WEAPON SYSTEM POLLUTION PREVENTION

MONITOR

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FEATURE STORY

OVERVIEW: INTEGRATING ENVIRONMENTAL, SAFETY, AND HEALTH (ESH) INTO THE SYSTEMS ENGINEERING PROCESS

This is the first in a series of weapon system ESH articles. Future articles will expand upon the important issues for Single Managers (SMs) and support staff. Readers are encouraged to suggest other topic areas related to integrating ESH issues into the acquisition management process. The information contained in this article also serves as the foundation for the Air Staff Program Element Monitor/Action Officer (PEM/AO) Handbook. This information is consistent with the ESH training modules now included in the Defense Acquisition University (DAU) courses for Systems Planning, Research, Development and Engineering (SPRDE) and Acquisition Production and Quality Management (APQM).

Overview of Department of Defense (DoD) ESH Requirements

Section 3.3.6 of DoD 5000.2-R (NOTE: this section will become 3.3.7 in change 3 to the regulation.) requires each Acquisition Strategy to include a programmatic ESH evaluation. For the Air Force, the acquisition strategy is typically included in the Single Acquisition Management Plan (SAMP). SAMPs should include a summary of what the program has done, is doing, and will be doing to integrate ESH considerations. A summary of the ESH evaluation results can be included in the Systems Engineering or Technical Section of the SAMP. This summary should address important ESH issues for the specific program that need to be raised to the decision-makers.

> The DoD Inspector General (IG) has begun to include ESH considerations in audits and inspections of weapon system program. The first DoD IG Report on an Air Force program included a finding of non-compliance with the DoD regulation because there was no evidence of a programmatic ESH evaluation. The DoD IG Report recommends program compliance before the next milestone decision.

Section 4.3.7 of DoD 5000.2-R requires every program, regardless of Acquisition Category (ACAT), to integrate ESH issues into the systems engineering process. This section of the regulation includes five interrelated topics that must be addressed: National Environmental Policy Act (NEPA), Environmental Compliance, System Safety and Health, Hazardous Materials, and Pollution Prevention.

National Environmental Policy Act (NEPA)

NEPA is one of the few environmental laws that can stop a program. As proponents of federal actions, such as testing, NEPA requires SMs to consider the environmental impacts of their action before they act. In accordance with Section 4.3.7.1 of DoD Regulation 5000.2-R, SAF/AQR is the final authority for all weapon-related NEPA documents. Formal weapon-related NEPA documents are staffed through AF/ILVEP and SAF/MIQ. The NEPA thought process is well documented in AFI 32-7061 "Air Force Environmental Impact Analysis Process." This process requires the SM to analyze their proposed actions and document their NEPA analyses. All mitigation activities identified in the analyses must be funded. Based on experience, establishing a program file of NEPA-related documents is a good idea. This file is called the Administrative Record and would be used in the courts if the program were required to testify to its NEPA compliance. Programs must comply with this AFI and their SAMPs should address the important NEPA-related actions and documents involved with the previous phase and anticipated for the next phase.

These five Environment, Safety, and Health (ESH) integration concepts apply equally across the full spectrum of acquisition strategies - from large new procurements that follow more traditional development acquisition strategies as well as relatively small procurements that follow Commercial Item/Non-developmental Item (CI/NDI) procedures.

5 Acquisition Reform and the SAF/AQ Lightening Bolt Initiatives shift management focus from a position of oversight (i.e., proscriptive oriented) to a position of insight (i.e., performance oriented). Insight is much more difficult of the two approaches and requires a thorough knowledge of the technical and management considerations affecting the system life cycle, to include disposal. This management philosophy shifts day-to-day design, materials, and industrial process decisions from the government to the contractor. Programs should leverage proven and acceptable techniques to influence the ESH-related performance aspects of the system.

4 Many ESH issues cut across DoD weapon systems and industry applications. System-unique ESH issues are the exception not the rule. In most situations, ESH issues have been addressed within DoD or industry. Programs should leverage applicable information from applicable sources outside of the program in making decisions.

3 ESH issues are inter-related not stand-alone. Programs should integrate ESH into their overall acquisition management process. These include organizational structure, the systems engineering process, risk management, and life cycle costing.

2 ESH-related decisions are based on good business decisions so that the Air Force incurs the lowest life cycle costs to protect human health and the environment. Programs should make informed decisions based on life cycle cost considerations. These include system design characteristics, material selection, associated industrial processes, and disposal issues.

1 Integrating ESH into the design aspects of a system typically improves the product over the life cycle (to include reduction in life cycle costs). The using Major Command(s) (MAJCOMs) should therefore have a role in identifying ESH issues of currently fielded systems so that these cost drivers can be avoided when modifying existing systems or when developing new systems. Programs should consider including MAJCOM representation in those Integrated Product Teams (IPTs) and program reviews that formulate ESH-related decisions. These could include cost IPTs, design-related IPTs, and Acquisition Strategy Panels (ASPs).

Five Important Concepts for ESH Integration

The action propent for NEPA is the individual who decides where, when, and how to implement the action. The action proponency under NEPA can actually shift depending on the action. For developmental testing (DT), the SM is the proponent because he/she usually determines three things - the nature of the test to meet program objectives, the timing of the test to meet program schedules, and the test range best suited to support the test. The SM is therefore the proponent for DT. For separate operational testing (OT), the Air Force Operational Test Evaluation Command (AFOTEC) usually determines the how, when, and where regarding the test. AFOTEC is therefore usually the proponent for OT. For beddown decisions, the User MAJCOM decides when the system will be fielded to meet Initial Operational Capability (IOC), how it will be fielded (e.g., in what numbers) to satisfy operation capabilities, and where (to what bases) to meet geographic distribution requirements. The User MAJCOM is usually the proponent for beddown decisions. Although propency may shift to the MAJCOM for beddown decisions, the SM continues to play a supporting role based on technical knowledge of the system to be fielded.

Environmental Compliance

In accordance with Section 4.3.7.2 of DoD 5000.2-R, all SMs are required to assess the impacts of current and future ESH laws and regulations on their programs. This assessment provides the SM with the requisite insight for informed decisions concerning design, material, and industrial process.

For instance, Class II Ozone Depleting Substances (ODS) will essentially be out of production by 2015. AFI 32-7086 "Hazardous Materials Management" prohibits the use of Class II ODS for new weapon systems or modification to existing weapon systems scheduled to remain in the inventory beyond 2020.

The draft Occupational Safety and Health Administration (OSHA) regulation concerning worker exposure to chromium is another example. This regulation will increase the life cycle costs of a system using chromium. The SM should have the insight to understand and document the impact of chromium (such as in chrome plating) before selecting this material and related industrial processes. Programs should address the impact of current and future laws and regulations in their SAMPs.

System Safety and Health

In accordance with Section 4.3.7.3 of DoD 5000.2-R all SMs must identify and evaluate system safety and health hazards, define risk levels, and establish a program that manages the probability and severity of all hazards throughout the life of the system. AFI 91-202 "Air Force Mishap Prevention Program" assigns SMs specific system safety responsibilities. This AFI mandates that acquisition programs structure their system safety efforts in accordance with the latest version of MIL-STD-882. Revision "C" is the latest version of this standard. The Air Force Material Command (AFMC) is up-dating this standard, but until that time, SMs can request a waiver to use MIL-STD-882C. In accordance with the DoD regulation, SAF/AQ is the final approval authority for acceptance of all high-risk hazards. Acceptance of serious (medium) risk hazards is the Program Executive Officer (PEO) level.

In addition to safety hazards, the methodology in MIL-STD-882C also applies to health hazards and environmental hazards. For health-related hazards, programs can leverage the Army's Center for Health Promotion and Preventative Medicine (CHPPM). For environmental hazards, the SM's NEPA analyses, Environmental Compliance assessment, and Hazardous Materials Management Program (described below) can provide input to the MIL-STD-882C methodology.

CHPPM has completed many health hazards analyses on chemicals and processes common across DoD. For example, recently an Air Force program office managing communications and electronics shelters effectively leveraged CHPPM's information base. The program office wanted to replace its handheld fire extinguishers that used a Class I ODS fire suppressant with more cost effective, supportable and environmentally friendly extinguishers. CHPPM had previously completed a health hazard analysis for similar Army shelters. The Air Force program office was able to tailor the Army analysis for their application thus saving time and money.

SAF/AQRE can facilitate waiver approval for the use of MIL-STD-882C. SAF/AQRE is developing a standard Air Force definition of risk levels so that decision-makers at all levels will use a common scale to measure risks regardless of the system in question. SAF/AQRE can assist programs in staffing high and serious risk hazard acceptance approvals.

Hazardous Materials Management

Section 4.3.7.4 of DoD 5000.2-R requires SMs establish a hazardous materials management program (HMMP). The HMMP ensures appropriate consideration is given to proactively eliminating reliance on hazardous materials rather than simply handling, treating and disposing of the wastes generated by their use.

AFI 32-7086 establishes a process whereby SMs and Using MAJCOMs can identify, prioritize, and manage the elimination of hazardous materials from new and existing systems. This AFI also mandates the following SM hazardous materials management requirements:

- Programs must obtain SAF/AQR approval for all contract requirements to any of the Class I ODS.
- Programs may not bring new or modified systems into the inventory with Class II ODS if those systems will remain in the inventory beyond 2020.

- Programs may not specify the use of an alternative to a hazardous material or ODS that increases the Environmental, Safety, and Occupational Health (ESOH) risks and costs.

Replacement of aircraft engine fire suppressants demonstrates the importance of ensuring that an environmental risk is not shifted to an occupational health or safety risk. Currently, most aircraft use Halon 1301, a Class I ODS. OSD and the three services recently concluded an extensive Research and Development program to assess potential alternatives. OSD's final recommendation was HFC-125. Some SMs (e.g., F-22) are using this suppressant to replace Halon 1301. However, a few SMs have considered using more toxic alternatives (e.g., CF_3I and PBr_3). Although these alternatives reduce environmental risks in comparison to Halon 1301, they increase OH risk because they are significantly more toxic.

The Aerospace Industries Association (AIA) developed the National Aerospace Standard (NAS) 411 "Hazardous Materials Management Program" as a non-government standard. SMs may use NAS411 to establish effective HMMPs with their prime contractors.

Programs must comply with the requirements of the mandatory DoD and Air Force policies cited above and should implement a HMMP. SAMPs should identify the status of the HMMP and any SAO approvals needed for the design.

SAF/AQRE can facilitate SAO approval for the use of ODS when needed and can assist in the techniques to effectively use NAS411.

Pollution Prevention

Section 4.3.7.5 of DoD 5000.2-R requires SMs follow a pollution prevention hierarchy in making material selection decisions. The Air Force has recognized the importance of the pollution prevention hierarchy that favors source reduction and has begun to shift compliance funding (typically for treatment and disposal) to prevention projects that eliminate or reduce reliance on end-of-the-pipe fixes. OSD together with each of the services has developed the Acquisition Pollution Prevention Initiative (AP2I). Change 3 to the DoD regulation will include the tenets of AP2I. AP2I is focused on reducing hazardous materials usage in contractor manufacturing plants. This concept involves government/contractor cost sharing (the ratio to be based on the benefits to each party) to validate new alternative materials and industrial processes. OSD strongly encourages SMs to provide technical and business support to AP2I. OSD has emphasized the importance of SM involvement in the process to ensure candidate materials and processes meet their performance and ESH requirements. The Defense Contract Management Command (DCMC) leads the AP2I efforts at each contractor facility and relies upon the Joint Group-Acquisition Pollution Prevention (JG-APP) for technical and administrative support. All three of the Component Acquisition Executives (SAF/AQ for the Air Force) support the voluntary, not mandatory, participation by program offices in AP2I.

ESH Considerations in Life Cycle Costing

Life cycle cost information is basic to informed ESH-related decisions. Benefits of effective ESH risk reductions are primarily accrued over the life of the systems. SMs can consistently make informed decisions by considering the cost impact of their design, material selection, and associated industrial processes through the entire life cycle (includes disposal) of the system. OSD and the Air Force have concluded that current ESH cost models do not provide the requisite insight for generating the data from which to base these decisions. SMs should use proven cost estimating techniques available within the Financial Management (FM) infrastructure. AFMC has developed an ESH Life Cycle Cost Guide for SMs, their staffs, and the cost estimating community. This guide can be used to understand how to estimate life cycle ESH costs. SMs should include the direct and indirect costs associated with a design, material, or industrial process selection. When SMs accurately reflect ESH life cycle costs, they will be in a better position to understand the Total Ownership Cost (TOC) of their systems. TOC is an emerging OSD initiative for the acquisition community. Center FMs and AFMC/FM can assist in formulating ESH-related life cycle cost estimating techniques.

If a SM is considering using cancer-producing cadmium plating, the direct cost of the plating process (e.g., chemical procurements, energy requirements for the process) and the indirect costs to the Air Force must be considered. These indirect costs might include the base clinic expense for the worker medical surveillance, the loss of productivity from shop employees who must work in pressure suits, and the projected disability payments associated with known adverse health affects from exposure to cadmium. In the past, SMs typically did not include these infrastructure costs.

ESH-related Training

ESH-related training is an important portion of the Air Force Pollution Prevention Strategy. Program office and support personnel can obtain ESH Integration training. The Deputy Under Secretary of Defense (Environmental Security) tasked SAF/AQRE to take the lead in developing and integrating an ESH module in the DAU SPRDE courses. A two-hour ESH Integration module is now included in the SPRDE courses taught throughout DoD. Air Force personnel can receive this training by taking the entire two-week SPRDE course or upon request, they can receive the two-hour block of ESH Integration instruction from SAF/AQRE.

This article was submitted by Lt Col Sherman Forbes (SAF/AQRE) and Mr. Carmen DiGiandomenico (Contractor). ■

REDUCING ENVIRONMENTAL, SAFETY, AND HEALTH RISKS IN THE EVOLVED EXPENDABLE LAUNCH VEHICLE

Environmental, safety, and health (ESH) issues are an important consideration during a system's development, procurement, operation, and disposal. While there are numerous ways to weave ESH into a system's life cycle, we can often learn by studying the methods used by other programs. This month we've chosen to highlight the successful approach used by a space launch program at the Space and Missile Systems Center (SMC): the Evolved Expendable Launch Vehicle (EELV). The following sections discuss the program and the steps it is taking to reduce ESH risk.

EELV - The next-generation launch system. The mission of the EELV Program is to partner with industry to develop a national launch capability that satisfies the Government's spacelift requirements, reduces the cost of space launch by at least 25% over existing systems, and enhances the U.S. industry's competitiveness in the international space launch market while remaining environmentally friendly.

EELV is a family of unmanned, expendable space launch vehicles evolved from existing systems. EELV will become DoDs primary source of expendable medium and heavy lift vehicles. It is anticipated that EELV will also become the launch vehicles of choice for the commercial payload community. The EELV concept consists of a family of medium launch vehicles (MLV) and heavy launch vehicles (HLV) launched from launch complexes at both Cape Canaveral Air Station (CCAS) and Vandenberg Air Force Base (VAFB). First flight is expected in 2001, with additional launches planned through the year 2020. The EELV will ultimately replace current Atlas II, Delta II, Titan II, and Titan IV launch vehicles.

The original acquisition strategy called for a three-phase "rolling downselect" approach. This strategy emphasized competition in the critical design phase as the number of contractors decreases from four to two, and then to one. The initial phase of the program, the Low Cost Concept Validation, was successfully completed in Nov 1996. The program is currently in the second phase, Pre-Engineering and Manufacturing Development, with Lockheed Martin and the Boeing Company working to refine their system concepts toward a *detailed system* design. The acquisition strategy was revised in Nov 97 with the new strategy calling for two competing contractors over the life of the program (see Figure 1). Such a change was made possible because a larger commercial market than envisioned two years ago led the government to believe there is sufficient market to support two contractors. Award of the third phase, Engineering and Manufacturing Development and Initial Launch Services, is anticipated to occur in June 1998.

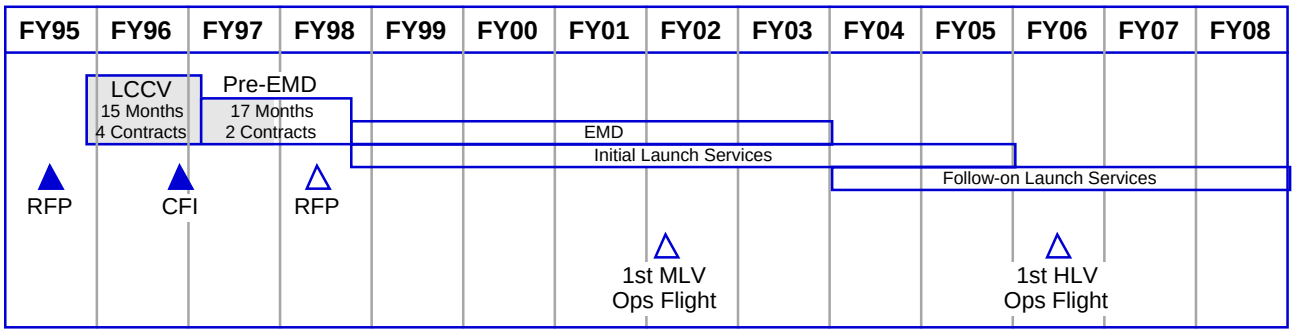

Figure 1. Proposed Acquisition Strategy
EELV Program Schedule

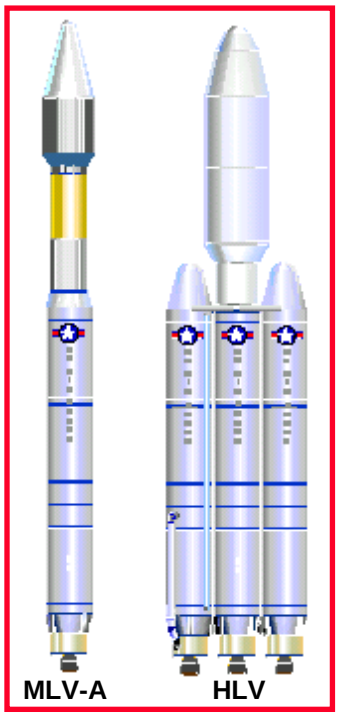

Figure 2. Lockheed Martin Concept

The Lockheed Martin concept uses a common booster core, with a Storable Upper Stage or a Cryogenic Upper Stage as second stage depending on the payload requirements (Figure 2). Lockheed Martin uses Space Launch Complex 41, or SLC-41, at CCAS and SLC-3W on South Vandenberg AFB for launch operations.

The Boeing concept has a common booster core, with a Storable Upper Stage or a Cryogenic Upper Stage as second stage depending on the payload requirements (Figure 3). Boeing will use SLC-37, at Space CCAS and SLC-6 on South Vandenberg AFB for launch operations.

Figure 3. Boeing Concept

ESH - Keys to Reducing Risk. As with many programs, success depends heavily on reducing risks. The EELV SPO recognized from the beginning a critical component of the risk reduction strategy was full consideration of environmental, safety, and health issues throughout the program's life cycle. This led to an aggressive plan to ensure adequate integration of ESH into all aspects of the system's design and management. The following sections outline the strategies and tactics used to conduct the programmatic ESH evaluation as discussed in DoD 5000.2-R, sections 3.3.6 and 4.3.7.

Planning, planning, planning. As many program managers and ESH professionals will emphasize, it is never too early to start considering the ESH impacts of and to your programs! Several key planning documents are helping EELV to ensure everything is adequately covered.

Environmental Impact Statement (EIS). The National Environment Policy Act (NEPA) is the Federal government's declaration of U.S. environmental policy. It requires us to consider the environmental consequences of major Federal Actions. Depending on size and complexity of the action, there are several levels of analysis. The Air Force decided to prepare an EIS, the most complex and comprehensive level of analysis for the EELV program. An EIS is a study to identify potential impacts to the human or natural environment that may result from implementing a proposed program. Currently in draft form for public review, the program office plans to release the final EIS in April 1998 and obtain a Record of Decision in June 1998.

System Performance Document (SPD). The SPD is where the program codifies performance characteristics for the system to meet its customer's needs. EELV included sections on safety and environmental issues. The safety portion addressed cooperation between wing safety personnel and contractors to ensure compliance with range safety requirements and mishap investigations. It also outlined system, flight, and range safety objectives, to meet the requirements of Eastern-Western Range Regulation (EWR) 127-1. The environmental section mandated the system operate within applicable laws and regulations, without need for waivers, and established an objective to minimize the use of hazardous materials throughout the life cycle of the system. It also prohibited use of Class I ODS in any phase of the system development and required minimal use of EPCRA Section 313 chemicals and Class II ODS.

Single Acquisition Management Plan (SAMP). SAMPs, which are driven by SAF/AQ's acquisition reform lightening bolts, consolidate a program's management strategy for acquisition of a proposed weapons system. This is a critical document for identifying strategies for handling ESH issues. EELV included in the "Technical Approach" portion of the Pre-EMD SAMP, sections specifically geared toward managing programmatic environmental, health, and system safety issues. One section laid out a general roadmap for initiating and conducting the Environmental Impact Analysis Process (EIAP), and summarized methods for addressing management of hazardous materials IAW National Aerospace Standard (NAS) 411. Another section addressed how system safety and health issues would be handled to make sure all system and operational safety hazards were "identified, eliminated or controlled, and verified within the constraints of program cost, schedule, and performance".

Test and Evaluation Management Plan (TEMP). The TEMP, currently in draft form, outlines the program's approach to conducting tests of systems and subsystems at various phases of development. Since ESH concerns will inevitably be players during the testing phases, EELV addressed them in this document. The ESH section stresses the environmental and safety planning aspects of testing activities, including regulatory permitting concerns, sampling, and the Environmental Impact Analysis Process.

Contract language. In today's environment of acquisition reform and downsizing, program managers must depend heavily on their contractors to provide them the information they need to make the right decisions. Furthermore, contractors need to be given the right guidance to ensure they meet the program's desires. A key to meeting ESH objectives throughout the system's life cycle is the language included in contract documents.

The EELV used a Call for Improvement (CFI) in the Pre-EMD phase, which is essentially a streamlined Request for Proposal (RFP). The CFI provided a key ESH link between the program and its contractors. The program emphasized ESH in the Pre-EMD CFI Statement of Objectives (SOO) by defining one of the objectives to be, "Integrate environmental, safety, and health factors into the EELV system design", making it clear that ESH is an important concern to the program. Additional portions of the CFI built on that objective. For example, the program integrated ESH concepts into the existing evaluation criteria under performance and proposal risks in the "Basis of Award and Evaluation Standards" section. The instructions for preparing contractor Integrated Task and Management Plans (ITAMPs) requested information on contractor ESH management structure. The program provided further ESH guidance through the Contract Data Requirements Lists (CDRLs) discussed below:

Environmental Analysis Report (EAR). This deliverable was one of only eight CDRLs. It was the foundation for developing the program's Environmental Impact Statement, and provided the mechanism for discussion of hazardous materials issues. It identified the possible environmental impacts of the proposed system concept, including viable alternatives that could reduce that impact. It also contained a discussion of anticipated permits, regulatory reviews, and required waivers. Two annexes were requested during the LCCV phase: a hazardous materials annex, which identified selected hazardous materials and efforts to eliminate or reduce them IAW NAS 411; and an alternative rocket fuels annex, which evaluated potential uses of more environmentally-friendly fuels as candidates for use in the proposed systems. Contractors are continuing to submit the hazardous materials annex throughout the Pre-EMD phase, since more details on selected hazardous materials become available as the designs mature.

Tailored EWR 127-1. The launch ranges at Vandenberg AFB and Cape Canaveral use a joint regulation, the Eastern-Western Range Regulation (EWR) 127-1, to define technical ESH requirements. Contractors submitted tailored versions of the regulation, specific to their individual design concepts, which were coordinated with and accepted by the ranges.

Integrated Task and Management Plan (ITAMP). Each contractor provided in their ITAMP an overview of how they intended to manage health, safety, and environmental issues in their programs. The CFI instructed contractors to define how they will "...implement programs for environmental protection, environmental compliance, system safety, human health, hazardous materials management (NAS 411 para. 4.3 and 5.2), and pollution prevention." Although the ITAMPs were not placed on contract, they allowed the program to gain insight into contractor ESH programs.

System Safety Plan (SSP). Contractors were guided to develop a System Safety Program Plan IAW MILSTD 882C via the model contract included as an annex to the CFI. Contractors submitted SSPs to the launch ranges, tailoring MILSTD 882C to outline the tasks they intend to perform. The plans include key objectives of each task, typical methods, task schedules, and outputs.

A team approach. There is no substitute for involving the right people from the very start. EELV chose to include ESH professionals throughout each acquisition phase, and to form several focus groups specifically to assess ESH issues. A listing of the various personnel involved in these groups is shown in Figure 4. Specific team composition and degree of member involvement varied according to the areas of expertise needed at any given time. Some of the more active groups are:

- Program Management (Contractor and Government)
- Systems Engineering (Contractor and Government)
- Test & Evaluation (Contractor and Government)
- Leads for Contractor Integrated Product Teams
- East/West Range Planning Personnel
- Legal Counsel
- SMC Environmental Programs Staff
- SMC Acquisition Health & Safety Staff
- Range ESH Personnel
- Federal Aviation Administration (FAA)
- Contractor ESH Personnel

Figure 4. Summary of Participants in the ESH Evaluation Process for the EELV Program

(EIS) Team. One of the initial focus teams to form was the EIS working group. This team worked with the Air Force Center for Environmental Excellence (AFCEE) to draft the EIS and handle associated NEPA requirements. The team held public scoping meetings and hearings in Lompoc, CA and Cape Canaveral, FL.

Site Activation Working Group (SAWG). EELV worked with HQ Air Force Space Command and the launch ranges to establish a SAWG. This working group is addressing site-specific facilities issues, environmental matters, range integration, and range safety through quarterly meetings at each range.

Contractor Integrated Product Teams (IPTs). Through IPTs consisting of both government and contractor personnel, EELV focused on using government insight over the traditional oversight to do business with the contractor. This approach has allowed the program office and the contractors to work more closely as a team with open communication while keeping everyone involved and informed.

Sky's the Limit. The program's ESH strategy is working well. While the ultimate proof will be in the final product, the program is doing an excellent job integrating ESH into its launch systems and looks forward to a successful first launch. For further information regarding the EELV program's initiatives, please contact Capt Lee Bosch (SMC/MVS) at (310)336-4475 or Capt Kevin Culp (SMC/AXZB) at DSN 833-1846. ■

A REQUEST TO THE FIELD FROM SAF/MIQ…

SAF/MIQ has released a draft Policy Directive, 90-xx, Environment, Safety, and Occupational Health for general comments prior to coordination. The document replaces AFPD 91-3, Occupational Safety and Health, September 93, and contains many policies of interest to the MONITOR readers. The draft document will be available on the SAF/MI web site at: http://www.safmi.hq.af.mil/saf-miq/miq.htm. or directly from our office. I encourage readers to contact me via e-mail for a copy of the draft policy and provide their comments to me by mid April 98. I will make sure all comments received are considered. Lt. Col John Garland, SAF/MIQ, e-mail: garlandj@af.pentagon.mil, DSN 227-1017. ■

COMMUNITY CROSS-FEED

MONITOR PROGRAM MANAGER RETIRES

Mr. John D. Biggs, who has served as the MONITOR's Program Manager since April 1995, retires from the Air Force on 31 March 1998. John's Air Force career, which encompasses over 38 years of services, started in 1960 as a laboratory technician for the USAF Epidemiological Laboratory at Lackland AFB, TX. He was discharged from active duty in 1963 and began his civil service career as a research chemist at the Epidemiological Laboratory at Lackland AFB. In this position, which he held till 1970, John supported the development of toxicological analytical procedures that led to fourteen publications in scientific journals.

John's 28 year career at Brooks AFB began in 1970 when the Epidemiological Laboratory was placed under the School of Aerospace Medicine. John continued to support the laboratory as a research chemist which resulted in the publication of five more papers. In 1971, John assisted in the establishment the Air Force Drug Testing Laboratory. John also served as a Forensic Chemist in support of the Office of Special Investigations, Air Force Physicians, and the Air Force Drug Testing Laboratory. Since 1992, John has been supporting acquisition pollution prevention initiatives at Brooks AFB. He has served as the Program Manager for Hazardous Materials Targeting and EPA-17 Cost Estimating Project. In April 1995, John became the Assistant Program Manager for the ODC Information Exchange and was designated to serve as the Program Manager for the MONITOR. He was the Program Manager for the ODC Information Exchange when the mission was transferred to PRO-ACT (30 September 1996). He has since been associated with the ESOH Service Center and in January 1997 became the Program Manager for the Armstrong Laboratory Occupational & Environmental Health Directorate (AL/OE) Newsletter, an in-house publication.

Under his management, the MONITOR has become a recognized Air Force Pollution Prevention publication and has published over 240 articles in the last three years to cross-feed programmatic, policy, tools, and success story related information across the Air Force community. The MONITOR staff and the Weapon System Pollution Prevention community wishes to thank John for this contribution to the MONITOR and his many years of service to the Air Force. ■

John, congratulations on your retirement! The Center Working Group (CWG) thanks you for your consistent support over the past three years in helping us meet our goals and objectives. As the Program Manager for the MONITOR, you have helped the CWG highlight activities important to weapon system pollution prevention. In addition, you have been a valuable member of the team and have always gone the extra mile to get the job done. Enjoy life outside the AF community!

Ray Olfky (HQ AFMC/DRIE)
Chairman, AFMC Center Working Group

A BIG THANKS…

In April 1995, I was assigned the task of being Program Manager for the MONITOR, a position previously held at HSC by Mr. Earl O'Carroll. The progress the MONITOR has made since then has been due to the support of numerous people and organizations that have contributed suggestions and articles. The combined efforts of all have allowed the MONITOR to become a unique publication cross-feeding programmatic, policy, success stories, and related ESOH information to the Air Force Weapon System Community.

Participation by SAF/AQRE has greatly aided the publication to disseminate policy/programmatic information to its readers including articles on the Programmatic Environmental Analysis (PEA), ODS Policy Issues, and the Hazardous Materials Reduction Prioritization Process (HMRPP).

SAF/MIQ's endorsement of the MONITOR has helped bring visibility to AFMC programs featured in the publication such as the C-17 and the F-22. Additionally, SAF/MIQ has broadened the perspective of the MONITOR by providing the "big picture perspective" on the Air Force's ESOH Initiative.

The Center Working Group (CWG) has provided the backbone for access to resources and information for the MONITOR. Starting with the first CWG meeting at Hanscom AFB, these meetings have provided an excellent forum for meeting and interviewing Air Force personnel. The CWG meeting at Hanscom AFB (see November 95 issue) provided an opportunity to document the SM's perspective on environmental issues.

The second meeting at WR-ALC (see March 96 issue) provided an opportunity to interview paint stripping operators on the C-141 flight line. Subsequent meetings continued to provide timely information in support of the MONITOR's activities.

During the last three years, the ODC Information Exchange and the ESOH Service Center at HSC have provided resources for disseminating tactical/case study type of information to readers. The ODC Information Exchange was an excellent source for cross-feeding conference information as well as problems/solutions encountered in the field. With the transition of the ODC Information Exchange to PRO-ACT, the MONITOR shifted its perspective in 1996 from policy and success story dissemination to programmatic and cross-feed/feedback related issues.

The recent success of the MONITOR is primarily due to the support provided by ASC's environmental co-locates. In 1997, the MONITOR featured articles on various programs including B-2, C-17, F-22, and the Propulsion Environmental Working Group (PEWG). These comprehensive articles required participation of a host of individuals and crossed SPO, ALC, contract, and MAJCOM boundaries.

Ms. Nalni Dhar and Ms. Heather Travis of SAIC have provided valuable contract support to the publication of the MONITOR. Ms. Dhar became a strong advocate for the MONITOR, giving her very best to see that the MONITOR was a success. Her tireless and unselfish devotion to the task of ferreting out and providing quality articles has contributed enormously to the success of the MONITOR. Ms. Heather Travis supported Ms. Dhar with her publishing and graphic skills to present the MONITOR in a professional type format. Contract support which takes ownership is to be commended.

I would like to thank all who supported the MONITOR and made my task easier. With my retirement, the MONITOR will transition to ASC/EM where the May 1998 issue will be published. I wish those who shall succeed me the best of luck and continued success as I ride off into the sunset. ***- John Biggs*** ■

PEWG MEETING UPDATE

On February 17-19, 1998, the Propulsion Environmental Working Group's (PEWG's), Winter Meeting, was hosted by Allied Signal Engines (Ms. Shruti Sehra), one of five Propulsion System manufacturers in the PEWG. The focus for the meeting was to revise the PEWG charter and business strategies and to "initialize" environmental projects for joint PEWG execution. The membership screened the 60 candidate projects for joint PEWG participation and down-selected to 43. The group then added four additional projects and ended up with 47 projects to validate. Technical evaluations will be performed on each project to determine feasibility and to support development of Project Summary Sheets for presentation to the Joint Propulsion Coordinating Committee during May 1998.

PEWG members and invited guests toured the Boeing Facility in Mesa, AZ and witnessed the operation of the FlashJet organic coatings removal process on Apache helicopter exterior mold lines. The process employs a high-energy light impulse to vaporize coatings followed immediately by blasting with CO_2 pellets to remove the residue. Mr. Sheldon Toepke, the Boeing representative, reports that the only hazardous waste (from chromated coatings) is filter media from the air emissions control equipment.

The PEWG program support group led discussions on "Global Teaming" for PEWG, with emphasis on Project Leveraging (Bob Bondaruk) and use of the WWW (Chuck Alford) to support project collaboration and technical information exchange. The PEWG Web site, http://www.pewg.com, although under construction nevertheless does provide information and a means of contacting the Chair should you desire. This PEWG had the largest membership turnout ever (35). Major Wampler (PEWG Chair) attributes this to the increased level of awareness and support since the MONITOR article publicizing the PEWG mission. Thank you MONITOR!

The Lead Maintenance Technology Center, Environment (LMTCE), Naval Aviation Depot, Jacksonville, Florida will host the Summer PEWG meeting, 7–9 July 98. NAVAIR POC is Mr. Gordon Ingmire. ■

TOXIC RELEASE INVENTORY ALTERNATIVE DEVELOPMENT (TRIAD): A "BOTTOMS UP" APPROACH TO TECHNICAL ORDER (TO) MODIFICATION AND PROCESS SUBSTITUTION

Warner Robins Air Logistics Center's Pollution Prevention Division (WR-ALC/EMP), has established the Toxic Release Inventory Alternative Database (TRIAD) Program to eliminate and/or reduce hazardous materials (HAZMATs) used at the installation. Currently, WR-ALC is the 2nd largest emitter of Toxic Release Inventory (TRI) chemicals in DoD. Reduction of HAZMAT use at the installation level is tied to the weapon systems/ components maintained at the base. These weapon systems/components include the C-130, C-141, F-15, Avionics, B-1/B, JSTARS, KC-135, and the C-5. Any potential changes to HAZMAT use is therefore directed by the Single Managers and the Environment, Safety, and Health (ESH) communities at the installation.

The TRIAD Program provides a consistent methodology and a sound business strategy for HAZMAT reduction/ elimination at WR-ALC. A key facet of this program is obtaining buy-in from all relevant stakeholders (e.g., Single Managers, system engineers) before investigating any material/process substitutions. Additionally, this methodology represents a "bottoms up" approach to Technical Order (TO) modifications at WR-ALC. Historically, TO modifications approval was sought after an alternative for an ODS/HAZMAT callout was identified. Through the TRIAD Program, the stakeholder's approval is obtained prior to any investigation. In short, this methodology is only implemented at the customer's discretion and approval. An overview of the TRIAD Program is provided below.

Overview of the TRIAD Program

The various phases of the TRIAD Program, as summarized in Figure 5, include the following:

- Chemical and process identification;
- Process evaluation and alternative identification;
- Alternative testing and verification;
- Alternative process implementation.

Further discussion related to each of these phases is provided below.

Chemical and Process Identification: This phase includes: 1) identifying the chemicals of interest; 2) identifying their usage; 3) identifying processes; 4) prioritizing Process Areas; and 5) developing Process Area roadmaps.

Based on installation priorities, WR-ALC/EMP has identified potential targets for HAZMAT reduction from the list of Ozone Depleting Substances, EPA-17 toxic chemicals, AFMC 24 listed chemicals, and the TRI listed chemicals. Factors considered in identifying potential chemicals for reduction include the chemical's historical usage and its associated compliance, health, or safety concerns. The Depot Maintenance Hazardous Material Management System (DM-HMMS) is used to identify annual

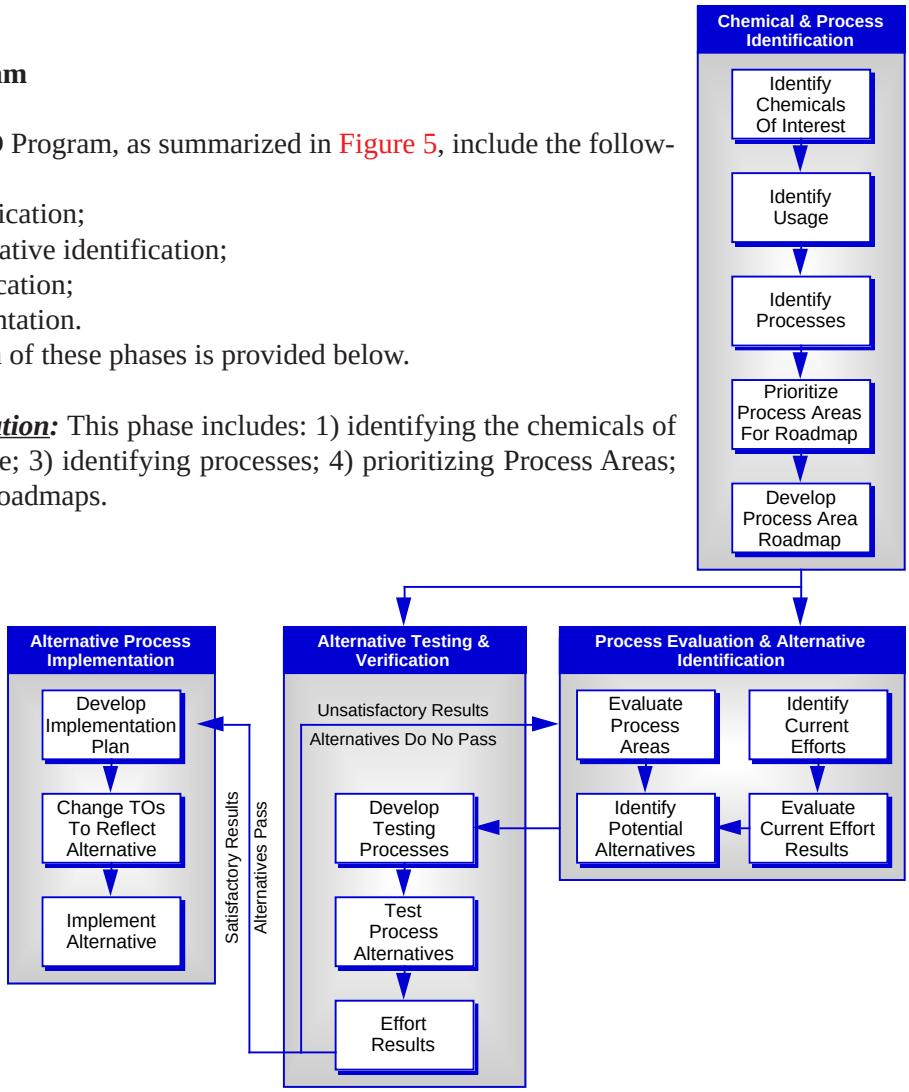

Figure 5. Overview of the TRIAD Program

usage and where necessary, the percent composition of a particular chemical (i.e., toluene) within a particular material (i.e., solvent). The process(es) associated with the targeted chemical(s) are identified from TRI reports. In cases where such data is not available and/or applicable (e.g., chromic acid anodize, gyroscope leak detection) chemical/material usage areas are grouped by Process Areas and defined through site visits and personnel interviews.

Based on the above evaluation, the identified Process Areas are prioritized (see Figure 6 for partial criteria listing), a rating system is established, and Directorate approval for prioritization established. The prioritized Process Areas become a living document and a roadmap for alternative identification, verification, and implementation. An example of the Process Areas established at WR-ALC through the TRIAD Program is provided in Figure 7.

Parameters for Prioritizing Process Areas

- Chemical Characteristics
- Annual Usage
- Percent Composition
- Technical Risk
- Other Factors

Figure 6. Partial Listing of Prioritization Criteria

Priority	Process Areas	Chemicals	Annual Usage (Lbs)
1	Gyroscope Bearing Cleaning	CFC-113	891.2 CFC-113
2	Gyroscope Cleaning	CFC-113, TCA	309.3 TCA, 5,047.7 CFC-113
3	Vapor Degreasing	TCA, PCE	23,719.12 PCE, 10,816.904 TCA
4	Cold Bath Cleaning	TCA	1,710 TCA
5	Paint Equipment Cleaning	MEK, Toluene	5,980 MEK, 577.3 Toluene
6	Pre-Coating Surface Preparation Wipe-Down	MEK, Toluene	7,400 MEK, 1,400 Toluene
7	Pre-Adhesive Surface Preparation Wipe-Down	MEK, Toluene	1,463.5 MEK, 50.8 Toluene
8	Coating Thinners	MEK, Toluene	1,452 MEK, 1,452 Toluene
9	Topcoat Stripping	DCM, Phenol	35,821.45 DCM, 9,426.5 Phenol
10	Epoxy Primer Stripping	DCM, Phenol	35,821.45 DCM, 9,426.5 Phenol
11	Polysulfide Primer Stripping	DCM	31,514.3 DCM
12	Lacquer Stripping and Carbon Removal	DCM	6,358.2 DCM
13	Chemical Milling Maskant	PCE, Toluene	1,172 PCE, 10,817 Toluene
14	Immersion Stripping	Ethylene Glycol (EG) Glycol Ethers (GE)	14,545 EG 2,645 GE
15	Propeller Fairing Installation	Toluene Di-isocyanate (TDI)	5,355.52 TDI
16	Phosphoric Acid Etching	Phosphoric Acid	1,138 Phos. Acid
17	Gyroscope Leak Detection	CFC-113	Not available
18	Refrigeration	CFC-12, CFC-11	Not available
19	Chrome Acid Anodize	Chromic Acid	Not available

Figure 7. Example: Use of TRIAD to Establish Process Areas

Process Evaluation and Alternative Identification: This phase includes: 1) identifying and evaluating the current and previous alternative identification efforts; 2) evaluating prioritized Process Areas; and 3) identifying potential alternatives.

The first part of this evaluation includes leveraging lessons learned for the targeted process/HAZMAT from current and previous AFMC, Air Force, and Tri-Service (e.g., JG-APP, JDEP, PEWG) initiatives. Additionally, all previous in-house and contractor efforts at the base are evaluated. The criteria used to evaluate past and current efforts include technical validity of the solution(s) and the merit of results achieved. Application specific evaluation is then conducted on the Process Areas through site visits, Technical Order (TO) identification and review, process baselines, and performance specifications. Identification of possible alternatives requires establishing a process baseline, evaluating ESH consideration of alternatives considered, and obtaining Directorate/Process Owner Approval. Getting buy-in from the Directorate and systems engineering is critical to ensuring the success of this phase.

Alternative Testing and Verification: This phase includes: 1) developing testing protocols; 2) testing possible alternatives; and 3) reporting test results.

Testing Protocols are developed based on performance specification and require: 1) identifying applicable standards and test methods; 2) identifying necessary equipment for performance testing; and 3) developing matrix

for performance testing. Testing of potential alternatives includes laboratory (corrosion testing, flashpoint, materials compatibility) and performance (for effectiveness and alternative process efficiency) testing. Both positive and negative results of the laboratory and performance tests results are reported. Positive results are immediately implemented; negative results require re-evaluation of the process and identification of additional alternatives. A document of decision is prepared and approval is obtained from various offices (see Figure 8 for listing).

Alternative Process Implementation: This phase includes: 1) developing an implementation plan; 2) changing TOs to reflect alternative; and 3) implementing alternative.

An Implementation Plan is prepared that describes the alternative process, and includes, as applicable, the demolition, installation, acceptance, and operator training plan. The plan will also include a cost-benefit analysis. TO Modification includes changing applicable TOs to reflect the selected alternative (using AFMC Form 252). Alternative implementation includes demolition/installation, acceptance testing, and operator testing, and troubleshooting.

Required Approval

- Corrosion Office
- Bioenvironmental Engineering
- Safety
- Environmental Management
- Fire Department
- Process Owner
- Systems Engineer

Figure 8. Stakeholders for the Decision Documents

For further information regarding the TRIAD Program, as implemented at WR-ALC/EM, please contact Mr. Dave Bury at DSN 468-1124 or commercial (912) 926-1124.

Future issues of the MONITOR will provide specific examples of the lessons learned from implementing the TRIAD Program at WR-ALC. ■

ENVIRONMENTAL PRODUCTS TOPICS

1. PHASE OUT USE OF METHYLENE CHLORIDE IF YOU CAN.

In 1997, the Occupational Safety and Health Administration (OSHA) issued revised standards applicable to methylene chloride, a suspected carcinogen. OSHA reduced the permissible exposure limit (PEL) by 95% from 500 to 25 parts per million as an 8-hour time weighted average. In late 1994, stringent national emission standards were issued for methylene chloride. In addition, the new OSHA standard requires exposure monitoring, medical surveillance, lab surveillance and hygiene facilities.

After investigating your particular situation by checking with the process owner, weapon system program manager or relevant technical authority, try substituting one of the alternatives to methylene chloride found in the DLA Environmental Products catalog. There are numerous alternatives suggested for paint stripping, parts cleaning, etc.

Some of the alternatives are used in an ultrasonic cleaning system tested and in use at Corpus Christi Army Depot, a bicarbonate of soda paint stripper used extensively by the Navy and other products that are listed in the EP catalog but may not have specific military service approvals. For more information, see Point Of Contact (POC) below.

2. ARMY GOAL: ELIMINATE ETHYLENE GLYCOL FROM THE WASTE STREAM

Recycling antifreeze is one way to meet this goal. Contracting with a firm that takes your used antifreeze away – even for recycling – does not eliminate the need to track and report the off site transfer of your ethylene glycol-based antifreeze under the Emergency Planning and Community Right To Know Act (EPCRA). These reports are consolidated into each services' and then DoD's toxics release inventory (TRI). This information is public knowledge and all DoD activities are under executive order to reduce their emissions and off site transfers of hazardous waste by 50% from 1994 to 1999.

The two antifreeze recycling systems approved by DoD are both listed in the DLA EP catalog. There are two types of approved processes, ion exchange and vacuum distillation. Two sizes of both types of machine are available, as well as a 220V version of the ion exchange process recycler for use in Europe. The two models listed in the EP catalog were the only two rated satisfactory by the Army TACOM Mobility Technology Center.

Purchase of antifreeze recyclers has a payback period of about two years. The cost to recycle antifreeze is about $4 per gallon vs. $11 per gallon for new antifreeze (including disposal). Recycled antifreeze performs as well as new antifreeze. These savings have direct impact at the unit level as the savings accrue to the Operations and Maintenance (O&M) accounts. For more information, see POC below.

3. REUSABLE BATTERIES AND OZONE-FRIENDLY REFRIGERANTS IN SUPPLY SYSTEM

Batteries. Two types of reusable batteries (alkaline and nickel cadmium) and their associated rechargers are now listed in the DLA EP catalog. The Ni-Cad batteries come in 9 volt, AA, C and D sizes and are manufactured in accordance with the NEMA/ANSI Standard. The alkaline rechargeable batteries are available in AA, AAA, C and D sizes and are manufactured by Rayovac Corp. under the RENEWAL brand name. The RENEWAL batteries are good for up to 25 uses. Multi-position rechargers are also listed to support these type batteries. Using rechargeable batteries will help Army units meet the Army-wide goal of 50% reduction in battery procurement costs. Other services can benefit from reduced costs and a reduced used battery waste stream.

Refrigerants. EPA-approved alternative refrigerants are listed in the EP catalog for the first time this year. There are 13 NSNs which represent 10 different refrigerants designed to replace an equivalent class I ozone-depleting substance. Use of the new refrigerants depends on the relevant system manager's approval and some retrofit is required. All except one of the 13 NSNs includes a disposable cylinder. In the one instance where the cylinder is reusable, the empty cylinder NSN is also given. Using these ozone-friendly refrigerants will help protect the earth's ozone layer while costing you much less than the rapidly rising prices of the old class I ODSs. For more information, see POC below.

Note: Articles based in part on material originally published by the US Army Environmental Center, Environmental Technology Division and the Army Materiel Command, Army Acquisition Pollution Prevention Support Office.

FOR TECHNICAL INFORMATION ON:

Methylene chloride alternatives, call Clifford Myers, Chemist at (804) 279-3995 or DoD HTIS at (804) 279-5168.

Antifreeze recyclers (hardware), call Mike Timms, Equipment Specialist at (804) 279-5529.

Antifreeze and additives (chemicals), call Clifford Myers at (804) 279-3995.

Reusable batteries, call Victor Poltrick, Equipment Specialist at (804) 279-5536.

Ozone-friendly refrigerants, call Dean Crawford, Equipment Specialist at (804) 279-3230.

FOR GENERAL INFORMATION ON DSCR'S ENVIRONMENTAL PRODUCTS PROGRAM:

Call Stephen Perez, DSCR Customer & Weapon Systems Support office at (804) 279-6054 or E-mail sperez@dscr.dla.mil.

This article was submitted by Mr. Stephen Perez, DSCR. ■

EPA-APPROVED REFRIGERANTS NOW EASILY AVAILABLE

Class I ozone depleting chemicals (ODCs) are substances which have been shown to deplete the earth's protective ozone layer. The United States has banned the manufacture and importation of Class I ODCs and has sharply raised the federal tax on such chemicals.

It's obvious that there are ample environmental and economic reasons to switch to non, or less ozone-depleting chemicals to get the job done. Under the Clean Air Act's Significant New Alternatives Policy (SNAP), the US Environmental Protection Agency (EPA) identifies and publishes lists of alternatives to Class I ODCs. The EPA does not allow the introduction of new products that simply present different adverse effects on human health or the environment than those of the product being replaced. More information is available from EPA's SNAP program hotline at (800) 296-1996. Overseas callers can dial (301) 614-3396. EPA's SNAP web site is at >>http://www.epa.gov/ozone/title6/snap<<.

DLA's Defense Supply Center Richmond has added an Alternative Refrigerants category to the 1998 DLA Environmental Products catalog. These alternative refrigerants are EPA SNAP-approved and are easily obtainable through the federal supply system. Their cost is substantially lower than the Class I ODCs they are intended to replace and usually much lower than local purchase prices, especially overseas.

All of the following items are made to American Refrigeration Institute Standard 700, require the system manager's approval and retrofit work, and come with a disposable cylinder except where noted.

Important note. These new refrigerants are *not* 'drop in replacements' for any Class I ODC. Regardless of which system is involved, it is imperative that the system manager approve the use of the new refrigerant and that appropriate retrofit work be carried out where needed.

Refrigerant	NSN	Size	Price	Equip/Where Used
R-123	6830-01-391-3106	CY (100) lbs)	$542.64	Stationary Equipment
R-123	6830-01-391-3111	CY (200 lbs)	$1,291.25	Stationary Equipment
R-123	6830-01-391-3108	CY (625 lbs)	$3,983.70	Stationary Equipment
R-124	6830-01-391-3107	CY (30 lbs)	$373.97	Stationary Equipment
R-134a	6830-01-412-6362	CY (30 lbs)	$104.96	Automotive
R-134a	6830-01-390-9622	CY (30 lbs)	$104.96	Stationary Equipment
R-401A	6830-01-391-3101	CY (30 lbs)	$180.63	Mobile and Stationary
R-401B	6830-01-391-3109	CY (30 lbs)	$169.79	Mobile and Stationary
R-402A	6830-01-391-3105	CY (27 lbs)	$279.53	Mobile and Stationary
R-402B	6830-01-391-3103	CY (13 lbs)	$162.82	Mobile and Stationary
R-404A	6830-01-392-0960	CY (33 lbs)	$563.95	Mobile and Stationary (Reusable Cylinder)
R-404B	6830-01-391-3104	CY (24 lbs)	$247.90	Mobile and Stationary
R-406A	6830-01-433-7032	CY (25 lbs)	$367.28	Mobile and Stationary

FOR MORE INFORMATION ON ALTERNATIVE REFRIGERANTS:

Call Dean Crawford, DSCR Equipment Specialist for Gases at DSN 695-3230 or e-mail dcrawford@dscr.dla.mil.

FOR MORE INFORMATION ON DLA'S ENVIRONMENTAL PRODUCTS CATALOG:

Call Stephen Perez at DSN 695-6054 or e-mail sperez@dscr.dla.mil. ■

THE MONITOR ON INTERNET

The Weapon System Pollution Prevention MONITOR is available on the Internet. The Monitor can be accessed from the ESOH Service Center Home Page at <http://www.brooks.af.mil/ESOH/esohhome.htm> or directly at <http://www.brooks.af.mil/HSC/EMP/Monitor/Monitor.html>. Current issues of the Monitor are in a Portable Document Format (PDF) file which requires a reader program for viewing or downloading. The Adobe Acrobat reader is available for downloading at no cost. ■

UPCOMING EVENTS

Date	Meeting	Location	POC	Phone/E-mail
01 Apr 1998	Weapon System P2 Center Working Group VTC	1100-1200 Eastern Time	Mr. Peter Logan	DSN 478-4536
01-03 Apr 1998	International Conference on the Environmental Health and Safety of Jet Fuel	Holiday Inn Riverwalk, Conference Center, 7th Floor, San Antonio, TX	Maj Les Smith	DSN 240-6143, 6146, 6119 comm. (210) 536-6143
06-09 Apr 1998	1998 Air Force Corrosion Program Management Conference	Crown Plaza, Macon, GA	Ms. Beverly Dillard	DSN 468-3284
06-09 Apr 1998	24th Environmental Symposium and Exhibition	Tampa Convention Center, Tampa, FL	NDIA	(703) 522-1820
14-16 Apr 1998	Weapon System P2 Center Working Group Conference - 9th Joint Solutions to Common Problems	Holiday Inn Select, San Antonio, TX	Mr. Richard Freeman	DSN 487-6850
27-30 Apr 1998	Conference on Issues and Applications in Toxicology and Risk Assessment	Hope Hotel and Conference Center, Wright-Patterson AFB, OH	Ms. Lois Doncaster	(937) 255-5150, ext. 3140
28-30 Apr 1998	National P2 Roundtable	Hyatt Regency, Cincinnati, OH	USEPA	(513) 569-7578
06 May 1998	Weapon System P2 Center Working Group VTC	1100-1200 Eastern Time	Mr. Peter Logan	DSN 478-4536
09-15 May 1998	American Industrial Hygiene Conference & Exposition	World Congress Center, Atlanta, GA	AIHA	(703) 849-8888
11-13 May 1998	Environmental Summit '98, the International EHS Conference and Exposition	Research Triangle Park, NC	Ms. Brooke Ramos	(888) 4ES-1998, ext. 223 FAX (919) 469-4137 or e-mail: bramos@ercweb.com
11-15 May 1998	Global Demilitarization	Coeur d'Alene, ID	National Defense Industrial Association	(703) 522-1820 FAX (703) 522-1885
12-14 May 1998	Halon Options Technical Working Conference	Sheraton Old Town, Albuquerque, NM	Ms. Leanne Oliver	(505) 272-7250 FAX (505) 272-7203 or e-mail: oliver@nmeri.unm.edu
15 May 1998	ASC Acquisition Environmental & Health Protection Committee Meeting	Room 217, Bldg. 14, Area B, Wright-Patterson AFB, OH	LtCol Gil Montoya	DSN 785-3059, ext. 308
19-21 May 1998	Clean Tech '98, International Cleaning Technologies Exhibition	Rosemont, IL	WPC Exhibitions	(908) 788-0343, ext. 135 FAX (908) 788-9381
19-22 May 1998	Oxygen Standardization Coordinating Group Meeting No. 69	Monterey Beach Hotel, Monterey, CA	Mr. John Hollingsworth	(301) 342-9223 DSN 326-9223 FAX (301) 342-8484
01-03 Jun 1998	3rd Conference on Aerospace Environmental Technology	Von Braun Center, Huntsville, AL	Mr. Bob Cothran	(205) 890-6372 or 1-800-448-4035
03 Jun 1998	Weapon System P2 Center Working Group VTC	1100-1200 Eastern Time	Mr. Peter Logan	DSN 478-4536
14-18 Jun 1998	The Air & Waste Management Association 91st Annual Meeting and Exhibition	San Diego, CA	Ms. Denise Liberto	(412) 232-3444, ext. 3142 e-mail: d.liberto@awma.org
07-09 Jul 1998	Weapon System P2 Center Working Group Conference - 10th Joint Solutions to Common Problems	Raytheon - TI, Dallas, TX	Mr. Bob Hill	DSN 986-3678
05 Aug 1998	Weapon System P2 Center Working Group VTC	1100-1200 Eastern Time	Mr. Peter Logan	DSN 478-4536
18-20 Aug 1998	Tri-Service Environmental Technology Workshop	San Diego, CA	Ms. Sonja Herrin	(757) 865-7604
25-28 Aug 1998	3rd Annual Joint Service P2 Conference and Exhibition	Henry B. Gonzalez Convention Center, San Antonio, TX	National Defense Industrial Association	(703) 522-1820 FAX (703) 522-1885