

## 1.0 INTRODUCTION

The Naval Air Systems Command (NAVAIR) MH-60R Multi-Mission Helicopter Program is an Acquisition Category (ACAT) 1C program under the authority of Air ASW, Assault and Special Mission Programs (PMA-299) and a new build air vehicle procurement. The MH-60R helicopter is designated as one of two of the U.S. Navy's new multi-mission helicopter platforms. The MH-60R replaces the SH-60B in the Undersea and Surface Warfare missions and the SH-60F in the Anti-submarine Warfare mission. The MH-60R program is currently completing preparations for a successful Milestone III Full Rate Production (FRP) Decision Review in January 2006. The MH-60R Program is fully compliant with Environmental Safety and Occupational Health (ESOH) acquisition guidance due to the efforts of the MH-60R ESOH Team.

## 2.0 BACKGROUND

During the achievement period for the Fiscal Year 2005 Secretary of Defense Environmental Awards (1 October 2003 – 30 September 2005), the MH-60R Program successfully completed Development and Operational Testing (DT/OT) milestones. It is this critical program-testing period for which the MH-60R ESOH Team's outstanding support deserves recognition. MH-60R ESOH Team member information is presented here.

### **MH-60R ESOH Team**

Since 1997, the MH-60R Program has teamed with the NAVAIR Ranges Sustainability Office (NAVAIR SO) at the Naval Air Warfare Center Aircraft Division (NAWCAD) at Patuxent River, MD (AIR-5.2F), to provide PESHE and Environmental Strategy support. This arrangement allows the number of members on the ESOH Team to fluctuate as necessary depending on where the program is in its lifecycle, however two core ESOH employees (one government, one contractor) are always maintained to ensure MH-60R ESOH compliance. During the time period being evaluated, Mary Hammerer and Jennifer Paulk provided the core support to the program and coordinated with the following organizations to manage ESOH concerns:

- NAVAIR 1.1E, Environmental Acquisition Support Office
- NAVAIR 11.3, Office of Counsel (Environmental/NEPA)
- NAVAIR SO resources (i.e., Test Plan Environmental Review Checklist Tool)
- NAVAIR 4.9.7.2, Materials Engineering Branch
- NAVAIR 4.3.5.1, Thermal Management Branch, Fire Protection
- MH-60R Program Office, System Safety Working Group (SSWG)
- Prime Contractors (e.g., Sikorsky Aircraft Corporation (SAC) and Lockheed Martin Systems Integration (LMSI))
- HX-21 and VX-1 (MH-60R DT/OT) squadrons
- NAWCAD Lakehurst
- CNO, N456, Operational Environmental Readiness & Planning Branch
- Fleet Forces Command (FFC)
- Naval Undersea Warfare Center (NUWC), Newport Division
- Naval Facilities Engineering Services Center (NFESC)
- Testing Range Environmental Planners (e.g., Southern California Offshore Range (SCORE) and Atlantic Undersea Test & Evaluation Center (AUTEK))
- Navy Inventory, Demilitarization and Disposal Centers (e.g., Defense Logistics Agency; Naval Inventory Control Point; and Depots)

**Mary Hammerer** is an Environmental Engineer currently supporting the NAVAIR Logistics & Industrial Operations Group (AIR-6.7.1). For the past two fiscal years, Ms. Hammerer served as the Environmental Safety and Occupational Health (ESOH) Coordinator for the MH-60R Multi-mission Helicopter Program Office, as well as, one of two government leads for the NAVAIR Ranges Sustainability Office (NAVAIR SO). As ESOH Coordinator, Ms. Hammerer was responsible for ensuring that the program office was compliant with all DoD and U.S. Navy environmental acquisition requirements. Major routine duties entailed providing input to the Program Manager, participating in Integrated Product Team and test planning meetings, assessing and mitigating risk to the program office from environmental considerations and drafting major program environmental planning documentation.

**Jennifer Paulk** is an Environmental Analyst employed by Ecosystem Management & Associates who has provided environmental planning on-site support to the NAVAIR SO and Ms. Hammerer since April 2004. For the past two fiscal years, Ms. Paulk's primary responsibility has been to review and develop MH-60R ESOH planning documents. Routine duties have entailed drafting National Environmental Policy Act (NEPA) and Executive Order (EO) 12114 documents related to proposed program testing; contributing to program environmental planning meetings; and developing a marine species protective measures training course for MH-60R pilots. Ms. Paulk received a Letter of Appreciation from the PMA-299 Program Manager for her environmental planning support of the MH-60R program. She is a certified Environmental Compliance Inspector and a member of the California Water Environment Association and Air & Waste Management Association.

### **3.0 TEAM ACCOMPLISHMENTS**

#### **ESOH Program Management Approach**

The MH-60R ESOH Team's program management approach is to interface with key program stakeholders throughout the MH-60R acquisition program life cycle to ensure that timely and accurate information is obtained for the purpose of eliminating and minimizing ESOH risks to the program. This was accomplished during MH-60R Low Rate Initial Production and DT/OT by meeting every week with MH-60R subsystem Integrated Product Team (IPT) leads to obtain and share information necessary to prepare for upcoming testing and ensure that environmental considerations are incorporated into program planning. Additional stakeholders and subject matter experts, listed in Section 2.0, were consulted prior to and during this time period to update required program ESOH documentation. ESOH planning documents that are discussed in subsequent paragraphs are the Programmatic Environmental Safety and Health Evaluation (PESHE), the Hazardous Materials Management Program (HMMP)/Pollution Prevention (P2) Plan, annual HMMP/P2 Report; and Deactivation, Demilitarization and Disposal (3D) Plan. In addition, much effort during this time period was productively focused on consideration and mitigation of potential environmental impacts from proposed program actions in NEPA and/or E.O. 12114 documentation.

The MH-60R ESOH Team also makes every effort to operate efficiently by making use of existing government environmental management resources, drafting environmental planning documents that can be transferred across aircraft platforms, and consolidating environmental planning efforts across U.S. Navy commands for combined testing and training events. Examples of these successes are provided in subsequent paragraphs.

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**Incorporating Environment, Safety, and Occupational Health Analysis in Acquisition**

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The following is a summary of how the MH-60R ESOH program complies with Defense acquisition requirements to incorporate ESOH analysis into the MH-60R acquisition process, as well as, ESOH accomplishments during the achievement period.

- ❑ **PESHE** – The MH-60R Program Manager developed a PESHE for Milestone II (MS II). The PESHE has been updated twice since MS II, with the latest update in 2005, as required for Milestone III/FRP Decision Review. As the program enters FRP, the PESHE serves as a risk management tool to track progress in incorporating ESOH considerations and minimizing ESOH risks throughout the MH-60R’s life cycle. Integrating ESOH considerations into the Systems Engineering risk management process is achieved by using the methodologies described in the government-industry standard, *Standard Practice for System Safety*, MIL-STD-882D. The MH-60R PESHE assesses ESOH risk through the use of analysis matrices, in accordance with MIL-STD-882D. The overall program ESOH risk assessed in the 2005 PESHE is low.
- ❑ **NEPA/EO 12114 Compliance Schedule** – The PESHE includes the NEPA/EO 12114 Compliance Schedule that tracks the program’s environmental planning associated with proposed program actions. A major focus of MH-60R ESOH Team efforts during this achievement period was in assessing potential environmental impacts from MH-60R testing. The ESOH Team applied existing environmental documentation where appropriate and prepared required NEPA/EO 12114 documentation with the concurrence of NAVAIR Office of Counsel, NAVAIR Environmental Acquisition Support Office and N45.
- ❑ **HMMP/P2 Plan and Annual Report** – In addition to the PESHE, the MH-60R program prepared a Programmatic HMMP/P2 Plan to evaluate the elimination/reduction of HM associated with design, manufacture, maintenance, operation and disposal of the MH-60R and associated systems to the maximum extent possible through P2 initiatives. The MH-60R HMMP/P2 Plan (updated 2005) identifies HMs that are targeted for reduction and that have been reduced in MH-60R design and manufacture. In addition, the HMMP/P2 Annual Report prioritized chemicals targeted for reduction by the Navy and the MH-60R program that are currently being used by the Fleet to maintain and operate legacy H-60 helicopters. The use of P2 techniques is the preferred method of achieving ESOH compliance. Material substitution efforts that have been implemented and are being researched are listed in Table 1.
- ❑ **3D Plan** – The current 3D Plan update was completed in 2005 in time for MS III/FRP Decision Review and was reviewed by MH-60R Logisticians, Naval Inventory Control Point, NAWCAD Lakehurst, and Navy Depots. The plan identifies all MH-60R parts that require demilitarization, contain materials that may be a hazard to workers during demilitarization, may require hazardous waste disposal, or may have inherent value and should be reclaimed. The plan will be reviewed and updated on at least an annual basis, if new information is gained regarding the material composition of the aircraft and related weapon systems; and associated hazards.
- ❑ **System Safety and Occupational Health** – MIL-STD-882 establishes the requirements for an acquisition program to form a SSWG, which is responsible for the identification and resolution of potential system safety risks imposed by the design and operation of the system. To implement system safety, the MH-60R SSWG (established June 1997) defined a process annotated in the MH-60R System Safety Program Plan (SSPP). System Safety Engineering and Occupational Safety & Health (OSH) share the objective to ensure employee exposure to

workplace hazards are eliminated or minimized. The PESHE outlines MH-60R program OSH objectives and identifies potential OSH hazards associated with the program for which progress in mitigating is tracked in the MH-60 System Safety Action Record (SAR).

- ❑ **ESOH Federal, State and Local Regulatory Compliance** – Through preparation of the above documents and consideration of potential environmental impacts from program actions via the NEPA process, continuous compliance with all applicable Federal, state, and local ESOH laws and regulations is ensured. ESOH Team members periodically review emerging regulations to identify potential impacts to the Program compliance, schedule and cost.
- ❑ **Incorporating ESOH Considerations into Program Acquisition Strategy** – The MH-60R Acquisition Strategy document includes a summary of the PESHE, including a strategy for integrating ESOH considerations into the Systems Engineering process; ESOH risks and risk mitigation efforts; and a compliance schedule for NEPA/EO 12114.
- ❑ **Sustainment and Infrastructure** – The Acquisition Logistics Support Plan (ALSP) provides the single overall plan for the management and execution of product support. The MH-60R ALSP describes the Supportability Analysis (SA) program, which provides a systematic analysis technique and a centralized commercial database for use by all logistics elements in evaluating system design, developing design change recommendations, and establishing support system and resource requirements. One of the objectives of the SA program is to eliminate or minimize environmental hazards.

### Environment, Safety and Occupational Health Integration

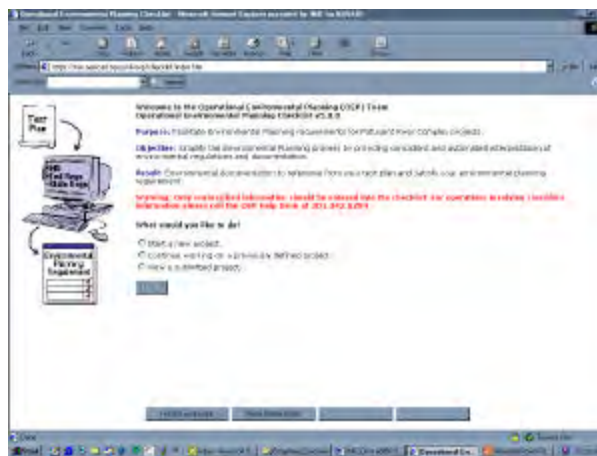
The ESOH Team has integrated ESOH considerations into each MH-60R program acquisition phase. Below are accomplishments associated with each phase of the MH-60R life cycle.

- ❑ **Design** – SAC and the U.S. Navy have worked together successfully to eliminate and reduce HM in the MH-60R (see Table 1). This pays off down the line by reducing hazards and costs associated with the aircraft's maintenance, operation, demilitarization and disposal.
- ❑ **Manufacturing** – ESOH requirements are incorporated into production contracts.
  - SAC has a robust environmental program and has been successful in eliminating/reducing HM usage associated with MH-60R production (see Table 1). SAC continues research efforts to discover and implement HM substitutions during production. As a deliverable on the LRIP Contract, SAC and LMSI prepared HMMP Plans and Reports based on National Aerospace Standard 411. Subsequent SAC production contracts require annual HMMP Reports describing progress, which will serve as a management tool for the PMA-299 MH-60R ESOH Support Team to ensure that continuous progress is made toward achieving the HMMP objectives.
  - In addition, the MH-60R ESOH Team prepared Records of Categorical Exclusion to address potential environmental impacts from MH-60R production, a contract action. Prime contractors' facilities' regulatory compliance have been and will continue to be assessed on an annual basis.
- ❑ **Test and Evaluation** – All NEPA/EO 12114 documents were completed such that there was no delay in developmental or operational testing and allowed for the successful entry into the Operational Evaluation (OPEVAL) test phase.
  - The environmental planning document prepared during the achievement period, by the MH-60R ESOH Team and NUWC Newport Division, that warrants particular recognition is the *Overseas Environmental Assessment (OEA) of Testing The Hellfire Missile System's Integration with the H-60 Helicopter*, May 2005. This OEA was



reviewed and approved by N45. The OEA has application to any H-60 (and potentially any helicopter) aircraft platform in the conduct of live Hellfire missile shots in a specified area of the Virginia Capes Operating Area.

- MH-60R OT pilots (VX-1 squadron) try to combine their testing with training events when possible. In these instances, the MH-60R ESOH Team successfully worked with FFC in the development of EO 12114 documents that addressed the potential environmental impacts from proposed joint testing and training actions. This consolidated effort is supportive of both OT pilots and the Fleet and helps to reduce costs to the U.S. Navy associated with environmental planning.
- In addition to the programmatic environmental documentation, all MH-60R NAVAIR test plans are reviewed by Environmental Analysts in the NAVAIR SO, using the Operational Environmental Planning (OEP) Checklist Tool. This additional review of each MH-60R test plan provides added assurance that planned operations have been assessed under existing environmental documentation.



**OEP Checklist Tool Screen Shot.**

- ❑ **Operations** – MH-60R ESOH Team has worked and continues to work with the MH-60R Fleet Introduction Team to ensure that appropriate environmental considerations are being incorporated into upcoming MH-60R home basing and subsequent Fleet operations.
- ❑ **Logistics Support** – The MH-60R Assistant Program Manager for Logistics (APML) has prepared a Facility Requirements Document (FRD) and Site Activation Support Plans (SASPs) to support fielding the MH-60R to the Fleet. The FRD and SASPs, in concert, identify maintenance, supply, and support facility requirements for the MH-60R Helicopter. In order to develop the SASPs, a MH-60R survey team visited each site and briefed the facility, squadron, and environmental managers on the mission of the MH-60R. These briefings provided an opportunity for the MH-60R survey team to receive feedback to potential basing issues, such as NEPA/EO 12114 requirements.
- ❑ **Disposal** – The MH-60R 3D Plan (2005) provides information regarding the material composition of the MH-60R and possible associated hazards to the worker performing demilitarization or to the environment during disposal. By identifying health and environmental hazards associated with demilitarization and disposal of MH-60R parts early in the program life cycle, the individual can avoid safety and health hazards and the program can reduce risks and costs. In addition, materials of value are identified so that they may be reclaimed with a cost savings to DoD.
- ❑ **Life Cycle Costs** – MH-60R ESOH Team utilized the Design for the Environment and Safety (DFES) concept to integrate ESOH considerations into the systems engineering process as early as possible and over the MH-60R system life cycle to reduce Total Ownership Cost (TOC). This approach has resulted in cost savings largely from making efficient use of existing government environmental planning resources, as described throughout this document.

**Material Substitution/Hazardous Material Elimination or Minimization**

**Table 1: HM Elimination/Minimization Initiatives**

P2 Initiative	Description
Chrome Replacement	SAC is successfully implementing a boric sulfuric acid anodizing (BSAA) process as an alternative to the chromic acid anodizing process. Projected reduction of SAC’s hazardous material usage by 3,000 pounds per year.
	U.S. Navy is researching High Velocity Oxygen Fuel (HVOF) thermal spray process to replace hard chrome electroplating on aircraft landing gear. Implementation would reduce/eliminate chromium usage, hazardous waste and employee exposure.
Reduce/Zero Volatile Organic Compound (VOC) on Rotor Blades	U.S. Navy, Marine Corps and SAC arranged to conduct a “Lead the Fleet” effort to apply a Zero VOC Coating to both new production and legacy H-60 rotor blades. SAC received positive feedback from the Fleet after 96% of tests were completed in the field. SAC plans to transition to the Zero-VOC coating on the production line, thereby providing an additional 4.0 pounds reduction in air emissions per aircraft.
Guide to Environmentally Friendly Replacements	To aid design engineers, the SAC environmental team has developed a guide listing environmentally friendly materials and processes that are approved for application to ensure that they are incorporated into SAC processes and designs, resulting in the reduction of hazardous materials at SAC.
Solvent Substitutions	SAC has developed zero VOC (Type I) primers that reduce air emissions and employee exposure to carcinogens, such as xylene, toluene, and methyl ethyl ketone (MEK). Topcoat savings would be ~25 lbs. per aircraft.
	U.S. Navy is assessing paint strippers and jointing compounds that do not contain methylene chloride.
	U.S. Navy is conducting evaluation of Zero VOC High Gloss coatings on airframes.
MH-60R Halon Replacement Plan	U.S. Navy is conducting full-scale testing of MEK and acetone replacement in adhesive pre-bonding applications.
	SAC is working with the U.S. Navy to execute Phase II of the halon Replacement Plan for the MH-60R Engine Fire Suppression System. This entails constructing and testing a prototype system. If suitable, the replacement could be used by other H-60 aircraft.

**Education and Outreach**

**Marine Species Awareness Training**

Implementing marine species protective measures is a requirement of several MH-60R NEPA/EO 12114 documents; and U.S. Navy Instructions and Messages. To mitigate risk to the MH-60R program, the MH-60R ESOH Team, in coordination with the NAVAIR SO, developed and conducted a course to instruct MH-60R pilots in the implementation of marine species protective measures during underwater acoustic testing in the Atlantic Ocean. Pilots were taught how to visually recognize marine mammals, in particular, from the air and how to acoustically detect marine mammals through passive underwater acoustic monitoring. Specific protective measures and after action reporting requirements were reviewed with the test pilots for upcoming planned testing. Class survey results indicated that all pilots felt that the course was worthwhile and useful to them. The course was reviewed and approved by Mr. Robert D. Kenney, PhD, a Marine Biologist from the University of Rhode Island, Graduate School of Oceanography, who conducts classroom and field marine species monitoring courses for NAVSEA.

