WEAPON SYSTEM POLLUTION PREVENTION

MONITOR

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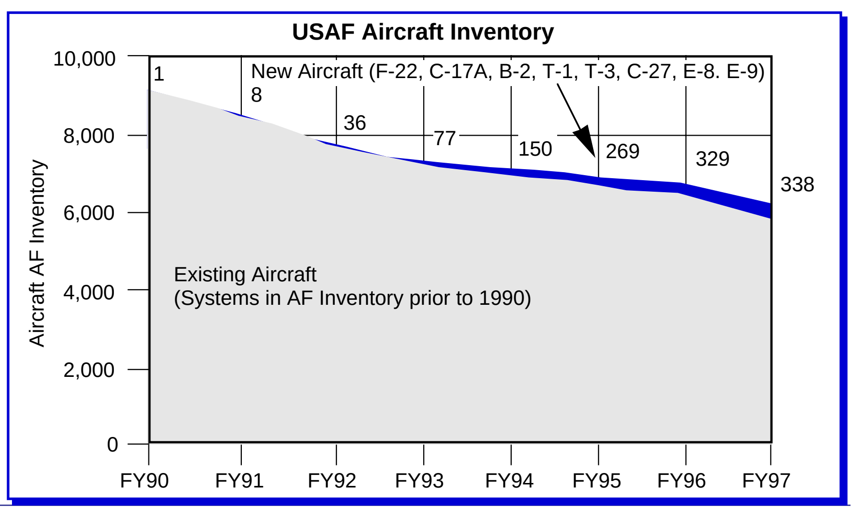
FEATURE STORY

KEYNOTE SPEAKER AT JOINT SERVICE POLLUTION PREVENTION CONFERENCE ADDRESSES POLLUTION PREVENTION IN ACQUISITION

On 5 August 97, Dr. Helmut Hellwig, the Deputy Assistant Secretary on Science, Technology, and Engineering (SAF/AQR) addressed Pollution Prevention in Acquisition at the Joint Service Pollution Prevention Conference in San Antonio, TX.

In his opening remarks, Dr. Hellwig discussed the role of his organization (SAF/AQR) in relation to the Air Force *weapon system program offices, laboratories, and the Air Force Materiel Command environment, safety, and health support infrastructure*. In short, SAF/AQR facilitates the integration of Environment, Safety, and Health (ESH) both vertically, through Science, Technology, and Engineering, and horizontally as a part of the systems engineering process. Dr. Hellwig explained that pollution prevention in acquisition results from this integration of environment, safety, and health considerations into the systems engineering process. Acquisition Pollution Prevention is not something that you do; it is an outcome of integrating environment, safety, and health considerations into the entire acquisition life cycle.

Dr. Hellwig explained that weapon system affordability and readiness concerns drive the need to integrate environment, safety, and health in order to accomplish weapon system pollution prevention. Weapon sys-



tems drive 80% of DoD HAZMAT usage and each $1 of HAZMAT used drive $80 of associated life cycle costs. In addition, environmental limits on such things as the use of deicing chemicals, Ozone Depleting Substances, and cadmium can adversely impact mission capability of weapon systems. Today there are over 300 systems managed by 74 Single Managers. However, the preponderance of these systems are older weapon systems, as demonstrated by looking at the Air Force aircraft inventory (see figure on page 1). This means that the acquisition community must try to achieve the goal of pollution prevention at each opportunity to modify or upgrade these existing systems. Dr. Hellwig compared the efforts to achieve acquisition pollution prevention to the adoption by industry and DoD of the "Total Quality Management" principles. Acquisition programs have fully integrated quality considerations into everything they do. This same thing must happen with environment, safety, and health considerations in order to successfully achieve acquisition pollution prevention. Dr. Hellwig cited the HAZMAT Reduction Prioritization Process (HMRPP) described in the new AFI 32-7086 as one of the key initiatives for developing and institutionalizing this thought process. ■

OVERVIEW OF AETC'S ENVIRONMENT, SAFETY, AND OCCUPATIONAL HEALTH (ESOH) NEEDS IDENTIFICATION PROCESS

This article summarizes the presentation made by Mr. Richard Freeman (HQ AETC/LG) at the Joint Service P2 Conference in San Antonio in August 97

Air Education Training Command (AETC) has developed a holistic approach to identifying and minimizing hazardous environments in weapon systems and support infrastructure requirements. Central to this approach is the focus on the Environment, Safety, and Occupational Health (ESOH) Needs Identification Process since many environmental (E) problems and solutions are inextricably linked to the safety (S) and occupational health (OH) of personnel. The goal of this approach is to improve planning/programming, and to streamline execution through active customer participation in the entire process.

Focus Areas of AETC's ESOH Needs Identification Process

Historically, environmental needs have been identified by the installation's civil engineering environmental offices and programmed by the MAJCOM civil engineer to Air Staff. However, hazardous waste disposal trends indicate that 80% of all hazardous waste generation can be attributed to logistics operations (see Figure 1). Therefore, AETC's ESOH Needs Identification Process focuses on ensuring that the ultimate customers, which includes operations, are active and informed consumers. As shown in Figure 2, the building block for the ESOH Needs Identification Process at AETC has moved from an "E"/Civil Engineering focus to one that is more holistic and thereby simultaneously vitalizing the Environmental Protection Committee (EPC) with cross-functional representation as an interactive decision making body.

Another focus area for the ESOH Needs Identification Process at AETC is ensuring that organizations use a standardized criteria for evaluating overall program needs. Needs collected through an ESOH evaluation of all potential stakeholders have been consolidated at AETC into the following three major areas: 1) technical needs; 2) projects/programs; 3) training.

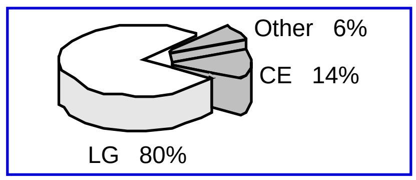


Figure 1. Hazardous Waste Disposal Trends

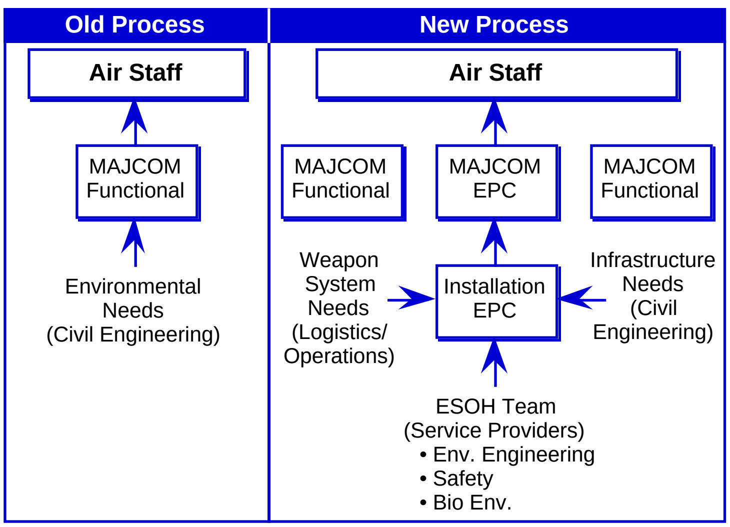


Figure 2. Old Vs. New ESOH Needs Identification Process at AEDC

The identified technical needs are then subjected to the AF ESOH TPIPT criteria for evaluation which gives the highest weight to the associated human hazards and mission impairment. Projects/Programs needs are evaluated by HQ AETC EPC Environmental Quality Sub-Committee Project Priority Model which uses Operational Risk Management (ORM), installation priority and business analysis for project prioritization. Finally, the training needs are subjected to HQ AETC's EPC Training & Manpower Sub-Committee Project Priority Model that gives the highest weight to immediate mission impact. A summary of the evaluation criteria for all three needs areas (technical, projects/programs, and training) is provided below in Figure 3.

AF ESOH TPIPT Criteria

Criteria	Weight %
• Mission Impairment	29
• Pervasiveness	10
• Env Hazard Severity	14
• Human Hazard	35
• Regulator Risk	4
• Cost of not fixing	6
• AF Goals and Political Sensitivity	2

Training Priority Model

DoD Priority	Law	Reg	Job Acomp	Prof Devl	Nice to Have
Immediate Mission Impact	12	11	9	0	0
Potential Mission Impact	10	8	6	4	0
Improved Productivity	7	5	3	2	1

Env Quality Project Priority Model

Operational Risk Management (ORM)	Installation Priority	Business Analysis
Categories A Legal/Life Safety B Direct Wing Mission Support C Base Support D Corporate Support ***Significance*** 1 Critical 2 Essential 3 Accomplishment 4 Enhancements	• **Installation Priority** • Top 20% = 10 pts • 60 - 80% = 8 pts • 40 - 60% = 6 pts • 20 - 40% = 4 pts • 0 - 20% = 2 pts	***Categories*** A Cross-Functional Benefits B Environmental C Base Operating Support D Direct Wing Mission Support ***Significance*** 1 Profitable 2 < 1 Yr Pay Back 3 < 3 Yr Pay Back 4 > 3 Yr Pay Back

Figure 3. Evaluation Criteria for Technical, Project/Program, and Training Needs

Summary of the ESOH Needs Identification Process

An overview of the ESOH Needs Identification Process is graphically presented in Figure 4.

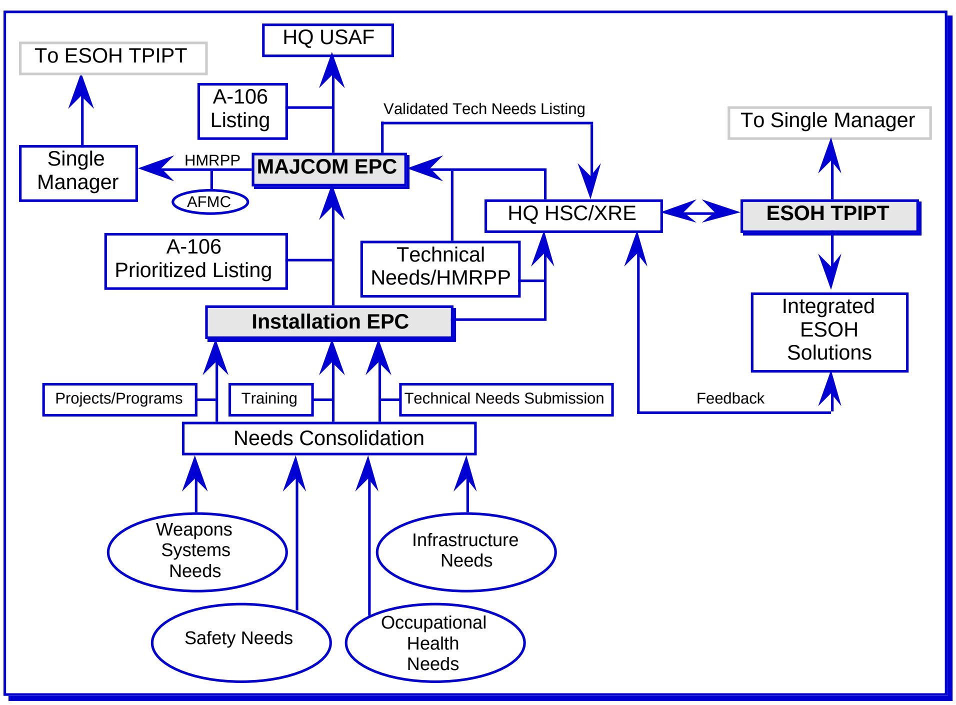


Figure 4. Summary of the Overall ESOH Needs Identification Process at AETC

The overall technical needs process from identification to execution can take between 2-5 years. Once the needs are consolidated and prioritized through the EPC, they are further validated through the MAJCOM EPC and then either submitted to HSC/XRE for inclusion in the ESOH TPIPT process or forwarded to the Single Manager (SM) as a Hazardous Material Reduction Prioritization Process (HMRPP) project. Upon evaluation of the HMRPP projects, the SM may choose to have some of these projects executed and/or monitored by the ESOH TPIPT. For such HMRPP projects and other identified ESOH needs, the ESOH TPIPT interfaces directly with the customer to provide feedback on the TPIPT's activities and the identification of potential solutions. For all other HMRPP projects, the SM interfaces directly with the appropriate MAJCOM identifying the original need.

The overall program/project needs process from identification to execution can take between 1-2 years. Prioritized project/program needs are sent from the Installation EPC to the MAJCOM EPC and then to HQ USAF using the A-106 project system. This process ensures standardization and validation through all levels of the AF organizational structure. Although the training needs are evaluated using a different criteria than program/project needs, they are also processed to Air Staff through the A-106 project system.

Benefits of the ESOH Needs Identification Process

The benefits of this holistic approach for identifying technical, projects/programs, and training needs have been summarized in Figure 5. AETC's submission of A-106 projects and technical/HMRPP needs has significantly improved from FY 96 to FY 97. Some of the cost savings associated with the identification of these needs includes a $20M cost avoidance from reducing NESHAP "major" source bases from 13 to 3. Central to the overall needs identification process has been the Shop Level P2 Training Manual developed at AETC. This effort has been the foundation of developing an "informed consumer of ESOH needs." As of 15 Jul. 97 over 50% (4,100) of AETC's logistics personnel have received this training.

Benefits - Need Submissions

AETC Logistics Submissions	95	96	97
A-106, $M (# Submitted)	0.2 (3)	1.5 (18)	5.2 (53)
Technical Needs (AFI 63-118)	0	0	*14
HMRPP (AFI 32-7086)	0	1	9

- Tech Needs Examples:
  - Non-ODS compound drop-in replacement for Halon 1301
  - Alternative non-toxic monopropellant for Hydrazine (F-16)
  - Environmentally safe replacement for chromate chemical conversion coating (Alodine)
  - Avoid requirement for additional facility upgrades to meet VOC standards under CAA
  - Low altitude flying trng mission air emission contributions to air quality control regions
  - Elimination of chromate and lead-containing paint primers

Benefits - Projects/Programs

- Reduced NESHAP "major" source bases from 13 to 3 - $20M cost avoidance
- $11.2M cost avoidance through introduction of high solid low VOC paints
- Leading AF initiative to secure acceptable replacement of Alodine pre-coat
- Teaming with AFMC to research use of non-chromated primers ton AETC F-15's
- Leading AF in environmental program execution rates

Benefits - Training

- Empowers process owners to proactively resolve environmental issues
- Converts system from a "push" to a "pull" process
- Significantly improves identification of customer (process owner) requirements
- Proportional reduction in resources required to achieve the desired end - more efficient

Figure 5. Summary of the Benefits Associated with the ESOH Needs Identification Process at AETC

For further information regarding AETC's ESOH Needs Identification Process, please contact Mr. Richard Freeman at DSN 487-6277 or commercial (210) 652-6277. ■

Description of Active Aircraft at AETC Bases

AETC Bases	Approx. # of Active Aircraft	Aircraft Description and Associated Number at Location
Laughlin	260	T-1A(71); T-37B(104); T-38A(85)
Columbus	241	T-1A(48); T-37B(95); T-38A(66); AT-38B(32)
Sheppard	215	T-37B(97); T-38A(98); AT-38B(20)
Randolph (12th)	211	T-1A(17); T-3A(57); T-37B(61); T-38A(45); AT-38B(15); T-43A(10); C-21A(6)
Vance	206	T-1A(38); T-37B(97); T-38A(71)
Luke (56th)	170	F-16C(108); F-16D(62)
Tyndall	87	F-15C(63); F-15D(24)
Academy	54	T-3A(54)
Altus	53	C-5A(8); C-17A(6); KC-135R(24); C-141B(15)
Kirtland	31	C-130E(1); MC-130P(4); MC-130H(3); UH-IN(6); HH-60G(7); MH-53J(4); TH-53A(6)
Randolph (Queen Bee)	21	AT-38B(21)
Luke (425th)	12	F-16C(11); F-16D(1)
Kessler	7	C-12C(2); C-21A(5)
Fairchild	4	UH-IN(4)
Maxwell	4	C-21A(4)

COMMUNITY CROSS-FEED

FEEDBACK FROM THE READERS

The series of articles on the F-22 were extremely timely. Besides being a project engineer on the Apache Helicopter, I also write curriculum on Environmental Accounting and Design for the Environment for an Arizona manufacturing education group, which Boeing is a member. I used the lessons on the "Green Engine's" as a case study for my course. The interest in the Raptor case was very high. Keep up the good work!

Mr. Fred Missel, Environmental Management - Lead, Boeing - Apache Helicopter Division

I find the MONITOR an excellent source for concise and up-to-date information regarding weapon system pollution prevention initiatives. It's my primary source for Weapon System P2 information. Thanks for your hard work. Keep up the great job!

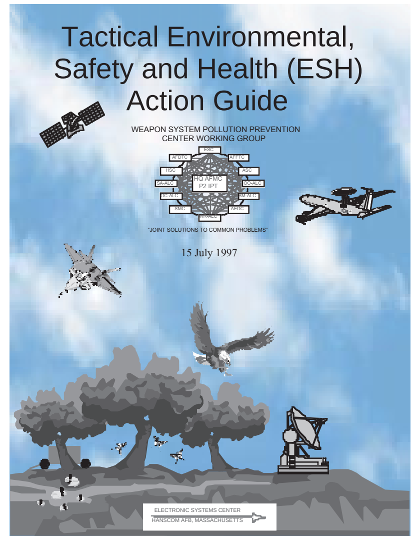
Capt Darren Gibbs, AFIT Facility Engineer, Director, Pollution Prevention Operations and Management Course, ENV 022. ■

AL/OE NEWSLETTER

The Armstrong Laboratory Occupational and Environmental Health Directorate (AL/OE) provides a newsletter with environment, safety and occupational health (ESOH) information. Laboratory services information is also provided. E-mail John Biggs at john.biggs@guardian.brooks.af.mil or call at DSN 240-5452/210-536-5452 to be put on the mailing list. ■

ELECTRONIC SYSTEMS CENTER'S (ESC'S) INPUT

OVERVIEW OF THE TACTICAL ENVIRONMENTAL, SAFETY AND HEALTH (ESH) ACTION GUIDE



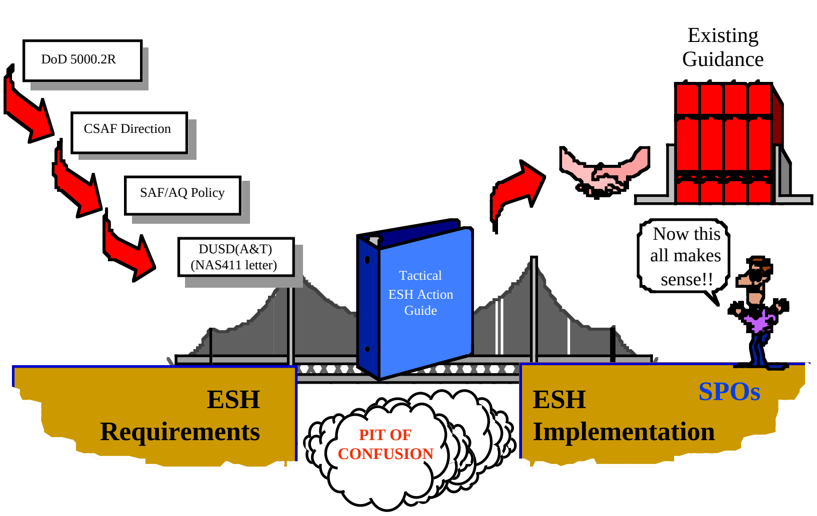
The Acquisition Pollution Prevention Team at Electronic Systems Center (ESC) at Hanscom AFB, recently unveiled the "Tactical Environmental, Safety and Health (ESH) Action Guide" or TEAG. The TEAG provides guidance for implementing the ESH requirements of DoD 5000.2-R and was approved for use in Air Force Materiel Command (AFMC) at the July 1997 meeting of the Weapon System Pollution Prevention Center Working Group (WSP2CWG). The WSP2CWG is chartered by HQ AFMC. Their credo is to find "Joint Solutions to Common Problems" for pollution prevention at the product, support and test centers. Integrating the tenets of ESH into the acquisition/systems engineering process falls directly into the category of a "common problem" which needed a "joint solution" across all AFMC centers.

The concept for the TEAG was initiated when program offices, reacting to the ever increasing emphasis on ESH issues, began asking; "What were the ESH requirements? When did the requirements need to be completed? How can these requirements be met?" Program managers and their staff recognized that not only was ESH compliance the right thing to do, but as resources continue to diminish, ESH compliance was also an operations and sustainment issue. Minimizing ESH problems early in the acquisition process, (e.g., reducing the use of hazardous materials), means less money is spent on items such as personal protection equipment (PPE), specialized training, and disposal of those materials. This makes more money available for operations and sustainment since PPE, training and disposal costs (as well as fines for non compliance) come out of the operations budget. *The time to implement ESH into a program is as early in the acquisition process as possible - it's cheaper!*

But how do you do it? The main problem for the program offices was the lack of resources to maintain dedicated ESH experts. Therefore, the ESC Acquisition Pollution Prevention Office sought to fill that need and targeted their development efforts on producing an easy to use guide to assist acquisition specialists and others consider the tenets of ESH as they progress through the acquisition/system engineering process. DoD 5000.2-R was used as the foundation to support development of suggested language for use in the various documents that are part of the acquisition of weapon systems. Every attempt was made to create "cut and paste" type language that can be easily tailored to specific program needs.

As DoD 5000.2-R applies to all services, the TEAG is also potentially applicable for use by all services once it is tailored for the service specific acquisition processes. Of note is that in developing the TEAG, rather than reinvent the wheel the ESC team reviewed all available ESH guidance to capitalize as much as possible upon the "smart" way that other organizations and services were doing business. In light of this, Army, Navy and USMC process type ESH language may already be in the TEAG.

ESH Requirements Implementation



The TEAG "bridges" the gap between ESH requirements and implementation; it goes "hand-in-hand" with existing guidance.

Although the TEAG was developed by the Acquisition Pollution Prevention Team, it was actually written by the ESC System Program Offices (SPOs) along with all of the WSP2CWG members at the various AFMC product, support and test centers. The initial package was reviewed by the members of ESC's Environmental Working Group (EWG) to first determine if the approach was correct, i.e., would it be useful (and used), and second to solicit feedback on additional information that should be included in the guide. This resulted in many suggestions to add information and increase the scope of the guide. *The customers (the SPOs) asked the questions and the team did the research which made the customers very happy!* The TEAG was then reviewed by the ESC legal (JA) and contracting (PK) offices to ensure proper compliance with the law and the principles of acquisition reform. The development process was then completed after the TEAG went out to the other centers for their input. *The response from the centers was overwhelming.* Their input expanded the health and safety aspects of the TEAG and also provided numerous, additional examples of suggested ESH language to illustrate the particulars of how they conduct the acquisition process at their specific center. *Through the WSP2CWG, this development process produced an ESH implementation guide that will serve the needs of all the centers within AFMC.*

What does it do? The TEAG provides suggested ESH language (by example) that can be included in each of the acquisition documents and actions that make up the acquisition process. It lets the Weapon System Single Managers take the necessary action to implement the ESH requirements of DoD 5000.2-R.

How do you use it? You don't have to be an ESH expert to use the TEAG. Whether preparing for an Acquisition Strategy Panel (ASP), writing a Statement of Objective (SOO), filling out an AF Form 813 or evaluating a proposal, one only needs to open up the table of contents and go to the appropriate tab. Each tab contains a short overview followed by examples. Using these examples, and with knowledge of program specifics, the reader will be able to review or generate the appropriate sections of acquisition documents.

As the TEAG is the first ever of this particular type of ESH guidance (cut and paste language), this "final" version actually represents a basic, **first start** to providing easy to use guidance to the weapon system program managers. The TEAG is a dynamic document which will be modified as it gets used and we see what works and what doesn't. In order to save resources, the TEAG will be distributed electronically via the Internet. This will allow distribution of updates in "near real time" without wasting paper. Customers need only to access the ESC Acquisition Pollution Prevention Office Home Page at **http://www.hanscom.af.mil/Orgs/O_Orgs/AX/pollprev/p2home.htm** for copies of the latest TEAG. They can also request to be placed on the official distribution list to receive electronic notification of any updates.

The ESC Acquisition Pollution Prevention Team at the August 1997 Joint Service Pollution Prevention Conference booth.

For additional information on the Tactical Environmental, Safety and Health Action Guide (TEAG), suggestions for improvement or other guidance developed by ESC's Acquisition Pollution Prevention Office, please go the Internet address above or contact Mr. Peter Logan, ESC/CO, DSN 478-8884 or (617)377-8884 or via electronic mail at loganp@hanscom.af.mil.

This article was submitted by Mr. Andy Bryson, ESC. ■

UPCOMING EVENTS

Date	Meeting	Location	POC	Phone/E-mail
28 Sep - 01 Oct	Professional Conference on Industrial Hygiene	Hyatt Regency Baltimore, Baltimore, MD	AIHA	(703) 849-8888
01 Oct	Weapon System P2 Center Working Group VTC	1100-1200 Eastern Time	Mr. Peter Logan	DSN 478-8884
14-17 Oct	Engineering and Environmental Stewardship	Portland, OR	Mr. Dick Crim	(503) 235-5022, ext. 4496
15-16 Oct	Simulation & Modeling to Support Environmental Technology Transfer	Alexandria, VA	Ms. Tricia Wright	(814) 269-2567, e-mail: wright@ctc.com
21-24 Oct	International Conference and Workshop on Risk Analysis in Process Safety	Atlanta, GA	Center for Chemical Process Safety	(212) 705-7319
04-06 Nov	Joint Depot Environmental Panel Meeting	OO-ALC, Hill AFB, UT	Maj Norm LeClair	DSN 777-6655
04-06 Nov	Weapon System P2 Center Working Group Conf. - 8th Joint Solutions to Common Problems	SMC, Los Angeles AFB, CA	LtCol Denton Crotchett	DSN 833-0293
05-07 Nov	Cadmium and Chromium Alternatives: Information Exchange	Pittsburgh, PA	Ms. Teresa Kishlock	(814) 269-2800, e-mail: kishlock@ctc.com
12-13 Nov	International Conference on Ozone Protection Technologies	Baltimore Convention Center, Baltimore, MD	Ms. Heather Tardel	(703) 807-4052
13 Nov	Acquisition Environmental & Health Protection Committee Meeting	Bldg. 14, Area B, Wright-Patterson AFB, OH	LtCol Gil Montoya	DSN 785-3059, ext. 308
17-19 Nov	Pollution Prevention/Green Manufacturing Conference for Industry and Business	Marriott Marquis Hotel, Atlanta, GA	USEPA Reg. 4	(404) 562-9362
19-20 Nov	Symposium on Sustainable Green Manufacturing	Plaza Hotel, Morristown, NJ	Ms. Donna Gorog	(973) 724-4666 or e-mail: dgorog@pica.army.mil
02-05 Dec	9th Annual Chemical Emergency Preparedness and Prevention Conference	Pittsburgh, PA	USEPA Reg. 3	(610) 701-3080, internet: http://www.vtec2.com/cepp97.htm
03 Dec	Weapon System P2 Center Working Group VTC	1100-1200 Eastern Time	Mr. Peter Logan	DSN 478-8884

AERONAUTICAL SYSTEMS CENTER'S (ASC'S) INPUT

"FLASHJET" — PULSE OF THE FUTURE

The Pollution Prevention Division within the Acquisition Environmental Management Directorate at Wright-Patterson AFB is exploring a project designed to eliminate or significantly reduce the use of thousands of gallons of hazardous materials. Partnering with engineers and scientists at Warner Robins Air Logistics Center (WR-ALC) in Georgia, this team is testing a new aircraft paint removal process that supports pollution prevention initiatives, while protecting human health and the environment.

According to Charles Valley, program manager for Aeronautical Systems Center's (ASC's) Applied Technology Program, the $4 million dollar Composite Depaint Project facility represents a major milestone for ASC's Pollution Prevention Division. Recognized as being the largest pollution prevention initiative placed on contract through the Applied Technology Program, this innovative paint removal project will potentially reduce the use of thousands of gallons of methylene chloride and methyl ethyl ketone, which are currently used in depot paint stripping operations. The program manager added that by reducing the use of these chemicals, this project directly supports the Environmental Protection Agency's efforts to discourage the production and use of specific hazardous materials included on the EPA-17 listing.

Valley said, "The Applied Technology Program is important because it promotes pollution prevention at the Air Logistics Centers and at other joint service depots. Its goal is to identify and provide alternative processes for systems currently using hazardous substances. The program (Applied Technology Program) is successful because it produces quick, tangible "environmental victories" as in the case of the Composite Depaint Project". To support his point, he stated that since residual levels of chemicals can etch and eventually threaten the mechanical integrity of composite structures like aircraft radomes or thin-skinned aging aircraft, a viable alternative in an environmentally- compliant paint stripping process is needed".

F-15 Eagle Gantry Paint Stipping System

The proposed paint stripping design, known as the "Flashjet" process, is a pulsed light energy system that incorporates CO2 (dry ice) for cleaning the stripped surface, supported by another system that captures particles generated in the cleaning process. The program manager said that the pulsed light energy comes from an electrically energized xenon lamp that emits light onto the painted surface. The surface coating absorbs (photon) energy, heats to the point of pyrolysis, where it changes into fine ash particles. While the cleaning process is occurring, the CO2 system provides cooling to the surface area, which maintains the desired paint stripping temperature. The CO2 stream also helps to clear particulates away from the flashlamp window, which increases the opportunity for constant maximum light transmission. In addition, the stream sweeps away coating residue from the surface.

Another added benefit over current chemical processes, Valley related, is that the low pressure system applied by the pulsing flashjet process prevents damage to substrates (the surface being cleaned), particularly composites. Since dry ice particles change from a solid to a gaseous state upon impact, all of the removed coating is vacuumed away from the substrate by the effluent capture system and collected in specialized filters called High Efficiency Particulate Arrestants (HEPA). The remaining effluent vapors are collected in an activated charcoal air scrubber, leaving the resulting discharge totally clean and limiting the hazardous waste disposal to the volume of paint particles trapped in the HEPA filters.

Discussing the operational benefits of this project, the program manager said that the flashlamp can be controlled for strength of the photon beam, pulse rate (flashes per second), and rate of travel over the surface. The dry ice particle stream also can be controlled for mass flow rate of particles, delivery pressure, and delivery nozzle angle. A color sensor, in turn, controls the depth of the stripping process, as the sensor enables the flashlamp to fire only on selected colors and is capable of determining the difference between topcoats, primers, and substrates.

The intended use of the Flashjet paint-stripping process is on the F-15, C-141, C-130 and potentially the C-17 programs at WR-ALC. Valley suggested that with more military aircraft, both subsonic and supersonic, using composites to reduce the acquisition cost and weight of the aircraft, there is an increasing demand for paint-stripping processes that are accommodating to composite structures. Sharing his enthusiasm about the project, Dr. William White, chief scientist at WR-ALC said, "There appears to be no limit in using the unique capabilities of this process to strip composite parts". Also supportive of this project is Lt Col. Gil Montoya, chief of ASC's Pollution Prevention Division who emphasized that the Composite Depaint Project provides an excellent example of the successes that can be achieved through partnering efforts with the Air Logistic Centers.

Andrea Attaway-Young, ASC Public Affairs. ■

SUMMARY OF THE JG-APP INITIATIVE WITHIN THE AIR FORCE

The Joint Group on Acquisition Pollution Prevention (JG-APP) initiative, which is a joint service cooperative effort to reduce or eliminate the use of EPA-17 chemicals in the production of weapon systems and sustainment, consists of three phases as summarized in Figure 6.

- **Phase I - Pilot Phase:** designed to introduce the concept and validate the methodology.
- **Phase II - Transition Phase:** designed to allow further refinements to the methodology while transferring the program management control to HQ DCMC and the service lead agent.
- **Phase III - Implementation Phase:** designed to institutionalize the methodology while delegating control to DCMC/service field units.

Figure 6. The Three Phases of the JG-APP Initiative

JG-APP projects currently involve 22 Original Equipment Manufacturers (OEMs), seven AF product, test, and logistic centers, and 26 Air Force weapon systems plus engine programs. This article summarizes the current status of the three phases of the JG-APP initiative.

Phase I: JG-APP has seven pilot projects located at various site locations. These pilot projects will assist in validating the 16-step joint service program methodology for establishing and executing JG-APP projects. Once the process is refined and stabilized, as many as 28 additional sites supported by JPPAB, Defense Contract Management Command (DCMC), and Service lead agencies will be selected as JG-APP projects.

Phase II: The Transition Phase will expand the development of common industry standards for environmentally preferable manufacturing processes and further disseminate the methodology used in developing these standards. During this phase, the JPPAB will provide guidance and program management for the joint methodology, advising HQ DCMC and the Service Lead Organizations on the implementation of their roles and responsibilities. Additionally, centralized management transitions to HQ DCMC.

The Service Lead Organization for the Air Force will be responsible for carrying out the following tasks in this phase of the program:

- advocating the execution of the JG-APP methodology,
- ensuring P2 concerns and issues are fully explored,
- defining and secure required resources,
- revising and coordinating JG-APP documents such as the PAR, JTP, and JTR,
- promoting/coordinating technology transfer initiatives,
- coordinating related activities with other HQ AFMC programs,
- continually reviewing process changes to the methodology.

Phase III: During the implementation phase, the matured and fully documented methodology, as well as the repository of best practices and lessons learned, will allow decentralized execution of the program by the services and DCMC without the day-to-day involvement of the JPPAB, HQ DCMC or service lead organizations. The full implementation phase plan calls for an addition of 18 new sites for a total of 35 sites to be engaged during this phase.

For more information, refer to the World Wide Web pages: www.ascem.wpafb.af.mil or www.jgapp.com. ■

THE JG-APP INITIATIVE CORNER…..

The Circuit Card Assembly and Materials Task Force (CCAMTF): is the first project chosen for the transition phase of the JG-APP initiative. The CCAMTF, which focuses on the elimination of conformal coatings and tin-lead from surface finishes, is comprised of 19 stakeholders from industry and government and will effect over 140 contracts and 49 weapon systems. During the transition phase, 17 sites will be involved with JG-APP.

BC-MAMS - Non-Chromated Primers Project for Aircraft Mold Lines: will render a cost avoidance of $31.3 million over 20 years and impact five depots. At the present time, F-15 aircraft are being field tested with a non-chromated primer and inspected for a two year period by the JG-APP corrosion team at Warner Robins Air Force Base, GA. This field test is concurrent with the Navy F-18 aircraft, utilizing a non-chromated primer that is tested under different environmental weather conditions.

Raytheon/Government Counterparts: completed 243 Prime/First Tier contract changes which resulted in a $9.0 Million cost avoidance. The proposed changes involving the reduction of VOC content in paints and primers will affect 1,400 contracts, 250 programs and approximately 6,000 drawings.

The Status of Engagement of the AF Weapon System Programs with the JG-APP Project Sites is listed below.

Original Equipment Manufacturers (OEM)	Boeing Defense and Space Group	Hughes Missiles Systems	Lockheed Martin Electronics and Missiles	BC-MAMS Aerospace - East	Propulsion Environmental Working Group (5 companies)	Raytheon TI Defense Systems and Electronics	P&W-United Technologies Corporation	Circuit Card Assembly and Materials Task Force (CCAMTF) (19 organizations)
Major AF Program	Cadmium and Chromium	Chromated Primer	Chromated Topcoats/ Primers and Ident. Markings	Chromated Primer	Lead in Dry Film Lubricants	High VOC Primers and Paints	Zinc Chromate	VOCs in conformal coatings and Tin-lead from surface finishes
AMRAAM	X	X						X
B-2	X							X
B-52	X							
C-17				X				X
E-3	X							
F15				X				X
F16						X		X
F22	X		X					X
F100, 119 Engines					X		X	
KC-135	X							X
LANTIRN			X			X		X
ICBMs	X							
Paveway						X		X

**OEMs are only listed/counted one time.* ■

SPACE MISSILE COMMAND'S (SMC'S) INPUT

MAKING SMART CHOICES IN MATERIAL SELECTION

Material selection for any system or process should be carefully considered during the design and acquisition phases. The use of materials during all phases of a process, including manufacture, operation, maintenance, and disposal, could have long lasting and significant impacts on environmental, safety, and health (ESH) issues, as well as on the life-cycle costs of the system. This article addresses all phases of a project and presents several questions that should be considered when making decisions regarding the life of a project.

These questions are meant to assist system engineers and program managers in making effective choices through an analytical process. This analytical approach will serve to clearly define the problem of material selection in terms of ESH concerns. Answers are needed for each material candidate and alternative. Decisions on ESH issues surrounding material choices must be integrated into a program manager's existing risk management and business-based decision making frame work. The final decision on material selection should minimize life-cycle costs and balance cost, performance, and schedule risks against the impacts to human health and the environment. Systems engineers and program managers must draw upon the expertise, evaluation, and recommendations of ESH personnel to ensure that all issues are adequately addressed. The questions are not all inclusive and may be a springboard to other ESH related questions.

Project Considerations:

1. Involve experts in the evaluation process: Materials selection and evaluation requires input from many different specialists including industrial hygiene, occupational health, toxicology, acquisition pollution prevention, materials science, process engineering, systems safety, ground safety, operational safety, explosive safety, environmental management, and environmental compliance. These experts should participate in any environmental or human exposure testing and/or review the results of this testing.

2. Define processes and tasks: To truly evaluate the hazards and risks from each material/chemical requires knowledge of the process and how the material is used in the process. A change in the material may cause a change in the process; i.e., multiple rinse cycles, longer drying times, additional capital equipment. Occupational health hazards, other than those related to chemicals and materials, should also be identified for each process. Workers may also be exposed to noise, radiation, heat/cold, safety, fire, and explosive hazards. The combinations of processes, materials, and hazards to perform a job/task/requirement can then be compared to make informed decisions.

3. Identify issues related to maintenance activities: Materials/Chemicals used to perform maintenance procedures and those contained within each sub-system can cause exposures. Exposures to maintenance personnel could occur during procedures which empty, purge, and refill materials and from the clean-up of spilled materials. Exposures could also occur from cleaning, washing, stripping, painting, lubricating, welding, brazing, soldering, plating, metal treating, cutting, sanding, grinding, rubbing, and other maintenance procedures. The materials may also have environmental impacts.

4. Consider accidental spills and discharges: If materials/chemicals are contained within the weapons system or its sub-systems, the potential for accidental spills or discharges must be considered. The site of the spill should also be considered (e.g., on the ground, in flight, in a storage facility, in a maintenance shop) as this affects the approach personnel would take to respond to a spill.

5. Special facilities requirements: The use of certain materials/chemicals often require the construction of special maintenance and storage facilities. These facilities may need special ventilation systems, special waste containment or collection systems, special waste treatment or neutralization systems, or any other engineering controls.

6. Consider training requirements: Training may include: maintenance procedures, use of PPE, use of engineering controls, emergency response/evacuation procedures, spill clean-up procedures, hazard communication required by the Occupational Safety and Health Administration, safety hazards, health hazards, waste disposal, and record keeping.

7. Special pay requirements: Will Wage Grade/General Schedule (WG-/GS-) civil service employees be entitled to Environmental Differential Pay because of the hazards associated with any material or process?

8. Operational considerations: Since the materials/chemicals used in, on, and with the weapon system will go to war with the system, the designers must consider all ESH issues when applied to a bare base or pre-engineered deployment site and wartime scenario. The special facilities may not be there and the use of special PPE may slow down the maintenance process if work/rest cycles for heat or cold stress injuries/illnesses need to be implemented. Additionally, in the stress of the moment, from the Operations-Tempo of war fighting, ground crew and maintenance personnel may not exactly follow the required procedures or may take short-cuts which will increase the risk of potential exposures and other mishaps. The fewer the special procedures, special PPE, special facility requirements, etc. needed during wartime scenarios, the better. If designers make it easy for the people (ideally no PPE, no special procedures, no special facility), then workers will not forget something critical concerning ESH issues. The more complicated the procedure/process the more apt people are to forget something.

9. Manufacturing/Production: Each prime contractor and sub-contractor should be making smart business decisions about the use of hazardous materials which will minimize the manufacturing costs. This will, in turn, help to minimize the weapon system's life cycle cost.

10. Life-cycle costs: If the use of any of the material candidates and alternatives drive special handling, special PPE, special storage and maintenance facilities, environmental and exposure monitoring, additional medical surveillance, special training, special disposal, etc., the life-cycle costs of these items for both peacetime and wartime scenarios should be considered and included in the life-cycle cost of the weapons system. Any trade studies used to make decisions on the material selections should also be reviewed.

11. Disposal/Demilitarization of the system: The disposal/demilitarization procedures and processes for the weapons system need to be evaluated. Disposal and potential recycle opportunities should be identified.

Specific Questions to Ask:

1. Project definition phase:

   a. Have the appropriate experts been consulted?
   b. Have all material/chemical candidates and alternatives, and the quantities needed, which will be used in or on the weapon system and its sub-systems, or for its operation, been identified?
   c. Is there enough toxicological information known about the hazardous materials?
   d. For complex materials, such as mixtures of solvents and cleaners, or for multi-step process which may mix chemicals, is enough information known about potential synergistic or antagonistic effects of the mixtures on humans?
   e. Is any toxicological testing needed to characterize hazards to humans?
   f. Will any qualification, acceptance, or flight testing be needed to select materials and processes?
   g. Have all processes for storage, operation, use, maintenance, support and disposal of the weapon system and its sub-systems been identified and defined?
   h. Have all subordinate tasks within these processes been identified and described?
   i. For each task, have all material/chemical candidates and alternatives, the quantities needed, and the application method(s) been identified?

j. Are any of these materials hazardous materials or radioactive materials?
k. Are Material Safety Data Sheets (MSDSs) available on each hazardous material candidate and alternative?
l. Is enough information known about the effects each material/chemical/substance candidate and alternative will have on other materials used in or on the weapons system and its sub-systems?
m. Have other safety, chemical, physical, radiological, biological, and ergonomic hazards associated with each process and task been identified? (e.g., noise, lifting, repetitive motion, cutting, falling, microwaves).
n. Will any federal/state/local regulatory agencies require permits or licenses for the system operation, maintenance, materials, or processes? (e.g., air emission or waste water discharge permits, radioactive material licenses)

2. <u>ESH issues during operation and maintenance</u>:

a. What are the estimated exposures to maintenance personnel which may occur during the routine maintenance procedures?
b. What are the potential exposure routes (inhalation, skin contact, skin absorption, ingestion)?
c. Are any exposures likely to exceed existing exposure limits?
d. If any material has cumulative effects, then what is the life-time exposure to an individual worker from these exposures?
e. Is any testing needed to better characterize exposures to maintenance workers?
f. Will maintenance activities cause additional exposure monitoring by industrial hygiene and occupational health specialists?
g. Will they cause additional medical surveillance and occupational health training?
h. Will engineering controls (e.g.; exhaust ventilation) be needed to control exposures to maintenance workers?
i. Will the maintenance personnel be required to wear personal protective equipment (PPE)?
j. Will the PPE be routine (i.e.; eye protection, gloves, aprons, hearing protection, etc.) or will special PPE (e.g.; chemical resistant encapsulation suits, supplied air respirators) need to be developed and/or procured?
k. What are the waste disposal requirements for each material/chemical/substance candidate and alternative?
l. How much waste will be generated during each maintenance process or task?
m. Will any waste be recycled?
n. Will any of waste be a hazardous waste as defined in the Resource Conservation and Recovery Act (RCRA) (See 40 CFR 260-265) or similar state/local codes?
o. Can a release to the environmental (soil, water, air) occur from the maintenance process or task?
p. Is the release likely to exceed existing environmental contaminant limits/standards?
q. Is any testing needed to better characterize release to or impacts on the environment?
r. Will maintenance activities cause additional environmental monitoring to ensure compliance with regulatory requirements?
s. Will engineering controls (e.g., exhaust stack scrubbers, waste water treatment) be needed to control or prevent releases to the environment?
t. What special training will need to be given to the maintenance personnel, the aircraft ground crew, the storage facility personnel, and emergency response personnel?
u. When and where will this training take place?
v. Will periodic refresher training be needed?

3. <u>Spills, discharges, disposal issues</u>:

a. Where will the accidental spill/discharge occur?

b. How will each material candidate and alternative be treated or neutralized if spilled?
c. How will each material candidate and alternative and any treatment or neutralization processes or chemicals affect the materials used in the construction of the storage and maintenance facilities?
d. How much material is likely to be released? How will the remainder be captured?
e. Can exposure to ground crew, maintenance workers, storage facility occupants, emergency response personnel, or other workers occur from the accidental spill/discharge?
f. How often are accidental exposures likely to occur?
g. What are the potential exposures routes (inhalation, skin contact, skin absorption, or ingestion)?
h. What are the estimated exposures to personnel from each accidental exposures?
i. If any material has cumulative effects, then what is the life-time exposure to an individual worker from these accidental exposures?
j. Are any exposures likely to exceed existing exposure limits?
k. Is any testing needed to better characterize exposures to ground crew, maintenance workers, storage facility occupants, emergency response personnel, or other workers?
l. Can a release to the environment (soil, water, air) occur from the accidental spill or discharge?
m. What concentration is likely to be released to the environment?
n. What impact will this have on the soil, air, water, plants, animals, human receptors?
o. Is any testing needed to better characterize release to or impacts on the environment?
p. How will each material candidate and alternative and any treatment or neutralization process or chemicals affect the materials used in the construction of the storage and maintenance facilities? Will special construction materials need to be selected?
q. Will special safeguards be necessary to mitigate incompatibilities with surrounding activities?
r. What measures can be taken to mitigate or reduce possible spill scenarios? (e.g., smaller containers, pressure or check valves, alarms)
s. Do special emergency response or clean-up procedures need to be developed?
t. Will any chemicals/materials be needed to prepare the system for disposal, recycling, sale, or demilitarization?
u. What are the estimated quantities of materials generated during the disposal and demilitarization processes?
v. Will any of the system materials be recycled or sold for scrap?
w. Do any of the materials used in the weapon system require special handling?
x. Do any of the materials used in the system require disposal as a hazardous waste?
y. Do any of the materials used in the system require disposal as a radioactive material?

4. General questions:

a. Does any material have a shelf life? A shorter shelf life may lead to wasted materials which drive up disposal costs.
b. Can smaller containers be substituted to mitigate impact of exposure, spill, or waste?
c. Are there any special handling requirements for each material/chemical/substance candidate and alternative?
d. Will any special materials be needed on the weapons system, any sub-system, or for any maintenance equipment to contain or store hazardous materials?
e. Will the materials and quantities used initiate or add to reports required by federal/ state/local regulatory agencies? (e.g., Emergency Procedures and Community Right to Know Act, Toxic Release Inventory, Clean Air Act, Clean Water Act, National Pollution Discharge Elimination System)

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HUMAN SYSTEMS CENTER'S (HSC'S) INPUT

TOXICOLOGY AND CHEMICAL HEALTH EFFECTS EVALUATIONS

Toxicology in its most simplified definition involves the science of poisons and their impacts on biologic species. Toxicology incorporates a multidisciplinary approach utilizing the disciplines of chemistry (most important), biology, biochemistry, microbiology, and physiology. The study of mechanisms whereby chemicals cause damage to biologic species is important. Formal toxicology training evolved from pharmacology; although, there are programs in toxicology available today.

Poisons are chemical compounds which have an adverse effect on the biologic species at, in general, low concentrations. Poisons come in many different forms such as carbon monoxide (a gas), cyanide (gas when present as hydrogen cyanide or solid when present as a salt), methanol (a liquid), strychnine (a powder), and lead (a metallic solid or inorganic salt). Their impacts to the biologic system generally vary and involve different pharmokinetic paths. Pharmacokinetics or toxicokinetics examines the uptake, distribution, storage, metabolism and elimination of a chemical in the body.

The importance of completing these studies for new chemicals and products or for chemicals new to a particular process cannot be over emphasized. The usage scenario must be evaluated to determine what precautions must be taken to reduce health impacts. The program manager or engineer wishing to make a change in a process may often feel frustrated as toxicology evaluations hinder implementing changes in a timely manner. The selected chemical or material may have passed all the engineering requirements, yet it cannot be used pending completion of toxicology studies. This article concerning the discipline of toxicology attempts to explain the different areas of toxicology, the content of toxicology evaluations, and that it is a time consuming process that needs to be started early in the engineering development process.

Toxicology is utilized by medical care professionals, the legal community, environmentalists, and regulatory agencies. Clinical toxicology is utilized by hospitals and reference laboratories for patient care in areas of drug overdoses, therapeutic drug monitoring, and poisoning determinations generally performed on biological specimens. Forensic toxicology uses a disciplined approach for specific identification of drugs, chemicals and other confiscated paraphernalia to support law enforcement.

Environmentalists use toxicology to assess impacts on ecosystems from the use and misuse of chemicals. Environmental toxicology plays a major part in determining the response of populations of organisms (birds, animals, fish, plants, and even humans) representing different trophic levels and different environmental exposure to hazardous materials. Data is collected and used to determine the concentration of a chemical or hazardous material in the habitat that may present a threat to the species in question.

Regulatory agencies use toxicology to assess the impact of exposure to chemicals and hazardous materials on the human population. Toxicology studies are used to assess the risk to human health and determine unsafe exposure levels. Exposure evaluations are based on short-term exposure (acute toxicity studies), mid-term exposure (subchronic toxicity studies), and long-term exposure (chronic toxicity studies).

Acute toxicity studies usually involve a battery of five tests which include the following: oral, dermal and inhalation toxicity studies and skin and eye irritation studies. Other tests that can be performed include reproductive tests, dermal contact sensitization and phototoxicity studies. Acute toxicity evaluations usually take from 3 to 9 months to complete.

Subchronic toxicity studies usually consist of a battery of three tests identified as: oral, dermal and inhalation evaluations. Acutely nontoxic chemicals and hazardous materials may be toxic after prolonged exposure, even at low doses, due to accumulation, changes in enzyme levels, and disruption of physiologic and biochemical homeostasis. Therefore, subchronic testing is considered essential for all new chemicals before their specific hazard can be determined and assessed by regulators. A wide variety of adverse effects can be detected by monitoring many different parameters, such as clinical chemistries and histopathology. The results from these studies can provide information that will aid in selecting doses for chronic, reproductive, and carcinogenic studies. Subchronic studies are also valuable in establishing doses at which no toxicological effects are evident, a critical factor in risk assessment. Subchronic toxicity evaluations usually take from 9 to 12 months to complete.

Chronic toxicity studies are performed to evaluate reproductive effects (adverse effects on male or female reproductive organs and functions), developmental effects (teratogenic and other embryotoxic effects), mutagenicity (heritable genetic and chromosomal mutation), and carcinogenicity (tumors). Exposure factors such as route of exposure most likely to be experienced and duration of exposure must be considered when designing the study. The dose administered should span the range of the highest no effect level to the highest dose tolerated over the entire course of the study. Chronic toxicity evaluations usually take from 1 & 1/2 year to 3 years to complete.

Toxicology studies are expensive and take a long time to complete. The results of a good toxicology program for a chemical will be the establishment of a safe level for operational use and minimal environmental impact. This will result in cost savings or cost avoidance (medical surveillance, medical claims, litigation, site remediation, demilitarization problems) throughout the lifetime of a system.

Toxicologists at OET actually conduct toxicity research while toxicologists at OEMH serve as consultants for toxicity data, work with Agency for Toxic Substance and Disease Registry (ATSDR) on health risk assessments and, in coordination with OET, perform chemical risk assessments on chemicals for Air Force use.

Questions concerning toxicology issues can be addressed to the Toxicology Division (AL/OET, David R. Mattie, PhD, DABT, DSN 785-3423, ext. 3105) at Wright-Patterson AFB, OH or to the Risk Assessment Branch (AL/OEMH, John Hinz, DSN 240-6136) at Brooks AFB, TX.

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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. ■

CORRECTIONS TO THE JULY 97 WSP2 MONITOR

The ESOH WWW site location for the USAF ESOH Technical Planning Integrated Product Team (TPIPT) listed on page 9 is incorrect. The WWW address is <http://xre22.brooks.af.mil>.

The internet addresses listed for HSC ESOH Education and Training Requirements Consult Service (RCS) on page 14 is actually for the Air Force Medical Service located at Bolling AFB, Washington DC. Contact the RCS at DSN 240-3403/210-536-3403 for information about their web page. ■