

ENVIRONMENTAL AWARDS

*ENVIRONMENTAL EXCELLENCE IN WEAPON SYSTEM ACQUISITION TEAM AWARD:
WRIGHT-PATTERSON AIR FORCE BASE*

INTRODUCTION

The Air Force Life Cycle Management Center (AFLCMC)'s Acquisition Environment, Safety, and Occupational Health (ESOH) Integrated Team (ESOH Team) is responsible for outlining the approach to ESOH Risk Management, reviewing contractor ESOH deliverables, and ensuring compliance with the National Environmental Policy Act (NEPA). In addition, the ESOH team provided contractual language for solicitations to properly identify and manage ESOH risk. This provides the framework for the Program Office to identify and track hazards and if needed their mitigation status throughout the life cycle of the program. The language provides methods to identify and track hazardous materials used in the modification including the requirement for the contractor to develop and implement mitigation or replacement strategies.

BACKGROUND

Headquartered at Wright-Patterson AFB, the mission of Air Force Materiel Command (AFMC) is to equip the Air Force for World-Dominant Airpower. The Air Force relies on AFMC to provide leading-edge science and technology, perform "cradle-to-grave" life cycle weapon systems management, accomplish world-class developmental test and evaluation, accomplish world-class depot maintenance and supply chain management, and enhance the Air Force nuclear enterprise. AFMC has organized to focus the execution for Weapon System (WS) Acquisition to AFLCMC. AFLCMC manages over 400 Air Force, joint Department of Defense (DoD), and international aircraft acquisition programs; executes an annual budget of over \$19 billion; and employs a work force of more than 26,000 airmen, civilian, and contractors across some 75 locations worldwide.

The mission of the AFLCMC is to acquire and support war-winning capabilities. AFLCMC's objectives are to: deliver cost effective acquisition solutions, deliver affordable and effective product support, launch high confidence sustainable programs, standardize and continuously improve center processes, develop and place the right person at right time, and assure a safe, secure, and quality work environment.

AFLCMC is organized in ten Program Executive Office directorates. The ESOH team includes staff from 2 of these directorates: the Agile Combat Support Directorate (i.e., materiel acquisition and modernization) and the Mobility Directorate (i.e., cargo transports and training aircraft). In the past 2 years, the C-5 Division of the Mobility Directorate has initiated several major Acquisition Category (ACAT) I and smaller ACAT III programs to upgrade its maturing fleet of C-5 Galaxy aircraft. The C-5M Core Mission Computer/Weather Radar Replacement Program (CMC/Wx Radar Mod), an ACAT III program is one important program within this timeframe. The CMX/Wx Radar Mod specifically addresses navigation communication interface and weather detection equipment upgrades. This development effort is a permanent sustainment modification that includes the replacement and integration of the CMC/Wx Radar Mod components with the objective to increase C-5 fleet availability and enhance mission readiness through Calendar Year (CY) 2040.

Throughout the CMC/Wx Radar Mod acquisition process, the ESOH team involvement was a critical aspect of the program's success. ESOH considerations were addressed in accordance with MIL-STD-882D, DoD 5000.02, and NEPA compliance requirements and were accomplished within or ahead of the established program schedule. The ESOH Team is tasked with reviewing and recommending alternates to hazardous materials, and mitigations to occupational health risks. The tasks are considered for all aspects of the program life cycle. The approach to identifying hazards is documented and updated in the Programmatic Environment, Safety, and Occupational Health Evaluation (PESHE) and includes the NEPA Compliance Schedule. ESOH risk management is conducted based on criteria established in the PESHE and the Systems Engineering Plan (SEP) by the ESOH Team and others. This benefits the CMC/Wx Radar Mod program by identifying, qualifying and quantifying, and mitigating where practicable the ESOH risks associated with this program. Addressing these risks early in the program life cycle adds value through risk mitigation (i.e., an ESOH-compliant and safer product).

TEAM DESCRIPTION

The ESOH Team, based at Wright-Patterson Air Force Base (AFB), Ohio, is comprised of members of the AFLCMC's Agile Combat Support Directorate, Acquisition Environmental & Health Risk Management Branch (AFLCMC/WNVV). They provide ESOH considerations, Pollution Prevention (P2) material substitutions, and incorporate programmatic ESOH risks into the WS acquisition programs; and members of the Mobility Directorate's C-5 Division. This division is responsible for the C-5 program design engineering and materiel acquisition process. Individual participation varied throughout the two-year award period, so the combined efforts of the ESOH Team members across both offices will be used herein for brevity.



Shown here are members of the Air Force Life Cycle Management Center (AFLCMC) Acquisition Environmental & Occupational Health Integrated Team who are current and past staff of the Acquisition Environmental & Health Risk Management Branch (AFLCMC/WNVV) Home Office. From left to right, the team members are: (Front Row) Mr. Jim Ryckman & Mr. George Walters, (Second Row) Mr. Thomas McDonald & Mr. Tedmond Grady, (Third Row) Mr. Jeff McCann & Mr. Derek Gray, (Rear) Mr. Arnold Godsey. Absent from the picture are Mr. Andy Ghazee & Mr. David Walker.



Shown here are members of the Air Force Life Cycle Management Center (AFLCMC) Acquisition Environmental & Occupational Health Integrated Team from the Mobility Directorate and C-5M Program Offices. From left to right, the team members are: Mr. Doug Chapman, Mr. Benjamin Thrasher, & Mr. Michael Kinane. Absent from the picture is Mrs. Theresa Hay.

The team members are (alphabetically):

- Mr. Doug Chapman, C-5 CMC/Weather Radar Program Manager, AFLCMC/WLSP
- Mr. Andy Ghazee, Environmental Engineer, AFLCMC/WNVV
- Mr. Arnold Godsey, Environmental Manager/Facilities Engineer, AFLCMC/WNVV
- Mr. Tedmond Grady, Division Technical Advisor, AFLCMC/WNVV
- Mr. Derek Gray, Environmental Manager/Facilities Engineer, AFLCMC/WNVV
- Mrs. Theresa Hay, Mechanical Engineer, AFLCMC/WLV
- Mr. Michael Kinane, Systems Safety Engineer, AFLCMC/WLSE
- Mr. Jeffrey McCann, Branch Chief (Acting), AFLCMC/WNVV
- Mr. Thomas McDonald, ESOH Program Manager, AFLCMC/WNVV
- Mr. James Ryckman, Environmental Engineer, AFLCMC/WNVV
- Mr. Benjamin Thrasher, Environmental Engineer, AFLCMC/WLVE
- Mr. David Walker, Occupational Health Manager, 711 HPW/HPO
- Mr. George Walters (former Acting Branch Chief), AFLCMC/WNVV

TECHNICAL MERIT

The primary mission of AFLCMC/WNVV – the lead office for the ESOH Team – is to reduce the ESOH risks to programs by the integration of ESOH requirements into WS program management processes. AFLCMC/WNVV accomplishes this mission through the ESOH Risk Management P2 program. AFLCMC/WNVV assesses technologies for integration into WS procurement and production. ESOH risk reduction efforts can be incorporated in the most cost and schedule effective manner at this stage of the acquisition life cycle. Implementation of these technology solutions reduces the ESOH risks and the environmental footprint across the WS life cycle.

Incorporating ESOH into Systems Engineering (SE) is an essential step accomplished by AFLCMC/WNVV that greatly reduces the risk of ESOH in WSs. AFLCMC/WNVV reviews each weapon system program (including ACAT II and ACAT III programs such as the CMC/Wx Radar Mod) to ensure a solid ESOH strategy is in place

that will deliver a product or service within cost, schedule, and performance goals. AFLCMC/WNVV addresses ESOH considerations at the beginning of the acquisition process – when changes are cheapest and easiest to implement – allowing for more successful mitigation of ESOH risks through the SE process.

The primary focus of the C-5 program is to deliver a quality product at the least cost, and ESOH risk management supports that focus. Through multiple interactions with C-5 WS engineers, sustainment process engineers, and other stakeholders, the ESOH Team collected and analyzed WS specific engineering challenges that pose ESOH risks. The resulting engineering requirements will be reviewed by the AFLCMC/WNVV ESOH Managers, by the CMC/Wx Radar Mod ESOH Team, and the Program Manager. While it is the AFLCMC/WNVV mission to integrate solutions to ESOH requirements in the WS procurement stage, projects are reviewed for potential cross-platform integration often resulting in benefits to other WSs regardless of their life cycle phase.



Pictured here, Capt. David Elkins, 22nd Airlift Squadron C-5 aircraft commander, examines the weather radar during a pre-flight check. This picture was taken in preparation of the Crisis Look 07-02 deployment exercise held on Travis Air Force Base, California. Within the cockpit can be seen the original, pre-CMC/Wx Radar Modification and pre-Avionics Modernization Program upgrades to the display equipment.

The ESOH Team developed the PESHE for the CMC/Wx Radar Mod, which establishes the overarching ESOH guidelines for the program. The PESHE is a living document that will be updated and maintained throughout the progression of the program, from concept to disposal. Because the PESHE is a program document, it is not

intended to supersede or replace other ESOH documents (e.g., System Safety Management Plans, Hazardous Material/Pollution Prevention Plans, NEPA documents, etc.), but it establishes how and by whom the program's ESOH considerations will be monitored. The ESOH Team has integrated Department of Defense Instruction (DoDI) 5000.02 requirements into the SE and overall risk management processes to ensure that WS Programs acquire the most effective equipment, at the best price and delivered on time, to support our war fighters as they maintain our nation's defense.

ORIENTATION TO MISSION

The C-5 Galaxy is the largest strategic airlift platform in the DoD inventory and is a long-range, high speed, high altitude airplane, designed for use as a heavy logistic transport. The principle purpose of the C-5 is to enable the military core competency of rapid global mobility. The C-5 accounts for over half of the Air Force's organic airlift capability and one quarter of total airlift capability. It is one of only two U.S. platforms capable of delivering oversized cargo.



Shown above is the cockpit of the C-5B Galaxy. This aircraft includes none of the Avionics Modernization Program (AMP) upgrades or any of the C-5M Core Mission Computer/ Weather Radar Modification (CMC/Wx Radar Mod) program's upgrades. The CMC/Wx Radar Mod will not only upgrade the existing computer hardware to modern technological capabilities, but it will also allow the aircraft to detect inclement weather sooner and interface with navigational communications systems (e.g., navigational beacons, air traffic control towers, other aircraft, etc.) better than ever before.



Shown above is the cockpit of the upgraded C-5M Super Galaxy. This aircraft includes the Avionics Modernization Program (AMP) upgrades. The CMC/Wx Radar Modification program upgrades will interface and be presented on the new digital readouts making the workload easier for pilots and crew alike and will provide much more real-time data than previous analog equipment.

To continue to effectively deliver this critical, military-unique capability, the C-5 must be more reliable, available, and maintainable. The aircraft must perform these missions throughout the worldwide air traffic control environment with the proper equipment to operate in Federal Aviation Administration (FAA)/International Civil Aviation Organization controlled airspace. Additionally, the C-5 aircraft must operate at night and in all categories of adverse weather.

The C-5 CMC/Wx Radar Mod Program addresses two elements of these ever-evolving WS needs. First, the Core Mission Computer component is a replacement for the existing C-5 Versatile Integrated Avionics/Auxiliary Interface Unit. Second, the C-5M weather radar includes the hardware and software modifications necessary to support installation and integration into the new CMC and C-5M architecture. The replacement radar will meet industry development standards including Telecommunications Service Orders C63c, Radio Technical Commission for Aeronautics DO-178B Level C, and DO-160D, as well as communication, navigation, and air traffic management requirements to both FAA and international aviation regulations for missions worldwide. This development effort is a permanent sustainment modification consisting of the replacement and integration of these two components with the objective to increase C-5 fleet availability and enhance mission readiness through CY2040. It is anticipated that the CMC/Wx Radar Mod will be implemented on 52 aircraft (3

Engineering and Manufacturing Development and 7 Low Rate Initial Production aircraft, and 42 in-service aircraft).

ESOH considerations will continue to be addressed by the program office per the PESHE requirements, the contractor-developed Health Risk Management Plan, and relevant sections of other program plans. Both contractor and Air Force personnel will monitor tests and production. Should a new hazard be identified, the contractor, with Air Force oversight, will conduct the requisite impact analyses and health assessments to determine required mitigations and/or control mechanisms, in accordance with MIL-STD-882D.

The PESHE for the CMC/Wx Radar Mod program identifies the overall risk management approach (strategy, processes and procedures) for the integration of ESOH considerations in SE processes and contract solicitation with respect to the Government's specific ESOH requirements for the program in the System Requirements Document, the Statement of Work, and the Contract Data Requirements List. Regular System Safety Working Group meetings throughout the acquisition process will be held to assess hazards and mitigate the associated risks to acceptable levels; these meetings are led by the System Safety Engineer, thus ensuring continuity of purpose and a centralized focal point for ESOH data management.

TRANSFERABILITY

Working with the C-5M CMC/Wx Radar Mod team, as well as with other ACAT programs of all sizes, AFLCMC/WNVV makes several tools developed in house available to assist Programs with their ESOH needs. These tools provide guidance on writing PESHEs; developing NEPA compliance schedules; and preparing contractual language to provide the necessary contract framework to require contractors to provide appropriate hazard information, to locate and quantify hazardous materials, and to comply with any current or future regulation that may affect the WS. These tools are available on the AFLCMC ESOH Central SharePoint website and are accessible to all WS programs within the Major Command. The tools offer a quick start to authoring the respective documents while also explaining the purpose of each section and sub-section within those documents; they cover all the necessary requirements set forth by Office of the Secretary of Defense. The development and deployment of several checklists and circulars (e.g., NEPA circular, PESHE Checklist, and ESOH circular) to directorate Environmental Managers

has also served as an integral part of transferring ESOH knowledge. The documents provide guidance and support to Environmental Managers by incorporating the most current information from regulations, instructions (both Air Force and DoD), and policies.

AFLCMC/WNVV also developed an ESOH computer-based Programmatic Risk Training (PRT) tool to raise awareness in ESOH related requirements. The ESOH PRT focuses the user on the NEPA and PESHE requirements needed for managing ESOH processes in Acquisition and SE via hands-on interactive computer modeling. Tools such as this enable a systematic approach to identify and communicate ESOH related risks to the WS program managers, Chief Engineers, Director of Engineering and Environmental Managers. These findings result in cost savings by highlighting risks that will occur if managers fail to manage properly the ESOH aspects of their program throughout the life cycle of a WS. These ESOH tools have been lauded by the Assistant Secretary for Acquisition as being highly effective ways in reducing ESOH risks during the many stages of the acquisition process. AFLCMC/WNVV manages these tools through their SharePoint website, a one-stop location for information regarding ESOH requirements mandated by regulations and policy.

In addition to AFLCMC/WNVV providing an abundance of tools and internal coordination efforts, our external efforts also extend to the following:

- Conducted technical information meetings to identify P2 needs, identified & demonstrated, qualified “next generation” technologies to address P2 & operational requirements and reduce/eliminate ESOH risk with program offices
- Conducted health risk assessment for occupational health risks of material substitutions
- Spread the ESOH “grassroots” message through briefing to AFLCMC functional, Acquisition Office & the ESOH council
- Educated over 1,000 personnel on ESOH risk management, PESHE writing, basics of ESOH, and statutory NEPA requirements and integrating ESOH into acquisition strategy and system engineering process

This type of networking resulted in personnel obtaining a firm grasp on the current and future ESOH impacts on the acquisition weapon systems and on the regulations or standards used to mitigate ESOH risk. Finally, this effort

sheds light on current risks and potential problems that may become a reality in the future. Without this outreach effort, personnel across WS platforms and Program Offices would not gain a firm understanding of what they need to do to improve the current ESOH standards on their WS and reduce the current ESOH burden.

STAKEHOLDER INTERACTION

Developing and implementing adequate ESOH considerations into a program of any ACAT level involves many processes and participation from multiple stakeholders. Airmen, Air Force civilians, and contractor participation is especially important for effective implementation because ESOH considerations are applied to WSs used in training and deployed to the field. Specific to the CMC/Wx Mod, the stakeholder interaction has been proactive and timely. This reflects the initial and future actions of the ESOH Team to identify the activities, locations, products, and services where ESOH concerns exist. The importance of including other interested stakeholders in these processes also is demonstrated through the NEPA review process. Programs are required to coordinate with environmental planning functions at test and beddown locations to identify and assess potential ESOH impacts related to the WS modifications, if any. Program requirements such as requirements for periodic inspection of various activities (e.g. at manufacturing plant) may also facilitate the activity of identifying an ESOH issue of interest and should require Stakeholder participation from the contractor through the WS lifecycle.

PROJECT IMPACT

A key CMC/Wx Radar Mod program goal is to protect human health and the environment by integrating ESOH considerations into the Systems Engineering process. Through risk assessment, the ESOH Team helps to ensure that the fielded system: optimizes ESOH considerations with respect to program cost, schedule, and performance throughout the system life cycle; avoids where possible the use of Class 1 and Class 2 Ozone-Depleting Substances; and cost-effectively avoids the use of any additional hazardous or toxic chemicals in the system while simultaneously attempting to reduce the hazardous materials (HAZMAT) currently present in the system.



Seen here, a C-5M Super Galaxy is delivering cargo in Antarctica. The largest cargo transport aircraft in the US Air Force fleet, the C-5M must stand mission-ready for any deployment anywhere in the world. The system and interface upgrades of the CMC/Wx Radar Mod program will increase mission effectiveness in remote and isolated locations as well as in major national and international airspace and the entire system is designed to increase safety, ease crew workload and enhance flight situational awareness.

The CMC/Wx Radar Mod Program anticipates several ESOH benefits throughout its life cycle:

- HAZMAT will be reduced in the new electronics devices (modern commercial off the shelf (COTS) equipment) over the old electronics devices (from the 1960s and 1970s), so Government Owned, Contractor Operated (GOCO)/depot facilities have less HAZMAT to handle (i.e., less potential for normal user to experience an accidental exposure)
- As the new systems are essentially “plug-and-play” devices (though with fewer components than the current system), installation of new devices will result in fewer Occupational Safety & Health Administration (OSHA) mishaps at the GOCOs & depots
- Through enhancements in adverse weather detection, the new radar gives pilots a larger field of view of their flight path making deviations for weather easier and more fuel efficient (i.e., shorter flight routes) which equates to fuel savings over current missions
- The new radar array is more ESOH friendly –as the new radar is 10 times less powerful than the previous unit (110Watts vs. 1000Watts); thus, it is safer for those who use, maintain, and service the aircraft, as well as to the environment itself

- Hazardous waste (HAZWASTE) streams will be greatly reduced over the life cycle of the program as Mean Time Between Failures (MTBF) are anticipated to increase (from approximately 100 hours to 2000 hours for the Wx Radar and from approximately 100 hours to 4000 hours for the CMC); fewer repairs/replacements equates to fewer accidental exposures to HAZMAT, and less HAZWASTE in the disposal stream
- MTBF improvements also have direct association with fewer GOCO/depot OSHA mishaps as repair frequency will be reduced significantly

Traditionally, each program develops specific programmatic documents such as the SEP and a PESHE. The ESOH Team realizes efficiencies through assisting in developing overarching SEP and other environmental management docs (such as the NEPA compliance checklist, etc.) as an effort saving practice that spans the breadth of C-5 Division’s Programs. These efficiencies create a familiar and standardized environmentally-conscious program for not only the CMC/Wx Radar Mod program but for the organization as a whole; and it ensures that pertinent and important environmental and occupation hazard considerations are not overlooked during any portion of the program’s life cycle.