General.* Each person performing an inspection required by Part 91, 123, 125, or 135 of this chapter, shall—

(1) Perform the inspection so as to determine whether the aircraft, or portion(s) thereof under inspection, meets all applicable airworthiness requirements; and

(2) If the inspection is one provided for in Part 123, 125, 135, or §91.409(e) of this chapter, perform the inspection in accordance with the instructions and procedures set forth in the inspection program for the aircraft being inspected.

(b) *Rotorcraft.* Each person performing an inspection required by Part 91 on a rotorcraft shall inspect the following systems in accordance with the maintenance manual or Instructions for Continued Airworthiness of the manufacturer concerned:

(1) The drive shafts or similar systems.

(2) The main rotor transmission gear box for obvious defects.

(3) The main rotor and center section (or the equivalent area).

(4) The auxiliary rotor on helicopters.

(c) *Annual and 100-hour inspections.* (1) Each person performing an annual or 100-hour inspection shall use a checklist while performing the inspection. The checklist may be of the person's own design, one provided by the manufacturer of the

equipment being inspected or one obtained from another source. This checklist must include the scope and detail of the items contained in Appendix D to this part and paragraph (b) of this section.

(2) Each person approving a reciprocating-engine-powered aircraft for return to service after an annual or 100-hour inspection shall, before that approval, run the aircraft engine or engines to determine satisfactory performance in accordance with the manufacturer's recommendations of—

(i) Power output (static and idle r.p.m.);

(ii) Magnetos;

(iii) Fuel and oil pressure; and

(iv) Cylinder and oil temperature.

(3) Each person approving a turbine-engine-powered aircraft for return to service after an annual, 100-hour, or progressive inspection shall, before that approval, run the aircraft engine or engines to determine satisfactory performance in accordance with the manufacturer's recommendations.

(d) *Progressive inspection.* (1) Each person performing a progressive inspection shall, at the start of a progressive inspection system, inspect the aircraft completely. After this initial inspection, routine and detailed inspections must be conducted as prescribed in the progressive inspection schedule. Routine inspections consist of visual examination or check of the appliances, the aircraft, and its components and systems, insofar as practicable without disassembly. Detailed inspections consist of a thorough examination of the appliances, the aircraft, and its components and systems, with such disassembly as is necessary. For the purposes of this subparagraph, the overhaul of a component or system is considered to be a detailed inspection.

(2) If the aircraft is away from the station where inspections are normally conducted, an appropriately rated mechanic, a certificated repair station, or the manufacturer of the aircraft may perform inspections in accordance with the procedures and using the forms of the person who would otherwise perform the inspection.

APPENDIX B. ATTACHMENT 3

Title 14: Aeronautics and Space

PART 61—Certification: Pilots, Flight Instructors, and Ground Instructors

Subpart G—Airline Transport Pilots

§ 61.151 Applicability.

This subpart prescribes the requirements for the issuance of airline transport pilot certificates and ratings, the conditions under which those certificates and ratings are necessary, and the general operating rules for persons who hold those certificates and ratings.

§ 61.153 Eligibility requirements: General.

To be eligible for an airline transport pilot certificate, a person must:

(a) Be at least 23 years of age;

(b) Be able to read, speak, write, and understand the English language. If the applicant is unable to meet one of these requirements due to medical reasons, then the Administrator may place such operating limitations on that applicant's pilot certificate as are necessary for the safe operation of the aircraft;

(c) Be of good moral character;

(d) Meet at least one of the following requirements:

(1) Hold at least a commercial pilot certificate and an instrument rating;

(2) Meet the military experience requirements under §61.73 of this part to qualify for a commercial pilot certificate, and an instrument rating if the person is a rated military pilot or former rated military pilot of an Armed Force of the United States; or

(3) Hold either a foreign airline transport pilot or foreign commercial pilot license and an instrument rating, without limitations, issued by a contracting State to the Convention on International Civil Aviation.

(e) Meet the aeronautical experience requirements of this subpart that apply to the aircraft category and class rating sought before applying for the practical test;

(f) Pass a knowledge test on the aeronautical knowledge areas of §61.155(c) of this part that apply to the aircraft category and class rating sought;

(g) Pass the practical test on the areas of operation listed in §61.157(e) of this part that apply to the aircraft category and class rating sought; and

(h) Comply with the sections of this part that apply to the aircraft category and class rating sought.

[Doc. No. 25910, 62 FR 16298, Apr. 4, 1997; Amdt. 61–103, 62 FR 40905, July 30, 1997]

§ 61.155 Aeronautical knowledge.

(a) *General.* The knowledge test for an airline transport pilot certificate is based on the aeronautical knowledge areas listed in paragraph (c) of this section that are appropriate to the aircraft category and class rating sought.

(b) *Aircraft type rating.* A person who is applying for an additional aircraft type rating to be added to an airline transport pilot certificate is not required to pass a knowledge test if that person's airline transport pilot certificate lists the aircraft category and class rating that is appropriate to the type rating sought.

(c) *Aeronautical knowledge areas.*

(1) Applicable Federal Aviation Regulations of this chapter that relate to airline transport pilot privileges, limitations, and flight operations;

(2) Meteorology, including knowledge of and effects of fronts, frontal characteristics, cloud formations, icing, and upper-air data;

(3) General system of weather and NOTAM collection, dissemination, interpretation, and use;

(4) Interpretation and use of weather charts, maps, forecasts, sequence reports, abbreviations, and symbols;

(5) National Weather Service functions as they pertain to operations in the National Airspace System;

(6) Windshear and microburst awareness, identification, and avoidance;

(7) Principles of air navigation under instrument meteorological conditions in the National Airspace System;

(8) Air traffic control procedures and pilot responsibilities as they relate to en route operations, terminal area and radar operations, and instrument departure and approach procedures;

(9) Aircraft loading, weight and balance, use of charts, graphs, tables, formulas, and computations, and their effect on aircraft performance;

(10) Aerodynamics relating to an aircraft's flight characteristics and performance in normal and abnormal flight regimes;

(11) Human factors;

(12) Aeronautical decision making and judgment; and

(13) Crew resource management to include crew communication and coordination.

§ 61.157 Flight proficiency.

(a) *General.*

(1) The practical test for an airline transport pilot certificate is given for—

(i) An airplane category and single-engine class rating;

(ii) An airplane category and multiengine class rating;

(iii) A rotorcraft category and helicopter class rating;

(iv) A powered-lift category rating; and

(v) An aircraft type rating for the category and class ratings listed in paragraphs (a)(1)(i) through (a)(1)(iv) of this section.

(2) A person who is applying for an airline transport pilot practical test must meet—

(i) The eligibility requirements of §61.153 of this part; and

(ii) The aeronautical knowledge and aeronautical experience requirements of this subpart that apply to the aircraft category and class rating sought.

(b) *Aircraft type rating.* Except as provided in paragraph (c) of this section, a person who is applying for an aircraft type rating to be added to an airline transport pilot certificate:

(1) Must receive and log ground and flight training from an authorized instructor on the areas of operation in this section that apply to the aircraft type rating sought;

(2) Must receive a logbook endorsement from an authorized instructor certifying that the applicant completed the training on the areas of operation

listed in paragraph (e) of this section that apply to the aircraft type rating sought; and

(3) Must perform the practical test in actual or simulated instrument conditions, unless the aircraft's type certificate makes the aircraft incapable of operating under instrument flight rules. If the practical test cannot be accomplished for this reason, the person may obtain a type rating limited to "VFR only." The "VFR only" limitation may be removed for that aircraft type when the person passes the practical test in actual or simulated instrument conditions.

(c) *Exceptions.* A person who is applying for an aircraft type rating to be added to an airline transport pilot certificate or an aircraft type rating concurrently with an airline transport pilot certificate, and who is an employee of a certificate holder operating under part 121 or 135 of this chapter or of a fractional ownership program manager operating under subpart K of part 91 of this chapter, need not comply with the requirements of paragraph (b) of this section if the applicant presents a training record that shows satisfactory completion of that certificate holder's or program manager's approved pilot-in-command training program for the aircraft type rating sought.

(d) *Upgrading type ratings.* Any type rating(s) on the pilot certificate of an applicant who successfully completes an airline transport pilot practical test shall be included on the airline transport pilot certificate with the privileges and limitations of the airline transport pilot certificate, provided the applicant passes the practical test in the same category and class of aircraft for which the applicant holds the type rating(s). However, if a type rating for that category and class of aircraft on the superseded pilot certificate is limited to VFR, that limitation shall be carried forward to the person's airline transport pilot certificate level.

(e) *Areas of operation.*

(1) For an airplane category—single-engine class rating:

(i) Preflight preparation;

(ii) Preflight procedures;

(iii) Takeoff and departure phase;

(iv) In-flight maneuvers;

(v) Instrument procedures;

(vi) Landings and approaches to landings;

(vii) Normal and abnormal procedures;

(viii) Emergency procedures; and

(ix) Postflight procedures.

(2) For an airplane category—multiengine class rating:

(i) Preflight preparation;

(ii) Preflight procedures;

(iii) Takeoff and departure phase;

(iv) In-flight maneuvers;

(v) Instrument procedures;

(vi) Landings and approaches to landings;

(vii) Normal and abnormal procedures;

(viii) Emergency procedures; and

(ix) Postflight procedures.

(3) For a powered-lift category rating:

(i) Preflight preparation;

(ii) Preflight procedures;

(iii) Takeoff and departure phase;

(iv) In-flight maneuvers;

(v) Instrument procedures;

(vi) Landings and approaches to landings;

(vii) Normal and abnormal procedures;

(viii) Emergency procedures; and

(ix) Postflight procedures.

(4) For a rotorcraft category—helicopter class rating:

(i) Preflight preparation;

(ii) Preflight procedures;

(iii) Takeoff and departure phase;

(iv) In-flight maneuvers;

(v) Instrument procedures;

(vi) Landings and approaches to landings;

(vii) Normal and abnormal procedures;

(viii) Emergency procedures; and

(ix) Postflight procedures.

(f) *Proficiency and competency checks conducted under part 121, part 135, or subpart K of part 91.*

(1) Successful completion of any of the following checks satisfy the requirements of this section for the appropriate aircraft rating:

(i) A proficiency check under §121.441 of this chapter.

(ii) Both a competency check under §135.293 of this chapter and a pilot-in-command instrument proficiency check under §135.297 of this chapter.

(iii) Both a competency check under §91.1065 of this chapter and a pilot-in-command instrument proficiency check under §91.1069 of this chapter.

(2) The checks specified in paragraph (f)(1) of this section must be conducted by an authorized designated pilot examiner or FAA aviation safety inspector.

(g) *Use of a flight simulator or flight training device for an airplane rating.* If a flight simulator or flight training device is used for accomplishing all of the training and the required practical test for an airplane transport pilot certificate with an airplane category, class, and type rating, if applicable, the applicant, flight simulator, and flight training device are subject to the following requirements:

(1) The flight simulator and flight training device must represent that airplane type if the rating involves a type rating in an airplane, or is representative of an airplane if the applicant is only seeking an airplane class rating and does not require a type rating.

(2) The flight simulator and flight training device must be used in accordance with an approved course at a training center certificated under part 142 of this chapter.

(3) All training and testing (except preflight inspection) must be accomplished by the applicant to receive an airplane class rating and type rating, if applicable, without limitations and—

(i) The flight simulator must be qualified and approved as Level C or Level D; and

(ii) The applicant must meet the aeronautical experience requirements of §61.159 of this part and at least one of the following—

(A) Hold a type rating for a turbojet airplane of the same class of airplane for which the type rating is sought, or have been designated by a military service as a pilot in command of an airplane of the same class of airplane for which the type rating is sought, if a turbojet type rating is sought;

(B) Hold a type rating for a turbopropeller airplane of the same class as the airplane for which the type rating is sought, or have been appointed by a military service as a pilot in command of an airplane of the same class of airplane for which the type rating is sought, if a turbopropeller airplane type rating is sought;

(C) Have at least 2,000 hours of flight time, of which 500 hours must be in turbine-powered airplanes of the same class as the airplane for which the type rating is sought;

(D) Have at least 500 hours of flight time in the same type of airplane as the airplane for which the type rating is sought; or

(E) Have at least 1,000 hours of flight time in at least two different airplanes requiring a type rating.

(4) Subject to the limitation of paragraph (g)(5) of this section, an applicant who does not meet the requirements of paragraph (g)(3) of this section may complete all training and testing (except for preflight inspection) for an additional rating if—

(i) The flight simulator is qualified and approved as Level C or Level D; and

(ii) The applicant meets the aeronautical experience requirements of §61.159 of this part and at least one of the following—

(A) Holds a type rating in a propeller-driven airplane if a type rating in a turbojet airplane is sought, or holds a type rating in a turbojet airplane if a type rating in a propeller-driven airplane is sought;

(B) Since the beginning of the 12th calendar month before the month in which the applicant completes the practical test for the additional rating, has logged—

(*1*) At least 100 hours of flight time in airplanes in the same class as the airplane for which the type rating is sought and which requires a type rating; and

(*2*) At least 25 hours of flight time in airplanes of the same type for which the type rating is sought.

(5) An applicant meeting only the requirements of paragraph (g)(4)(ii)(A) and (B) of this section will be issued an additional rating, or an airline transport pilot certificate with an added rating, as applicable, with a limitation. The limitation shall state: “This certificate is subject to pilot-in-command limitations for the additional rating.”

(6) An applicant who has been issued a certificate with the limitation specified in paragraph (g)(5) of this section—

(i) May not act as pilot in command of the aircraft for which an additional rating was obtained under the provisions of this section until the limitation is removed from the certificate; and

(ii) May have the limitation removed by accomplishing 15 hours of supervised operating experience as pilot in command under the supervision of a qualified and current pilot in command, in the seat normally occupied by the pilot in command, in an airplane of the same type for which the limitation applies.

(7) An applicant who does not meet the requirements of paragraph (g)(3)(ii)(A) through (E) or (g)(4)(ii)(A) and (B) of this section may be issued an airline transport pilot certificate or an additional rating to that pilot certificate after successful completion of one of the following requirements—

(i) An approved course at a part 142 training center that includes all training and testing for that certificate or rating, followed by training and testing on the following tasks, which must be successfully completed on a static airplane or in flight, as appropriate—

(A) Preflight inspection;

(B) Normal takeoff;

(C) Normal ILS approach;

(D) Missed approach; and

(E) Normal landing.

(ii) An approved course at a part 142 training center that complies with paragraphs (g)(8) and (g)(9) of this section and includes all training and testing for a certificate or rating.

(8) An applicant meeting only the requirements of paragraph (g)(7)(ii) of this section will be issued an additional rating or an airline transport pilot certificate with an additional rating, as applicable, with a limitation. The limitation shall state: “This certificate is subject to pilot-in-command limitations for the additional rating.”

(9) An applicant issued a pilot certificate with the limitation specified in paragraph (g)(8) of this section—

(i) May not act as pilot in command of the aircraft for which an additional rating was obtained under the provisions of this section until the limitation is removed from the certificate; and

(ii) May have the limitation removed by accomplishing 25 hours of supervised operating experience as pilot in command under the supervision of a qualified and current pilot in command, in the seat normally occupied by the pilot in command, in an airplane of the same type for which the limitation applies.

(h) *Use of a flight simulator or flight training device for a helicopter rating.* If a flight simulator or flight training device is used for accomplishing all of the training and the required practical test for an airline transport pilot certificate with a helicopter class rating and type rating, if applicable, the applicant, flight simulator, and flight training device are subject to the following requirements:

(1) The flight simulator and flight training device must represent that helicopter type if the rating involves a type rating in a helicopter, or is representative of a helicopter if the applicant is only seeking a helicopter class rating and does not require a type rating.

(2) The flight simulator and flight training device must be used in accordance with an approved course at a training center certificated under part 142 of this chapter.

(3) All training and testing requirements (except preflight inspection) must be accomplished by the applicant to receive a helicopter class rating and type rating, if applicable, without limitations and—

(i) The flight simulator must be qualified and approved as a Level C or Level D; and

(ii) The applicant must meet the aeronautical experience requirements of §61.161 of this part and at least one of the following—

(A) Hold a type rating for a turbine-powered helicopter, or have been designated by a military service as a pilot in command of a turbine-powered helicopter, if a turbine-powered helicopter type rating is sought;

(B) Have at least 1,200 hours of flight time, of which 500 hours must be in turbine-powered helicopters;

(C) Have at least 500 hours of flight time in the same type helicopter as the helicopter for which the type rating is sought; or

(D) Have at least 1,000 hours of flight time in at least two different helicopters requiring a type rating.

(4) Subject to the limitation of paragraph (h)(5) of this section, an applicant who does not meet the requirements of paragraph (h)(3) of this section may complete all training and testing (except for preflight inspection) for an additional rating if—

(i) The flight simulator is qualified and approved as Level C or Level D; and

(ii) The applicant meets the aeronautical experience requirements of §61.161 of this part and, since the beginning of the 12th calendar month before the month in which the applicant completes the practical test for the additional rating, has logged—

(A) At least 100 hours of flight time in helicopters; and

(B) At least 15 hours of flight time in helicopters of the same type of helicopter for which the type rating is sought.

(5) An applicant meeting only the requirements of paragraph (h)(4)(ii) (A) and (B) of this section will be issued an additional rating or an airline transport pilot certificate with a limitation. The limitation shall state: “This certificate is subject to pilot-in-command limitations for the additional rating.”

(6) An applicant who has been issued a certificate with the limitation specified in paragraph (h)(5) of this section—

(i) May not act as pilot in command of the helicopter for which an additional rating was obtained under the provisions of this section until the limitation is removed from the certificate; and

(ii) May have the limitation removed by accomplishing 15 hours of supervised operating experience as pilot in command under the supervision of a qualified and current pilot in command, in the seat normally occupied by the pilot in command, in a helicopter of the same type for which the limitation applies.

(7) An applicant who does not meet the requirements of paragraph (h)(3)(ii) (A) through (D), or (h)(4)(ii) (A) and (B) of this section may be issued

an airline transport pilot certificate or an additional rating to that pilot certificate after successful completion of one of the following requirements—

(i) An approved course at a part 142 training center that includes all training and testing for that certificate or rating, followed by training and testing on the following tasks, which must be successfully completed on a static aircraft or in flight, as appropriate—

(A) Preflight inspection;

(B) Normal takeoff from a hover;

(C) Manually flown precision approach; and

(D) Steep approach and landing to an off-airport heliport; or

(ii) An approved course at a training center that includes all training and testing for that certificate or rating and compliance with paragraphs (h)(8) and (h)(9) of this section.

(8) An applicant meeting only the requirements of paragraph (h)(7)(ii) of this section will be issued an additional rating or an airline transport pilot certificate with an additional rating, as applicable, with a limitation. The limitation shall state: “This certificate is subject to pilot-in-command limitations for the additional rating.”

(9) An applicant issued a certificate with the limitation specified in paragraph (h)(8) of this section—

(i) May not act as pilot in command of the aircraft for which an additional rating was obtained under the provisions of this section until the limitation is removed from the certificate; and

(ii) May have the limitation removed by accomplishing 25 hours of supervised operating experience as pilot in command under the supervision of a qualified and current pilot in command, in the seat normally occupied by the pilot in command, in an aircraft of the same type for which the limitation applies.

(i) *Use of a flight simulator or flight training device for a powered-lift rating.* If a flight simulator or flight training device is used for accomplishing all of the training and the required practical test for an airline transport pilot certificate with a powered-lift category rating and type rating, if applicable, the applicant, flight simulator, and flight training device are subject to the following requirements:

(1) The flight simulator and flight training device must represent that powered-lift type, if the rating involves a type rating in a powered-lift, or is representative of a powered-lift if the applicant is only seeking a powered-lift category rating and does not require a type rating.

(2) The flight simulator and flight training device must be used in accordance with an approved course at a training center certificated under part 142 of this chapter.

(3) All training and testing requirements (except preflight inspection) must be accomplished by the applicant to receive a powered-lift category rating and type rating, if applicable, without limitations; and—

(i) The flight simulator must be qualified and approved as Level C or Level D; and

(ii) The applicant must meet the aeronautical experience requirements of §61.163 of this part and at least one of the following—

(A) Hold a type rating for a turbine-powered powered-lift, or have been designated by a military service as a pilot in

command of a turbine-powered powered-lift, if a turbine-powered powered-lift type rating is sought;

(B) Have at least 1,200 hours of flight time, of which 500 hours must be in turbine-powered powered-lifts;

(C) Have at least 500 hours of flight time in the same type of powered-lift for which the type rating is sought; or

(D) Have at least 1,000 hours of flight time in at least two different powered-lifts requiring a type rating.

(4) Subject to the limitation of paragraph (i)(5) of this section, an applicant who does not meet the requirements of paragraph (i)(3) of this section may complete all training and testing (except for preflight inspection) for an additional rating if—

(i) The flight simulator is qualified and approved as Level C or Level D; and

(ii) The applicant meets the aeronautical experience requirements of §61.163 of this part and, since the beginning of the 12th calendar month before the month in which the applicant completes the practical test for the additional rating, has logged—

(A) At least 100 hours of flight time in powered-lifts; and

(B) At least 15 hours of flight time in powered-lifts of the same type of powered-lift for the type rating sought.

(5) An applicant meeting only the requirements of paragraph (i)(4)(ii) (A) and (B) of this section will be issued an additional rating or an airline transport pilot certificate with a limitation. The limitation shall state: “This certificate is subject to pilot-in-command limitations for the additional rating.”

(6) An applicant who has been issued a certificate with the limitation specified in paragraph (i)(5) of this section—

(i) May not act as pilot in command of the powered-lift for which an additional rating was obtained under the provisions of this section until the limitation is removed from the certificate; and

(ii) May have the limitation removed by accomplishing 15 hours of supervised operating experience as pilot in command under the supervision of a qualified and current pilot in command, in the seat normally occupied by the pilot in command, in a powered-lift of the same type for which the limitation applies.

(7) An applicant who does not meet the requirements of paragraph (i)(3)(ii) (A) through (D) or (i)(4)(ii) (A) and (B) of this section may be issued an airline transport pilot certificate or an additional rating to that pilot certificate after successful completion of one of the following requirements—

(i) An approved course at a part 142 training center that includes all training and testing for that certificate or rating, followed by training and testing on the following tasks, which must be successfully completed on a static aircraft or in flight, as appropriate—

(A) Preflight inspection;

(B) Normal takeoff from a hover;

(C) Manually flown precision approach; and

(D) Steep approach and landing to an off-airport site; or

(ii) An approved course at a training center that includes all training and testing for that certificate or rating and is in compliance with paragraphs (i)(8) and (i)(9) of this section.

(8) An applicant meeting only the requirements of paragraph (i)(7)(ii) of this section will be issued an additional rating or an airline transport pilot certificate with an additional rating, as applicable, with a limitation. The limitation shall state: “This certificate is subject to pilot-in-command limitations for the additional rating.”

(9) An applicant issued a pilot certificate with the limitation specified in paragraph (i)(8) of this section—

(i) May not act as pilot in command of the aircraft for which an additional rating was obtained under the provisions of this section until the limitation is removed from the certificate; and

(ii) May have the limitation removed by accomplishing 25 hours of supervised operating experience as pilot in command under the supervision of a qualified and current pilot in command, in the seat normally occupied by the pilot in command, in a powered-lift of the same type for which the limitation applies.

(j) *Waiver authority.* Unless the Administrator requires certain or all tasks to be performed, the examiner who conducts the practical test for an airline transport pilot certificate may waive any of the tasks for which the Administrator approves waiver authority.

[Doc. No. 25910, 62 FR 16298, Apr. 4, 1997; Amdt. 61–103, 62 FR 40905, July 30, 1997; Amdt. 61–104, 63 FR 20288, Apr. 23, 1998; Amdt. 61–109, 68 FR 54560, Sept. 17, 2003]

§ 61.158 [Reserved]

§ 61.159 Aeronautical experience: Airplane category rating.

(a) Except as provided in paragraphs (b), (c), and (d) of this section, a person who is applying for an airline transport pilot certificate with an airplane category and

class rating must have at least 1,500 hours of total time as a pilot that includes at least:

(1) 500 hours of cross-country flight time.

(2) 100 hours of night flight time.

(3) 75 hours of instrument flight time, in actual or simulated instrument conditions, subject to the following:

(i) Except as provided in paragraph (a)(3)(ii) of this section, an applicant may not receive credit for more than a total of 25 hours of simulated instrument time in a flight simulator or flight training device.

(ii) A maximum of 50 hours of training in a flight simulator or flight training device may be credited toward the instrument flight time requirements of paragraph (a)(3) of this section if the training was accomplished in a course conducted by a training center certificated under part 142 of this chapter.

(iii) Training in a flight simulator or flight training device must be accomplished in a flight simulator or flight training device, representing an airplane.

(4) Command, or any combination thereof, which includes at least—

(i) 100 hours of cross-country flight time; and

(ii) 25 hours of night flight time.

(5) Not more than 100 hours of the total aeronautical experience requirements of paragraph (a) of this section may be obtained in a flight simulator or flight training device that represents an airplane, provided the aeronautical experience was obtained in an approved course conducted by a training center certificated under part 142 of this chapter.

(b) A person who has performed at least 20 night takeoffs and landings to a full stop may substitute each additional night takeoff and landing to a full stop for 1 hour of night flight time to satisfy the requirements of paragraph (a)(2) of this section; however, not more than 25 hours of night flight time may be credited in this manner.

(c) A commercial pilot may credit the following second-in-command flight time or flight-engineer flight time toward the 1,500 hours of total time as a pilot required by paragraph (a) of this section:

(1) Second-in-command time, provided the time is acquired in an airplane—

(i) Required to have more than one pilot flight crewmember by the airplane's flight manual, type certificate, or the regulations under which the flight is being conducted;

(ii) Engaged in operations under subpart K of part 91, part 121, or part 135 of this chapter for which a second in command is required; or

(iii) That is required by the operating rules of this chapter to have more than one pilot flight crewmember.

(2) Flight-engineer time, provided the time—

(i) Is acquired in an airplane required to have a flight engineer by the airplane's flight manual or type certificate;

(ii) Is acquired while engaged in operations under part 121 of this chapter for which a flight engineer is required;

(iii) Is acquired while the person is participating in a pilot training program approved under part 121 of this chapter; and

(iv) Does not exceed more than 1 hour for each 3 hours of flight engineer flight time for a total credited time of no more than 500 hours.

(d) An applicant may be issued an airline transport pilot certificate with the endorsement, “Holder does not meet the pilot in command aeronautical experience requirements of ICAO,” as prescribed by Article 39 of the Convention on International Civil Aviation, if the applicant:

(1) Credits second-in-command or flight-engineer time under paragraph (c) of this section toward the 1,500 hours total flight time requirement of paragraph (a) of this section;

(2) Does not have at least 1,200 hours of flight time as a pilot, including no more than 50 percent of his or her second-in-command time and none of his or her flight-engineer time; and

(3) Otherwise meets the requirements of paragraph (a) of this section.

(e) When the applicant specified in paragraph (d) of this section presents satisfactory evidence of the accumulation of 1,200 hours of flight time as a pilot including no more than 50 percent of his or her second-in-command flight time and none of his or her flight-engineer time, the applicant is entitled to an airline transport pilot certificate without the endorsement prescribed in that paragraph.

[Doc. No. 25910, 62 FR 16298, Apr. 4, 1997; Amdt. 61–103, 62 FR 40906, July 30, 1997; Amdt. 61–104, 63 FR 20288, Apr. 23, 1998; Amdt. 61–109, 68 FR 54560, Sept. 17, 2003]

§ 61.161 Aeronautical experience: Rotorcraft category and helicopter class rating.

(a) A person who is applying for an airline transport pilot certificate with a rotorcraft category and helicopter class rating, must have at least 1,200 hours of total time as a pilot that includes at least:

(1) 500 hours of cross-country flight time;

(2) 100 hours of night flight time, of which 15 hours are in helicopters;

(3) 200 hours of flight time in helicopters, which includes at least 75 hours as a pilot in command, or as second in command performing the duties of a pilot in command under the supervision of a pilot in command, or any combination thereof; and

(4) 75 hours of instrument flight time in actual or simulated instrument meteorological conditions, of which at least 50 hours are obtained in flight with at least 25 hours in helicopters as a pilot in command, or as second in command performing the duties of a pilot in command under the supervision of a pilot in command, or any combination thereof.

(b) Training in a flight simulator or flight training device may be credited toward the instrument flight time requirements of paragraph (a)(4) of this section, subject to the following:

(1) Training in a flight simulator or a flight training device must be accomplished in a flight simulator or flight training device that represents a rotorcraft.

(2) Except as provided in paragraph (b)(3) of this section, an applicant may receive credit for not more than a total of 25 hours of simulated instrument time in a flight simulator and flight training device.

(3) A maximum of 50 hours of training in a flight simulator or flight training device may be credited toward the instrument flight time requirements of paragraph (a)(4) of this section if the aeronautical experience is accomplished in an approved course conducted by a training center certificated under part 142 of this chapter.

[Doc. No. 25910, 62 FR 16298, Apr. 4, 1997; Amdt. 61–103, 62 FR 40906, July 30, 1997; Amdt. 61–104, 63 FR 20289, Apr. 23, 1998]

§ 61.163 Aeronautical experience: Powered-lift category rating.

(a) A person who is applying for an airline transport pilot certificate with a powered-lift category rating must have at least 1,500 hours of total time as a pilot that includes at least:

(1) 500 hours of cross-country flight time;

(2) 100 hours of night flight time;

(3) 250 hours in a powered-lift as a pilot in command, or as a second in command performing the duties of a pilot in command under the supervision of a pilot in command, or any combination thereof, which includes at least—

(i) 100 hours of cross-country flight time; and

(ii) 25 hours of night flight time.

(4) 75 hours of instrument flight time in actual or simulated instrument conditions, subject to the following:

(i) Except as provided in paragraph (a)(4)(ii) of this section, an applicant may not receive credit for more than a total of 25 hours of simulated instrument time in a flight simulator or flight training device.

(ii) A maximum of 50 hours of training in a flight simulator or flight training device may be credited toward the instrument flight time requirements of paragraph (a)(4) of this section if the training was accomplished in a course conducted by a training center certificated under part 142 of this chapter.

(iii) Training in a flight simulator or flight training device must be accomplished in a flight simulator or flight training device that represents a powered-lift.

(b) Not more than 100 hours of the total aeronautical experience requirements of paragraph (a) of this section may be obtained in a flight simulator or flight training device that represents a powered-lift, provided the aeronautical experience was obtained in an approved course conducted by a training center certificated under part 142 of this chapter.

[Doc. No. 25910, 62 FR 16298, Apr. 4, 1997; Amdt. 61–103, 62 FR 40906, July 30, 1997; Amdt. 61–104, 63 FR 20289, Apr. 23, 1998]

§ 61.165 Additional aircraft category and class ratings.

(a) *Rotorcraft category and helicopter class rating.* A person applying for an airline transport certificate with a rotorcraft category and helicopter class rating who holds an airline transport pilot certificate with another aircraft category rating must:

(1) Meet the eligibility requirements of §61.153 of this part;

(2) Pass a knowledge test on the aeronautical knowledge areas of §61.155(c) of this part;

(3) Comply with the requirements in §61.157(b) of this part, if appropriate;

(4) Meet the applicable aeronautical experience requirements of §61.161 of this part; and

(5) Pass the practical test on the areas of operation of §61.157(e)(4) of this part.

(b) *Airplane category rating with a single-engine class rating.* A person applying for an airline transport certificate with an airplane category and single-engine class rating who holds an airline transport pilot certificate with another aircraft category rating must:

(1) Meet the eligibility requirements of §61.153 of this part;

(2) Pass a knowledge test on the aeronautical knowledge areas of §61.155(c) of this part;

(3) Comply with the requirements in §61.157(b) of this part, if appropriate;

(4) Meet the applicable aeronautical experience requirements of §61.159 of this part; and

(5) Pass the practical test on the areas of operation of §61.157(e)(1) of this part.

(c) *Airplane category rating with a multiengine class rating.* A person applying for an airline transport certificate with an airplane category and multiengine class rating who holds an airline transport certificate with another aircraft category rating must:

(1) Meet the eligibility requirements of §61.153 of this part;

(2) Pass a knowledge test on the aeronautical knowledge areas of §61.155(c) of this part;

(3) Comply with the requirements in §61.157(b) of this part, if appropriate;

(4) Meet the applicable aeronautical experience requirements of §61.159 of this part; and

(5) Pass the practical test on the areas of operation of §61.157(e)(2) of this part.

(d) *Powered-lift category.* A person applying for an airline transport pilot certificate with a powered-lift category rating who holds an airline transport certificate with another aircraft category rating must:

(1) Meet the eligibility requirements of §61.153 of this part;

(2) Pass a required knowledge test on the aeronautical knowledge areas of §61.155(c) of this part;

(3) Comply with the requirements in §61.157(b) of this part, if appropriate;

(4) Meet the applicable aeronautical experience requirements of §61.163 of this part; and

(5) Pass the required practical test on the areas of operation of §61.157(e)(3) of this part.

(e) *Additional class rating within the same aircraft category.* A person applying for an airline transport certificate with an additional class rating who holds an airline transport certificate in the same aircraft category must—

(1) Meet the eligibility requirements of §61.153, except paragraph (f) of that section;

(2) Comply with the requirements in §61.157(b) of this part, if applicable;

(3) Meet the applicable aeronautical experience requirements of subpart G of this part; and

(4) Pass a practical test on the areas of operation of §61.157(e) appropriate to the aircraft rating sought.

(f) *Category class ratings for the operation of aircraft with experimental certificates.* Notwithstanding the provisions of paragraphs (a) through (e) of this section, a person holding an airline transport certificate may apply for a category and class rating limited to a specific make and model of experimental aircraft, provided—

(1) The person has logged at least 5 hours flight time while acting as pilot in command in the same category, class, make, and model of aircraft that has been issued an experimental certificate;

(2) The person has received a logbook endorsement from an authorized instructor who has determined that he or she is proficient to act as pilot in command of the same category, class, make, and model of aircraft for which application is made; and

(3) The flight time specified in paragraph (f)(1) of this section must be logged between September 1, 2004 and August 31, 2005.

[Doc. No. 25910, 62 FR 16298, Apr. 4, 1997; Amdt. 61–103, 62 FR 40906, July 30, 1997; Amdt. 61–110, 69 FR 44869, July 27, 2004]

§ 61.167 Privileges.

(a) A person who holds an airline transport pilot certificate is entitled to the same privileges as those afforded a person who holds a commercial pilot certificate with an instrument rating.

(b) An airline transport pilot may instruct—

(1) Other pilots in air transportation service in aircraft of the category, class, and type, as applicable, for which the airline transport pilot is rated and endorse the logbook or other training record of the person to whom training has been given;

(2) In flight simulators, and flight training devices representing the aircraft referenced in paragraph (b)(1) of this section, when instructing under the provisions of this section and endorse the logbook or other training record of the person to whom training has been given;

(3) Only as provided in this section, unless the airline transport pilot also holds a flight instructor certificate, in which case the holder may exercise

the instructor privileges of subpart H of part 61 for which he or she is rated; and

(4) In an aircraft, only if the aircraft has functioning dual controls, when instructing under the provisions of this section.

(c) Excluding briefings and debriefings, an airline transport pilot may not instruct in aircraft, flight simulators, and flight training devices under this section—

(1) For more than 8 hours in any 24-consecutive-hour period; or

(2) For more than 36 hours in any 7-consecutive-day period.

(d) An airline transport pilot may not instruct in Category II or Category III operations unless he or she has been trained and successfully tested under Category II or Category III operations, as applicable.

[Doc. No. 25910, 62 FR 16298, Apr. 4, 1997; Amdt. 61–103, 62 FR 40907, July 30, 1997]

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APPENDIX C. JAG RESPONSES

21 September 2004

Three follow-up questions from the initial presentation to NAVAIR (CAPT Frank Nichols, AIR 1.2) on 15 September 2004 are in red and were forwarded to the Office of the Judge Advocate General (N3N5L) by NPS (CDR Bill Hatch) on 17 September 2004. The general consensus from the initial JAG responses is that use of civilian air crew is legally out of the question. However, there were still some questions about the use of embarked civilians to provide aircraft maintenance support. The response from OJAG is in Blue.

The following table describes the different categories of civilians encountered during this study.

Table D.1 Civilian Categories

Term	Definition	Status
Civilian Mariner (CIVMAR)/Reserve	Government employee, CIVMAR Naval Reserve Affiliate who can be activated during/in hostilities	Pending legislation
Civilian Mariner (CIVMAR)	Government employee, CIVMAR without Naval Reserve Affiliation	Pilot program on USS Coronado; scheduled for USS Mt Whitney. May not be permissible under current laws or conventions when the ships are engaged in combat (even if only in a command-and-control role)
LCS Contractor Civilian Aviation Detachment Members	A group of contractor civilians from one company who form part of a Navy composite MH-	Not legally viable on warships.

Term	Definition	Status
	60 and RQ-8 aviation squadron that will conduct combat operations	
MSC Contractor Civilian Aviation Detachment Members	A group of contractor civilians from one company who form a logistics aviation detachment (pilots and maintainers) embarked on MSC logistics ships that resupply combatants	Approaching completion of 5th year with Geo-Seis Helicopters, Inc.
Embarked Contractor Technical Representatives	Contractor tech reps from various companies embarked in aviation or air capable ships for technical support	>50 embarked in each deployed CV/CVN. They are considered "visitors" to the ship.
Fly-in Contractor Technical Representatives	Contractor tech reps from various companies who fly onboard aviation or air capable ships or meet them in port for technical support	Happens on an as-required basis. They are considered "visitors" to the ship.
Independent/Private Civilian Contractors	Contractor civilians in the Theater who may be providing generic support services, but who are not embarked in Navy ships	Many examples in Iraq and Persian Gulf
Contractor Civilian Aviation Squadron Members—Sea Base	A group of contractor civilians from one company who form part of a Navy composite MH-60 and RQ-8 aviation squadron who are embarked in a non-combatant logistics Sea Base	TBD. Physical Sea Base is in initial conceptual design phase. Much of the aviation maintenance beyond the daily/weekly requirements onboard LCS/cruisers/destroyers may be provided at the Sea Base.

Additional Question #1—It appears from the initial JAG response that a "dedicated" membership of a group of civilian contractor maintainers could not be a portion of an aviation detachment embarked in a Navy combatant.

- Request confirmation of this deduction.
- RESPONSE: The answer to the question rests with the customary international law definition of "warship," currently found, among other places, in the UN Convention on the Law of the Sea (even though the US is not a party to this Convention, we recognize the definition as being reflective of customary international law). In order for a vessel to be a warship and be able to lawfully engage actively and directly in combat (hostilities), that vessel must, among other things, be manned by personnel subject to regular armed forces discipline. Except in times of actual declared war (and the US has not issued a formal declaration of war since WWII), civilians accompanying the force are not subject to the UCMJ. The CIVMAR Reserve legislation being pursued would provide the "fix" to this technicality, allowing for the activation of CIVMARs for a certain period of time and bestowing upon them combatant immunity should they find themselves actively and directly participating in hostilities. That said, a "dedicated membership" or contingent of civilian contractor maintainers would create the situation existing now, onboard USS CORONADO, without the CIVMAR Reserve legislation—a mixed crew of Sailors and civilians, with the majority of the crew not having combatant immunity should the ship, which does not currently satisfy the definition of "warship," become embroiled in combat. If personnel are to be, in essence, permanent members of the crew, such as CIVMARs or a "dedicated membership or contingent of civilian contractor maintainers," on a vessel intended to be able to participate actively and directly in hostilities, they must be subject to armed forces discipline. Bottom line answer: to have "permanent" crewmembers who are not subject to armed forces discipline would deprive the vessel of warship status and, therefore, the belligerent rights it is intended and designed to have.
- Request to know if the deduction is "true," then how does this differ from the current use of Embarked Contractor Technical Representatives?
- Embarked contractor tech reps are not permanent members of the crew of a warship. They are considered by the Navy and Department of Defense as "civilians accompanying the force," who are to be treated as protected persons and prisoners of war should they fall into the hands of an enemy force. It is the opinion of the Navy and DoD that such personnel do not participate actively and directly in hostilities, but this is a subjective determination that may not comport with the determination of an enemy force. Bottom line answer: the presence of civilian personnel who are not permanent members of the crew, but are rather onboard the vessel on a "temporary" basis, does not deprive the vessel of its warship status and

ability to exercise belligerent rights. It must be noted that treaty-based and customary international law do not specify the threshold or maximum percentage of civilians that a warship may have onboard and still retain its status; the more civilians on board a vessel intended to exercise belligerent rights, the more it looks less like a warship.

Additional Question #2—Is the concept of using Contractor Civilian Aviation Squadron Members—Sea Base legally viable under existing laws and conventions, or would that group of civilians have to be in the Civilian Mariner (CIVMAR)/Reserve category?

- For the reasons discussed in the response to Additional Question 1, these civilians, who appear for all intents and purposes to be members of the ship's crew, as much as any aviation squadron personnel appear to be members of an aircraft carrier's crew, should be personnel subject to the Reserve legislation.

Original Response from OJAG

12 Aug 2004

From: Office of the Judge Advocate General (International and Operational Law Division)

Subj: LCS CIVILIAN AVIATION SUPPORT STUDY; RESPONSES TO QUESTIONS POSED

1. What, if any, congressional/legislative law/policy prevents/limits civilian personnel from engaging in combat operations?

Per DoD policy and guidance, civilians are an integral component of the DoD total force structure and may be deployed. That said, civilians who directly or actively participate in hostilities do not have combatant immunity and may be prosecuted for crimes under the domestic laws of foreign nations. Civilian mariners and aircrew could also be considered unlawful combatants and could be prosecuted for violations of the law of armed conflict. Commanders/Commanding Officers are also at risk if they employ civilians in ways that are not permitted under the law of armed conflict.

The Navy is conducting a pilot program in which a number of military personnel on board the Seventh Fleet (USS Coronado, substituting for USS Blue Ridge while that ship is in overhaul) flagship have been replaced with civilian mariners. To resolve the international law issues concerning such manning, the Navy is pursuing legislation that would make reserve affiliation a condition of employment such that the mariners could be activated during armed conflict. The current version of the legislation will apply to certain ships, including those supporting amphibious operations. This legislation would place the civilian mariners under an armed forces disciplinary system and would give them the highest level of protection as combatants under the Third Geneva Convention; without the legislation, the plans for manning will be problematic.

The Navy's pilot program shares a fundamental issue with the study of civilian support and/or crew for the MH-60R/S and Fire Scout aircraft aboard the Littoral Combat Ship: to what extent can civilians provide support without participating actively and directly in hostilities? Civilian mariners under the pilot program are performing functions such as deck, engineering, navigation, and hotel services. Military members, who are lawful combatants under the international law of armed conflict, remain responsible for, among other things, operation of the ship's weapon systems. More problematic with aircraft, however, particularly the smaller aircraft contemplated under this LCS Civilian Aviation Support Study, is that there are significantly fewer, if any, traditionally support functions than there are on a 570-foot, 17,000-ton warship.

2. What is the line of demarcation discriminating between support operations and combat operations for civilians?

The line is this regard is more gray than black and white. The pertinent criterion is what constitutes an active or direct part in hostilities. Direct participation in hostilities implies a direct causal relationship between the activity engaged in and the harm done to the enemy at the time and place where the activity takes place.

Without enactment of the reserve legislation to cover the concept vessels, there will be risk of adverse consequences if ships or aircraft engage in belligerent operations during traditional armed conflicts. The following are examples of the capabilities that are at risk:

a. Command and control of other vessels, aircraft, or units engaged in combat operations or exercise of belligerent rights

b. Command and control or direct support of operations directly projecting combat power ashore

c. Command and control or direct support of forcible entry operations

d. Deployment of forces ashore for forcible entry operations

e. Conducting independent operations for forcible entry operations

f. Conducting independent operations for combat operations

g. Launch and recovery of combat aircraft for combat operations

The following are examples of capabilities that are permissible regardless of civilian manning:

a. Command and control of humanitarian or non-combat-related missions, including permissive non-combatant evacuation operations (non-permissive NEOs will have to be assessed on a case-by-case basis, since, although they may not normally involve international armed conflict, there can be circumstances when the requirement arises to conduct such an operation during international armed conflict);

b. Conducting independent operations in a secure or benign environment such as providing humanitarian assistance, disaster relief missions or other non-combat-related missions;

c. Providing logistics support for all operations, such as maintenance, lighterage capability, cargo handling, and serving as a conduit for logistics support and sustainment.

Additional Question #3—"all operations, such as maintenance" could be construed as indicating that maintenance support for aircraft by civilians embarked in a combatant is permissible. Does this statement apply to combatants or to "rear area" logistics support, such as at the Sea Base?

- The law of armed conflict (treaty-based and customary international law) does not identify the threshold for activities such that, beyond that point, they amount to participating actively and directly in hostilities. In a rear area, the Navy and DoD would likely consider these civilians as civilians accompanying the force. We would see them as providing logistical support, rather than active and direct participation in hostilities. On board a vessel, however, unlike in a rear area, one must also consider the consequences for the platform. As indicated previously, having these civilians as "permanent members of the crew" could jeopardize the vessel's status as a warship and, therefore, its ability to lawfully exercise belligerent rights.

d. Conducting operations against non-state participants that do not involve international armed conflict

3. In what instances are civilians currently involved in combat operations either in Iraq or Afghanistan, or under what policy/rules/laws do they perform their functions?

Although the current state of conflict in Iraq and Afghanistan—international armed conflict, non-international (internal) armed conflict, operations other than war, etc.—is a matter of debate, what is clear is that the situation in both independent nations is no longer international armed conflict in the traditional sense, where hostilities exist between the forces of two or more nations. President Bush declared an end to major combat in Iraq on 2 May 2003, and the US occupation of Iraq ended 28 June 2004. The interim government of Afghanistan has been in place since 19 June 2002.

Current US military operations in both nations are being conducted at the invitation of the host governments. These operations amount to intelligence efforts, personal security details, and missions in furtherance of the Global War on Terror, and operations other than war. Civilians are present in both nations fulfilling support roles or private security functions. Some are associated with the DoD, and some are not associated with the DoD.

Per DoD policy, those civilians who do accompany US military forces in combat operations in Iraq, Afghanistan, or elsewhere in the world, whether civil servants or contractors, who do not actively or directly participate in hostilities, are considered "civilians accompanying the force." Such individuals are entitled to the protections of the Geneva Conventions as prisoners of war.

4. Can a civilian person in an aircraft be directed by a military person to deploy a weapon to neutralize a weapon (e.g., mine neutralization)?

Mine neutralization is a combat operation. Civilians who actively or directly participate in combat and in belligerent operations do not have combatant immunity and may be prosecuted for crimes under the domestic laws of foreign nations.

5. Can a civilian person in an aircraft be directed by a military person to deploy a weapon in offensive operations (e.g., torpedo against a submarine)? What about the deployment of sonobuoys?

Deploying a weapon offensively is clearly a combat operation. Deployment of sonobuoys, due to their intended purpose of assisting in the location of subsurface military assets or targets, is also likely to be viewed as a combat operation. Once again, civilians who actively or directly participate in hostilities do not have combatant immunity, and may be prosecuted for crimes under the domestic laws of foreign nations.

6. What is the implication of weapons release authority for an enlisted person? Is it that we have always done it that way or some actual law or mandate that signifies an officer as having weapons release authority? Either way, why cannot a civilian person have such authority?

From an international law perspective, there are no implications of weapons release authority for an enlisted member. Regardless of whether the member is serving subject to an enlistment contract or a commission, s/he is a member of the regular armed forces and, as such, has combatant immunity under the laws of armed conflict. At what level in the chain of command weapons release authority rests is a matter of training and responsibility determined by command and/or Navy policy, not international law.

For the reasons discussed previously, civilians cannot have weapons release authority. Commanders/Commanding Officers are also at risk if they employ civilians in ways that are not permitted under the law of armed conflict.

7. From observing the newspaper and CNN in regard to the use of the Predator or one of the other UAVs that carry the Hellfire missile, who has weapons release authority? Who actually pulls the trigger?

Once again, civilians who actively or directly engage in hostilities do not have combatant immunity and may be prosecuted for crimes under the domestic laws of foreign nations. If they so engage in hostilities, they could be considered unlawful combatants and could be prosecuted for violations of the law of armed conflict. For this reason, we have recommended that the individual "pulling the trigger" be a lawful combatant, a member of the regular armed forces of the United States.

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APPENDIX D. ACRONYM LIST

Acronym	Definition
A&P	Airframe and Powerplant
AAS	Alternative Aviation Study
ACU	Assault Craft Unit
AD	Aviation Machinist's Mate
AE	Aviation Electrician's Mate
AECS	Senior Chief Aviation Electrician
AET	Aviation Electrical Technician
AGF	Miscellaneous Command Ship
AIMD	Aircraft Intermediate Maintenance Department
AM	Aviation Structural Mechanic
AMO	Aviation Maintenance Officer
AMT	Aviation Maintenance Technician
AMTC	Aviation Maintenance Technician Chief
ANSI	American National Standards Institute
AO	Aviation Ordnanceman
AST	Aviation Survival Technician
ASU	Anti-Surface Warfare
ASW	Anti-Submarine Warfare
AT	Aviation Electronics Technician
ATC	Aviation Training Center
ATP	Air Transport Pilot
AW	Aviation Warfare Systems Operator
AZ	Aviation Maintenance Administrationman
BCHGRU	Beach Group
CASS	Civilian Aviation Support Study
CDI	Corrosion Damage Inspection
CDQAR	Corrosion Damage Quality Assurance Representative
CFR	Code of Federal Regulations
CHTWL	Commander Helicopter Wing Atlantic
CHTWP	Commander Helicopter Wing Pacific
CIA	Central Intelligence Agency
CIVMAR	Civilian Mariner
CLF	Combat Logistics Force
CNATRA	Chief of Naval Air Training
CNN	Cable News Network
COMSEVENTHFLT	Commander Seventh Fleet
COMTRAWING	Commander Training Wing
CONOPS	Concept of Operations

Acronym	Definition
CONUS	Continental United States
COTR	Contracting Officer's Technical Representative
CPO	Chief Petty Officer
CSG	Carrier Strike Group
CSO	Chief Staff Officer
CV/CVN	Aircraft Carrier/Aircraft Carrier Nuclear
DC	Damage Controlman
DoD	Department of Defense
EOD	Explosive Ordnance Detachment
ESG	Expeditionary Strike Group
F/A-18	Fighter/Attack Model 18 Aircraft
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FCBS	FC Business Systems
FFG	Guided Missile Frigate
FIT	Fleet Introduction Team
FMP	Focused Mission Package
FOPS	Flight Operations
FP	Force Protection
FR	Federal Regulation
GCU	Ground Control Unit
GSBPP	Graduate School of Business and Public Policy
GSH	Geo-Seis Helicopter, Inc.
HCO	Helicopter Control Officer
HH-65	Heavy-lift Helicopter Model 65
HITRON	Helicopter Interdiction Squadron
HQ	Headquarters
HSI	Human Systems Integration
HW	Hardware
ICAO	International Civil Aviation Organization
IFF	Interrogative Friend or Foe
IFR	Instrument Flight Rating
ILS	Integrated Logistics Support
ISO	International Organization for Standardization
JIATF	Joint Inter Agency Task Force
LCAC	Landing Craft, Air Cushion
LCC	Life Cycle Cost
LCS	Littoral Combat Ship
LPO	Leading Petty Officer
LSE	Landing Signal Enlisted

Acronym	Definition
LST	Tank Landing Ship
MDSU	Mobil Dive and Salvage Unit
MH	Medium Helicopter
MIW	Mine Warfare
MOS	Missions of State
MSC	Military Sealift Command
NAS	Naval Air Station
NASWF	Naval Air Station Whiting Field
NAVMAC	Navy Manpower Analysis Center
NAVSPECWARCOM	Naval Special Warfare Command
NCO	Non Combatant Operations
NDA	Non Disclosure Agreement
NDI	Non-Destructive Inspection
NETC	Naval Education and Training Center
NOTAM	Notice to Mariners
NPS	Naval Postgraduate School
NSN	National Stock Number
NSW	Naval Special Warfare
NVG	Night-Vision Goggle
OEM/PMA	Original Equipment Manufacturer/Parts Manufacture Authority
OINC	Officer-in-Charge
OJAG	Office of Judge Advocate General
OMB	Office of Management and Budget
OPAUDIT	Operational Audit
OS	Operations Specialist
PEO	Project Executive Office or Officer
PG	Postgraduate
PHM	Patrol Combatant Missile (Hydrofoil)
PIC	Pilot in Command
PMA	Project Manager
PMS	Planned Maintenance System
POW	Prisoners of War
PUK	Pack-Up Kits
QA	Quality Assurance
QASO	Quality Assurance Safety Observer
RFP	Request for Proposal
ROE	Rules of Engagement
ROM	Rough Order of Magnitude
S/R	Sierra/Romeo (MH-60 helicopter models)
SAR	Search and Rescue
SCIF	Sensitive Compartmented Information Facility

Acronym	Definition
SEVENTHFLT	Seventh Fleet
SI	Special Intelligence
SIC	Second in Command
SO	Safety Observer
SOP	Standard Operating Procedure
SUW	Surface Warfare
SW	Software
T&L	Turn-up and Launch
T/M/S or TMS	Type, Model, Series
T/S or TS	Top Secret
TACGRU	Tactical Group
TH-57	Training Helicopter Model 57
TN	Tennessee
UAV	Unmanned Aerial Vehicles
UCMJ	Uniform Code of Military Justice
UMFOTS	Undergraduate Military Flight Officer Training System
USC	United States Code
USCG	United States Coast Guard
USCGC	United States Coast Guard Cutter
USN/USMC	United States Navy/United States Marine Corps
USW	Undersea Warfare
VERTREP	Vertical Replenishment
VERTREP/VOD	Vertical Replenishment/Vertical Onboard Delivery
VTUAV	Vertical Takeoff Unmanned Aerial Vehicle
W/C	Work Center

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Acquisition Management

- Software Requirements for OA
- Managing Services Supply Chain
- Acquiring Combat Capability via Public-Private Partnerships (PPPs)
- Knowledge Value Added (KVA) + Real Options (RO) Applied to Shipyard Planning Processes
- Portfolio Optimization via KVA + RO
- MOSA Contracting Implications
- Strategy for Defense Acquisition Research
- Spiral Development
- BCA: Contractor vs. Organic Growth

Contract Management

- USAF IT Commodity Council
- Contractors in 21st Century Combat Zone
- Joint Contingency Contracting
- Navy Contract Writing Guide
- Commodity Sourcing Strategies
- Past Performance in Source Selection
- USMC Contingency Contracting
- Transforming DoD Contract Closeout
- Model for Optimizing Contingency Contracting Planning and Execution

Financial Management

- PPPs and Government Financing
- Energy Saving Contracts/DoD Mobile Assets
- Capital Budgeting for DoD
- Financing DoD Budget via PPPs
- ROI of Information Warfare Systems

- Acquisitions via leasing: MPS case
- Special Termination Liability in MDAPs

Logistics Management

- R-TOC Aegis Microwave Power Tubes
- Privatization-NOSL/NAWCI
- Army LOG MOD
- PBL (4)
- Contractors Supporting Military Operations
- RFID (4)
- Strategic Sourcing
- ASDS Product Support Analysis
- Analysis of LAV Depot Maintenance
- Diffusion/Variability on Vendor Performance Evaluation
- Optimizing CIWS Life Cycle Support (LCS)

Program Management

- Building Collaborative Capacity
- Knowledge, Responsibilities and Decision Rights in MDAPs
- KVA Applied to Aegis and SSDS
- Business Process Reengineering (BPR) for LCS Mission Module Acquisition
- Terminating Your Own Program
- Collaborative IT Tools Leveraging Competence

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