

Interim Guidance, 14 March 2003

This guidance supplements Air Force Instruction (AFI) 48-145, *Air Force Occupational Health Program*, and serves as the interim AFMAN 48-146, *Occupational Health Information Management*. It standardizes procedures for the collection, analysis, management, and communication of occupational health information. It incorporates Operational Risk Management methods and language into the Occupational Health.

This interim guidance applies to all Air Force (AF) personnel (active and reserve components) in both home station and deployed settings. Contractors who perform occupational health functions for the Air Force Medical Service must comply with this policy and compliance should be addressed in the contract. Maintain and dispose of records created as a result of processes prescribed in this policy in accordance with AFMAN 37-139, *Records Disposition Schedule*.

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Chapter 1

INTRODUCTION

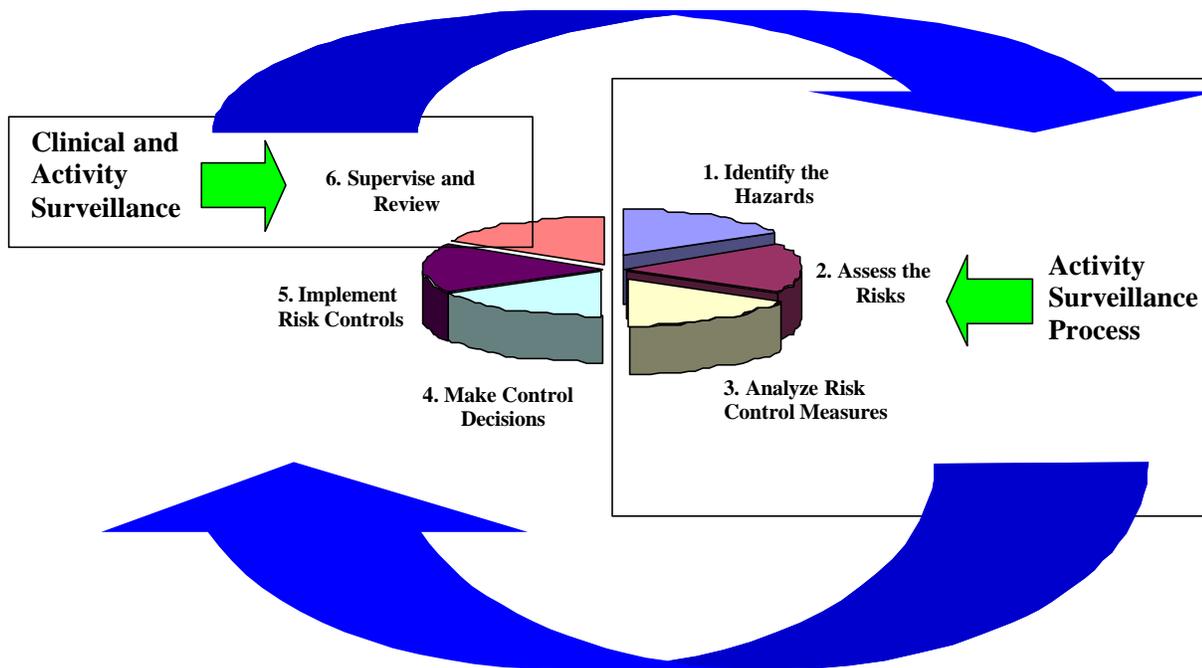
1.1. Overview.

1.1.1. It is DoD policy to provide each employee with a healthful work environment that is free from recognized chemical, physical, or biological hazards that cause or are likely to cause death or illness. To this end, health hazards must be anticipated, recognized, evaluated, and controlled. Consistent, meaningful occupational health and environmental surveillance programs must be implemented to ensure that controls adequately protect the health of DoD personnel. Military and DoD civilian officials at each management level are required to advocate a strong ESOH program; provide their personnel safe and healthful working conditions; and provide education and training that will enable them to prevent accidents, injuries, and occupational illnesses.

1.1.2. This interim guidance prescribes procedures to effectively capture, analyze and communicate occupational health risks via a standard method. It establishes procedures that ensure workers, supervisors, and commanders are provided with the information they need to protect health, minimize risks, and enhance performance, thus maximizing combat capabilities. This interim guidance prescribes the use of approved Occupational Health Management Information Systems (OHMIS) to simplify, standardize, and enhance data entry, management, and reporting. The current OHMIS for managing funding is Team Aerospace Funding Requirements (TAFR). The Command Core System (CCS) is the current OHMIS for managing projects and data associated with Industrial Hygiene.

1.1.3. Occupational health risk is communicated through the Operational Risk Management (ORM) process to allow effective change through wing resource prioritization. This process applies at the home station and during deployment. The overall occupational health program's contribution to the supported organization's ORM process is depicted in Figure 1.1.

Figure 1.1. Operational Risk Management.



1.1.4. As depicted in Figure 1.1 above, the occupational health program outlined in AFI 48-145 is a continuous cycle of activity surveillance and clinical surveillance. Air Force Medical Service (AFMS) personnel play a key role in this process by identifying hazards, assessing the risks, and analyzing control measures for each industrial workplace. Health risk management inputs are then provided for use in the commander's operational risk management process. By effectively capturing and communicating occupational health information, the AFMS provides commanders the tools they need to comply with the basic principles of ORM:

- ☞ Accept no unnecessary risks,
- ☞ Make risk decisions at the appropriate level,
- ☞ Accept risks when benefits outweigh the costs,
- ☞ Integrate ORM into operations and planning at all levels.

1.1.5. Commanders implement risk controls based on recommendations by the AFMS. Clinical and activity surveillance continue to ensure that the correct decisions have been made and adverse trends do not occur.

1.1.6. The OHMIS is the tool to execute health surveillance requirements and to address occupational and environmental health risks at the home station and during deployments. The procedures outlined in this interim guidance facilitate AFMS mission requirements for establishing a longitudinal health record for occupational health exposures in accordance with

Presidential Review Directive 5, "Improving the Health of Our Military, Veterans, and Their Families". The occupational health risk process in a deployed setting must mirror the home station process as much as possible to allow a longitudinal health record throughout a career. DODI 6490.3, "*Implementation and Application of Joint Medical Surveillance for Deployments*" requires a full career exposure assessment due to occupational hazards at the home station and during deployment. Refer to attachment 1 for a complete list of references and definitions.

1.1.7. In a deployed setting, a greater emphasis may be placed on environmental hazards not seen at most home bases. Because occupational and environmental health hazards can seriously impact the mission, the primary objective during deployments is to reduce and/or eliminate the negative effects of occupational and environmental exposures.

Special Note: Throughout this document, several AF Form 2700 series forms are referenced. Most of the 2700 series forms are no longer officially recognized by the Air Force; however, the forms may still be referenced as a way to relate historical documentation to modern practice. The existing OHMIS has equivalents, either existing or planned for most of the 2700 series forms mentioned in this interim guidance. Whenever a 2700 series form is mentioned, it is implied that the OHMIS captures equivalent data and has similar reports.

Chapter 2

RESPONSIBILITIES

2.1. Commander, Air Force Medical Operations Agency (AFMOA).

2.1.1. Plan, program, and budget for continued support, maintenance, and enhancement of the OHMIS.

2.1.2. Develop performance measures (metrics) for the OHMIS.

2.1.3. Formally appoint Functional User Group (FUG) or groups, as necessary to identify, prioritize, and resolve OHMIS issues.

2.1.4. Review proposed modifications to standardized data sets and provide concurrence/non-concurrence for implementation in the OHMIS.

2.1.5. Distribute policy to correct identified OHMIS requirement gaps.

2.1.6. Task responsible agencies if AF-wide information analysis is required beyond the normal annual frequency.

2.2. Major Command Surgeons.

2.2.1. Interpret this standard and coordinate with HQ AFMOA/SGZE to identify and resolve programmatic issues with respect to standardization of data archival, analysis, and reporting.

2.2.2. Inform AFIERA of new weapon systems operations and processes or changes to existing weapon systems maintenance and operating processes.

2.2.3. Review risk reduction opportunities to identify resource prioritization and advocacy with a clear return on investment and measured success with course correction, if necessary.

2.2.4. Review and compare Occupational Health Risk Management service performance at all bases within their command.

2.2.5. Coordinate with HQ AFMOA/SGZE to ensure data reporting capabilities, standardization of terminology, and cross feed of lessons learned.

2.2.6. Disseminate information pertaining to policy and new and pending legislation to respective bases.

2.3. Air Force Institute for Environment, Safety, and Occupational Health Risk Analysis (AFIERA).

2.3.1. Identify occupational health and environmental risk reduction opportunities and evaluate cost/benefits.

2.3.2. Analyze AF-wide occupational and environmental health data at home stations and during deployment and deliver the information to base Team Aerospace (TA) members, MAJCOM Combatant Command Air Component staff, and HQ AFMS staff.

2.3.3. Recommend performance metrics for MAJCOM and AF use.

2.3.4. Provide AF-wide information analysis to support program policy, guidance, and resource development & advocacy.

2.3.5. Identify, develop and maintain all standard data sets (lists) in OHMIS. Lists include, but are not limited to, occupational exposure limit (OEL) data sets, guidance criteria for exposures to hazards that do not have an established OEL, and lists identified in paragraph 6.1.1 below.

2.3.6. Provide guidance on implementing and sustaining the approved Material Safety Data Sheet tracking system (currently the Hazardous Materials Information Resource System (HMIRS)) with recommendations to fully link and maintain key data fields with the AFMS OHMIS.

2.3.7. Conduct mission impact analysis at the request of HQ AFMOA for such things as potential new regulatory standards or in response to data calls related to Occupational Health. Analysis shall include mission impact and recommended program and implementation guidance, if applicable, to meet new regulatory or USAF unique health standards to fully protect worker health.

2.3.8. Identify and integrate new system requirements into the OHMIS.

2.3.9. Maintain a master occupational health exposure data repository.

2.3.10. Publish technical guides and reports to support the OHMIS.

2.3.11. Plan, program and budget for maintenance and upgrades of the OHMIS software.

2.3.12. Budget for and facilitate meetings and teleconferences of the OHMIS Focused User Group (FUG).

2.4. Functional User Groups (FUGs).

2.4.1. Assist the AFMS with the identification, prioritization, and resolution of OHMIS technical, funding, management and policy issues. A FUG may be formally appointed by the AFMOA/SGZE or by responsible MAJCOM functional. Each FUG shall define its purpose, responsibilities and membership through a written charter.

2.4.2. Identify and prioritize changes to the OHMIS and present them to HQ AFMOA for funding, advocacy, and/or potential policy changes.

2.4.3. Evaluate the OHMIS against current policy and recommend changes to address deficiencies.

2.4.4. Review user manuals as directed by the functional owner and make recommendations for improvement.

2.4.5. Participate in the system development process to include evaluating and testing system changes.

2.5. USAF School of Aerospace Medicine (USAFSAM).

2.5.1. Provide training on the designated OHMIS covering home station and deployment scenarios.

2.5.2. Incorporate this interim guidance into all phases of training.

2.5.3. Support system changes and optimization through active FUG membership and participation.

2.6. Chief, Bioenvironmental Engineering.

2.6.1. Ensure only approved Occupational Health Management Information Systems are used for OH management.

2.6.2. Ensure complete and comprehensive documentation using OHMIS for all routine and special surveillance data.

2.6.3. Identify OHMIS deficiencies and/or recommendations for system improvement to MAJCOM FUG representative with the goal to optimize the OHMIS system for the AF.

2.6.4. Establish similar exposure group (SEG) or groups, link the workers to the SEG, and establish the start and stop dates for each worker assigned to the SEG. A SEG is a way of grouping persons who experience exposures similar enough that assessing the exposures of any member of the group is predictive of exposures of all members of the group (also see definition in attachment 1). Coordinate with the workplace supervisor and ensure they are aware of their

responsibility to notify BE when workers process in and out of the shop. Ensure supervisors provide the organization, office symbol, employee names, social security numbers and dates when individuals start working in the SEG/s.

2.6.5. Keep the SEG roster accurate. Validate the roster at least as frequently as the routine surveillance frequency established in AFI 48-145. Shops with personnel requiring medical surveillance will have their personnel roster reviewed and updated at least once every six months.

2.6.6. Periodically provide Public Health a list of routine and special surveillance conducted so that occupational exam implications can be evaluated.

2.6.7. Develop and implement the Annual Planning Cycle. Document and suspense routine surveillance via the OHMIS. Special surveillance items such as recurring ventilation surveys, prioritized air sampling lists, etc., should also be part of the Annual Planning Cycle. Revisions may be required as additional routine and special surveillance requirements are identified and adjustments will be made based on risks.

2.6.8. Identify and prioritize BE workload and programming, planning and budgeting needs to management. Linkage between OHMIS IH documented workload (deferred special surveillances) and requested unfunded or POM resources in TAFR should be evident.

2.6.9. With other members of the ESOH Team, perform QAE responsibilities for all contracted ESOH services. Provide contract technical oversight and data and outcome quality control reviews.

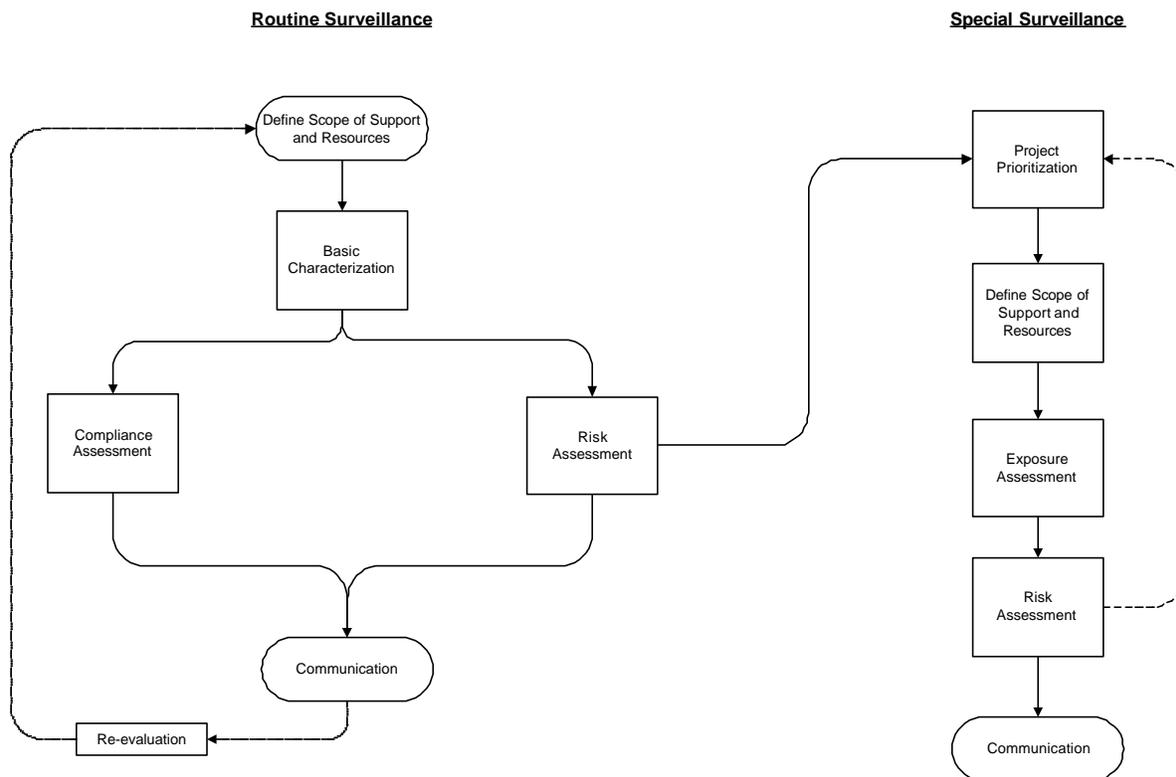
Chapter 3

ACTIVITY SURVEILLANCE PROCESS

3.1. Activity Surveillance Process (Operational Health Risk Management).

3.1.1. The activity surveillance process consists of two parts as shown in Figure 3.1, Routine and Special Surveillance.

Figure 3.1. Activity Surveillance Process.



3.1.2. Routine surveillance is a qualitative assessment that identifies hazards and associated risk so that limited resources can focus on high-risk activities. The principal purpose of routine surveillance is to:

- ☞ Identify organizations requiring industrial hygiene support
- ☞ Evaluate unscheduled requests such as pregnancy evaluations, occupational illness/injuries, etc.
- ☞ Identify activities with potential health hazards performed in the workplace or by the work group,

- ☞ Identify the potential hazards of each activity,
- ☞ Assess the effectiveness of controls, confidence in exposure characterization, and compliance with applicable standards,
- ☞ Assign a qualitative risk to each hazard and activity, and
- ☞ Provide a shop-level compliance assessment based on all shop activities.

3.1.3. Special surveillance is typically a quantitative assessment that focuses resources on those hazards at the activity level that require additional evaluation or classification. The principal purpose of special surveillance is to:

- ☞ Perform sampling and measurements to quantify potential exposures identified during routine surveillance.
- ☞ Perform periodic control evaluations (quarterly ventilation, RF, etc., surveys) to maintain confidence in the effectiveness.
- ☞ Improve compliance with specific regulatory requirements.

3.2. Activity Surveillance Steps

The paragraphs below list the major steps necessary to accomplish routine and special surveillance. These steps will be discussed further in Chapters 4 and 5.

3.2.1. Define Scope of Support and Resources includes the following:

- Listing the organizations to be served
- Capturing organization demographics
- Receiving unscheduled requests for surveys
- Programming and budgeting
- Scheduling and suspending

3.2.2. Basic Characterization includes the following:

- Reviewing previous data
- Identifying the shop
- Performing an opening conference
- Identifying activity/s performed by the shop. Creating multiple activities if there are more than one.
- Identifying each hazard (General Assessment) associated with the activity. There may be one or several.
- Identifying and evaluating controls required to control each hazard.
- Establishing one or more similar exposure groups (SEG) based on the activities performed by each group and their potential exposures
- Assigning personnel performing the activity to a similar exposure group (SEG).

3.2.3. Risk Assessment includes the following:

- Risk determination (Confidence in Existing Controls and Confidence in Hazard Characterization)
- Operational risk management (Severity and Probability)
- Project identification

3.2.4. Compliance Assessment includes the following:

Identifying applicable checklist items for the specific shop
Answering checklist questions for occupational health program areas (i.e. respiratory protection, HAZCOM, etc.)

3.2.5. Communication includes the following:

Commander in brief
Shop supervisor opening and closing conference
Routine and special surveillance reports
Commander out brief and executive summary
Occupational Health Workplace Exposure Data

3.2.6. Project Prioritization includes the following:

Prioritizing surveillance based on ORM matrix
Scheduling and suspending

3.2.7. Exposure Assessment includes the following:

Determining exposure (literature reviews, modeling, sampling, etc)
Computing time weighted averages (TWA)
Comparing exposure measurement to OEL
Determining exposure acceptability
Identifying recommendations

Chapter 4

ROUTINE SURVEILLANCE

4.1. Routine Surveillance.

4.1.1. Routine surveillance is an assessment that provides workers and managers an overview of the Occupational Health portion of the ESOH program. Hazards and controls associated with specific activities performed in the workplace, the overall working environment, and trends from clinical surveillance efforts are assessed. The focus of routine surveillance is to validate the existing Basic Characterization of the shop or workplace and to identify any new activities and hazards that require Basic Characterization. It is a qualitative assessment versus the typically quantitative assessment conducted during special surveillance where specific exposures are evaluated in detail. Routine surveillance provides the opportunity for BE to update administrative data, review previous assessment information, and document changes in the workplace itself or the activities performed by workplace personnel to accurately make conclusions about the occupational health risks and compliance of the workplace. Assessors rely on professional experience, a review of previously collected workcenter information and evaluations, supervisor and employee interviews, and visual observations of workplace activities. Survey equipment is typically not needed for routine surveillance. There may be times; however, when BE may want to verify or quantify exposures and instantaneous measurements or direct reading sampling may be accomplished. This would normally be accomplished only in situations where confidence in controls or confidence in hazard characterization is not high, an opportunity presents itself to collect the addition information, and/or there is a high return on the time invested. In those instances, a project should be identified for the sampling or survey. BE uses the information from routine surveillance to prioritize and schedule special surveillance. The primary emphasis is on the evaluation of hazards and controls for activities with identified changes or information gaps.

4.1.2. Routine surveillance shall be accomplished under the direction of bioenvironmental engineers (BEEs), civilian industrial hygienists, or Bioenvironmental Engineering Craftsmen (4B071s).

4.1.3. As specified in AFI 48-145, routine surveillance of shops is performed every 12 months for category 1 shops, at least every 24 months for category 2 shops, and as needed for category 3 workplaces. In the deployed setting, routine surveillance of category 1 and 2 shops should be performed during each Air Expeditionary Force (AEF) rotation or as directed by the Combatant Command BEE

4.1.4. Routine surveillance begins by defining the scope of support and resources required to adequately assess industrial activities and continues with basic characterization, a risk assessment, a compliance assessment, and communication, as depicted in Figure 3.1 above. The steps within each phase of routine surveillance are described in greater detail below.

4.2. Define Scope.

4.2.1. Identify Organizations. Most BE offices are well established and have identified organizations that require industrial hygiene (IH) support. Determining what organizations require support is based on the IH office's assigned mission, host-tenant support agreements, intra-agency and interagency support agreements, and contract support requirements. BE shall perform routine surveillance in newly identified industrial shops, or shops that have never been assessed, within three months of identification, to establish a foundation upon which future routine and special surveillance is based. It is also important to note that there is no "Baseline" or "Annual" survey designation.

4.2.2. Meet With Organizations. It may be necessary to meet with commanders of organizations or their representatives to identify their mission requirements, relative pace of military operations ("ops tempo"), and concerns for the health of their members. This step is especially necessary when new missions are established and when the IH program is not fully developed. This information is used to determine the scope of required support for the organization and is also an ideal time to capture organization demographics data such as:

- ☞ activity/organization name
- ☞ parent command/headquarters
- ☞ mission description
- ☞ exposure locations within each organization (e.g. subordinate units, shops, work centers, building, room, installation name, state, address, country, latitude & longitude)
- ☞ name of workplace supervisor
- ☞ telephone and facsimile numbers and e-mail addresses
- ☞ description of operations performed

For established IH programs, most of this data can be verified during the basic characterization phase of routine surveillance.

4.2.3. Unscheduled Requests.

4.2.3.1. Unscheduled requests are potential health risks identified or brought to the attention of BE from outside the routine surveillance process. These potential health risks must be prioritized for appropriate evaluation. Examples of unscheduled requests are: investigations necessary to evaluate abnormal special clinical examination results, occupational illness or injury reports, pregnancy evaluations, individual complaints or organizational identified deficiencies; evaluation of a hazardous material request (AF Form 3952), assessments of abnormal epidemiological trends, and/or health review of engineering/facility modifications, etc. The BE should review the existing risk determinations to make sure the risk determination is properly characterized.

4.2.3.2. The unscheduled request must first be associated with an activity. If the activity is not captured in the system, a new unique activity must be generated and a BE risk assessment is accomplished. The risk assessment is used to determine follow-up actions and prioritization. Considerations that must be factored into the prioritization are health hazard

severity factors (see Table 4.4 below). These include mission accomplishment, relative toxicity, risk of hazard, command interest, other governing regulation, political pressures, and workers' interest and awareness. Execution of any special surveillance evaluation should be accomplished in priority order and tracked until completion. The evaluation results should be documented and results provided to both the commanders and workers impacted (note: depending on the type of survey, this allows for multiple means of providing the information to the shop, including e-mail) summarizing the outcome of the special surveillance, plans for additional evaluations and recommended actions to reduce risk and cost when warranted. **Documentation and the mechanism for reporting should be in accordance with MAJCOM or local policy.**

4.2.4. Program and Budget. BE shall program and budget for required IH manpower, equipment, and supplies utilizing TAFR to support required organizations. After organizations have been identified, BE will schedule visits to organizations for exposure assessment. BE should make reasonable efforts to acquire necessary equipment on loan from other bases to perform special surveys when local resources are not available. (For example, when personnel are qualified and available to do noise dosimetry, but all dosimeters are out for repair/calibration). BE will use TAFR to project/program personnel training requirements needed to maintain an in-house capability to effectively manage the OHMIS. This training should include basic data entry and overview training, system administration training, advanced user training for ad-hoc report writing, training on deployment IH tracking systems, etc.

4.2.5. Schedule and Suspense.

4.2.5.1. BE will schedule and complete routine surveillance as outlined in AFI 48-145, this interim guidance, and other prescribed guidance. Periodic reviews of current and future routine surveillance schedules shall be conducted to identify potential resource shortfalls. Projected AEF deployment, permanent change of station, temporary duties, etc., that may affect scheduled completion of annual routine surveillance requirements should be considered and documented. The BE will identify these resource shortfalls and the resulting mission impact using Team Aerospace Funding Requirements (TAFR). Routine surveillance is a level 0 requirement and must be prioritized accordingly.

4.2.5.2. BE will use the OHMIS project tool to schedule and track needed special surveillance projects identified during the basic characterization of the shop. Projects will be scheduled for completion based on the priority assigned using the risk-based matrix in Table 4.5. Projects may need to be deferred due to limited personnel, lack of specialized equipment, or lack of specific skill sets required to complete the work. BE must document/justify why projects with high-risk hazards are deferred. BE will use the list of deferred projects/justification in the OHMIS to identify additional resource funding requirements within TAFR. Because TAFR is not used in deployed settings, funding requirements should be identified through the Air Component of the Combatant Command and special surveillance projects and resourcing requirements may be tracked using any practical means until GEMS matures.

4.3. Basic Characterization.

4.3.1. Preparation. Preparation is key to conducting good routine surveillance. Reviewing previous assessments provides the surveyor a working knowledge of the shop activities, compliance requirements, and health risk. Along with this information, a review of health outcome data (i.e., occupational illness trends) is an important tool to determine if the existing risk rationales, and the adequacy of controls are accurate or need further review. For example, ergonomic hazards should be further evaluated if adverse work-related musculoskeletal disorder trends are present. Similarly, further evaluation of noise hazards and controls is warranted if adverse trends in temporary or permanent hearing threshold shifts have been identified.

4.3.2. Commander In brief. The unit or squadron commander is a key customer of routine surveillance data and must be made aware of BE efforts to identify high-risk activities (as discussed in paragraph 4.3.4.2) and informed to make decisions regarding control strategies. In order to effectively involve commanders, routine surveillance of all required workplaces in a particular unit or squadron should be conducted within a fixed time frame if possible and deemed feasible. For example, all category 1 shops/workplaces and those category 2 shops/workplaces due for surveillance should be scheduled in the same month or months for larger units. Although the existing shop category established under AFI 48-145 provides the minimum visit frequency for individual shops, the scope of routine surveillance for the workplaces in a given unit or squadron should also factor in the addition of new or changed workplaces, illness or injury data, adverse occupational health exam trends, or concerns raised by members of the unit. The best mechanism to identify these conditions is to perform an in brief with the unit or squadron commander. Recommended topics for the in brief include:

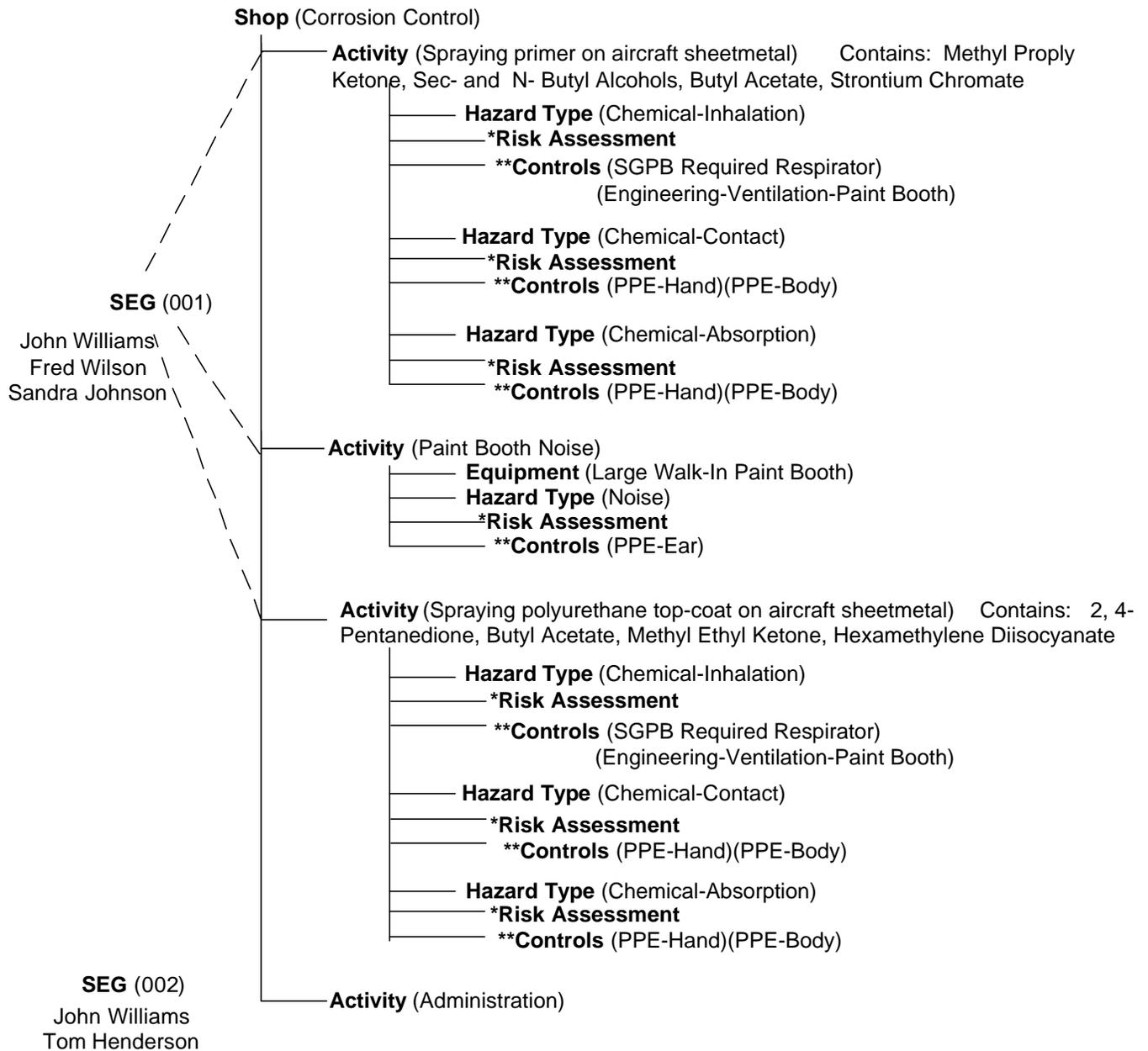
- ☞☞ The purpose, scope, and timeline of the various routine assessments
- ☞☞ Status of any previously identified and/or uncorrected findings or discrepancies across the unit
- ☞☞ Adverse trends in clinical surveillance or illness identification
- ☞☞ Any unit or squadron identified concerns or issues

4.3.3. Opening Conference. Following preparation, a BE representative shall schedule an opening conference with shop personnel. The opening conference is the time spent with affected personnel to gain support and understanding of the ESOH program and BE's role in it. The BE representative should communicate that the goal is to help provide a safe, healthy environment for assigned workers and assist in optimizing force health protection, and casualty prevention to ensure mission success. Opening conference attendees at a minimum must include the shop supervisor or representative, other interested personnel, and the BE representative. Affected workers, the union representative, and others should be invited as local policy dictates. The opening conference, although conducted by BE personnel, may involve inputs from other members of Team Aerospace or the ESOH team, and should cover

topics ranging from the purpose of the ESOH program to addressing any of the workers' ESOH concerns. The opening conference is documented in the OHMIS.

4.3.4. Survey. The BE representative conducts the survey with assistance and input from the shop supervisor or representative(s). The survey provides the assessor with eyes-on verification of activity information and allows for professional assessment of activity hazards and controls and facilitates later prioritization of activity evaluations based on risk. The intent is not to document what has already been evaluated, but rather to identify, assess, and evaluate changes from previous evaluations. In addition, the survey allows BE personnel to evaluate the effectiveness of occupational health programs. During the survey, BE shall immediately notify the shop supervisor of regulatory non-compliance issues so that corrective actions can be initiated. Depending upon the severity of human health hazard risk, BE personnel should also consider notifying the appropriate unit or squadron commander and their own chain of command. There are many variables between shops that will impact the total length of time required to complete the Basic Characterization Survey, however 1-2 days should be adequate for most workplaces. The basic characterization will be documented using the OHMIS ensuring activity changes and administrative data are documented and validated. Questions from shop personnel concerning their potential health risks should also be addressed at this time if possible, or provide follow-up responses at a later date if more information is needed. The basic characterization of a shop is organized as depicted in Figure 4.1. Data related to the survey shall be captured and input into the OHMIS following this structure. An example of a fictitious Corrosion Control shop is provided with several (but not necessarily all) identified activities. Individual elements of the structure are described below. Attachment 1 should also be referenced for a complete description of terms.

Figure 4.1. Basic Characterization Structure.



Step 1---Identify the Shop

Step 2---Identify Activity/s performed by the shop. Create multiple activities if there are more than one.

Step 3---Identify each hazard type associated with the activity. There may be one or several.

Step 4---**Identify and evaluate controls required to control each hazard. The recommended control should be based on the assessment of all hazard types. For example, if a shop has a chemical contact and chemical absorption hazard, then BE would

probably recommend one type of glove that would provide protection against both hazard types.

Step 5---Establish one or more Similar Exposure Groups (SEG) based on the activities performed by each group and their potential exposures

Step 6---Assign personnel performing the activity to a SEG.

Step 7---*At the conclusion of Basic Characterization, conduct a Risk Assessment for each hazard as depicted above

4.3.4.1. Shop (Workplace).

The shop is the organizational structure that ties workers and activities accomplished for mission performance to a specific organization or team and specific supervisor. The shop supervisor is responsible for the activities performed and usually has the authority to purchase PPE, modify work practices, and implement controls. The shop can be a physical location such as a building, or represent a group of people who engage in a similar activity that could potentially expose them to the same agents, e.g., washrack, hazmat response or crash recovery team. The decision to establish a shop versus separate similar exposure groups within the shop may be based on several factors; the mission, their establishment as a recognized entity within their organization (separate supervisor, office symbol, funding account, and possibly location, etc.) and the nature of activities performed by the workers. Although a shop can be defined at any level, it must clearly exist as an organizational entity with a clearly recognizable supervisor and chain of command.

Examples of shops:

1. **Aircraft Structural Maintenance:** Structural maintenance of aircraft has commonly been consolidated into the Aircraft Structural Maintenance (ASM) Flight. Corrosion Control, Fiberglass, Sheet Metal, and Welding shops usually fall under the ASM flight. If Corrosion Control has a dedicated supervisor, office symbol, funding account, etc., and the personnel assigned to Corrosion Control are the only ones who perform corrosion control activities, then it may be proper to assign Corrosion Control as a shop. However, if the personnel assigned to ASM all perform duties involving corrosion control, welding, fiberglass, etc., then the shop should be designated at the ASM level. A similar situation will be encountered when dealing with Civil Engineering shops. That is, most maintenance activities are consolidated under Zone, Horizontal or Vertical Maintenance. Again, the decision to assign the shop at the Zone/Horizontal/Vertical level or at the Carpentry, Paint, or Electrical level will depend on whether the personnel conduct only one type of maintenance activity, or if they are involved in all areas of building or infrastructure maintenance.
2. **Washrack:** Aircraft Washrack operations is another special example of workplace activities. Generally, only the shop supervisor is permanently assigned to the Washrack and the personnel tasked to wash the aircraft are assigned on a temporary basis. The supervisor may or may not actually perform Washrack activities (in most cases they don't). Since Washrack duty is temporary, a major responsibility of the

supervisor will be to provide BE with rosters of personnel assigned Washrack duties and the time periods they were assigned.

3. **HAZMAT Response Team:** One organization is responsible for HAZMAT; however, personnel from different organizations (e.g., Fire Dept, Liquid Fuels, Aircraft Maintenance) make up the team. They maintain equipment and stage training from a common facility. This comprises a shop with a clear supervisor and organization accountable for all activities performed by personnel associated with this shop. Aircraft Crash Recovery Teams are also structured this way.
4. **Quality Assurance (QA):** The Shop consists of three QA personnel who perform activities throughout the flightline. They have a single office in a nearby building. All activities performed in the office are strictly administrative, while work performed on the flightline presents hazards, e.g. noise. The criteria of a clear organization with a supervisor are met.

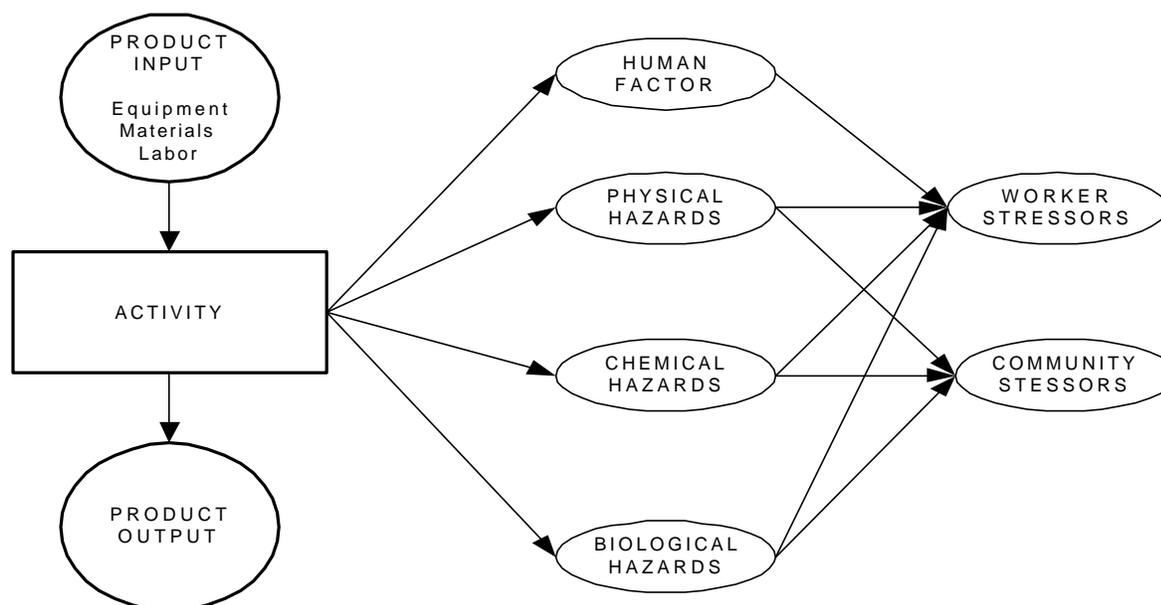
4.3.4.2. Activities.

An activity is any item of work or situation that may pose a risk and may require evaluation and control. An activity is the lowest level of worker task evaluation necessary to accomplish adequate exposure and control assessments. Figure 4.2 represents the typical elements of an activity and the environmental, safety, and occupational health interactions that may exist. As depicted, an activity is a unit of work that is performed upon the “input product” in order to achieve a desired “output product”. The completion of an activity may require equipment, materials and labor to produce the desired output. As the activity is accomplished, the worker may be exposed to chemical, physical, radiological or biological hazards. In addition, physical stresses directly related to the activity may impact the worker. From the BE perspective, an activity is defined based upon the hazards present and how you will recognize, evaluate, control, and communicate about them. It should also be noted that not all activities require materials or exist at a physical location. Some activities exist due to the location itself such as working near the flight line. From an ESOH perspective, there may be other drivers that impact our ability to create activities. For that reason, it is imperative that ESOH members work together when creating activities for cross-functional areas. Team members should be in agreement on the activity name and the level at which the activity is created. Some typical examples are discussed below:

- ✍✍ **BE Occupational Health-Driven Activities.** Painting may need to be broken out into priming application, top-coat application, and aerosol can stencil operations in order to properly evaluate hazards and communicate controls. An environmental compliance air pollution permit may only require a determination of the total emission from painting out a particular stack. In this case, the BE priorities would outweigh the air priority and individual activities would be created for priming, top-coat and stencil. The air program manager must understand this break out to associate each of these activities to the proper air emission algorithm.

✂✂ Air Permit Environmental Compliance-Driven Activities. Multiple plating tanks in a room generate exposures to workers who move between the various tanks to remove parts from the plating solutions. From the BE perspective, there is just one activity, “plating” and the exposure that occurs to workers in this area. From the air program requirement, each tank and associated stack emission must be tracked independently. In this case, the air program would create multiple activities and BE would need to create a higher order activity and associate each of the air activities to properly relate shared data for these activities.

Figure 4.2. Activity Description Showing ESOH Interactions.



4.3.4.2.1. For each shop, each activity of concern should be identified and documented with a clear description. Naming and describing the activity based on supervisor input is a key to effective communications. Properly defining and describing shop specific activities is the pivotal point to successful hazard assessment and communication. The activity should be established at the level necessary to communicate to the supervisor and workers the hazards, PPE, controls, and medical surveillance requirements. For example:

4.3.4.2.2. Establishing a single “painting” activity in the Corrosion Control Shop may be inadequate due to the unique hazards, potential PPE differences, and medical surveillance requirements associated with primer and top-coat application. Applying primer versus top-coat may present significantly different chemical hazards and the application method is equally important because spraying operations are usually more hazardous than brush-on or roll-on operations. For example, there is a strontium chromate exposure during spraying primer on aircraft sheetmetal and hexamethylene diisocyanate exposure during spraying polyurethane top-coat on aircraft sheetmetal. Therefore it may be more appropriate to create a “spraying primer on aircraft sheetmetal” activity and a “spraying

polyurethane top-coat on aircraft sheetmetal” activity. With a difference in exposures, there is also a potential corresponding difference in controls. For example, at one base, the top-coat paint contained isocyanates, methyl ethyl ketone and several other volatile organic carbon (VOC) materials. Based on the measured exposure level to isocyanates and VOC’s, workers were able to use a positive pressure (continuous flow) airline with shroud respirator. The primer; however, resulted in a strontium chromate exposure that could not be adequately controlled with this respirator; therefore, workers were required to use a pressure demand full-face air supplied respirator during priming. In order to effectively communicate the required controls, it was necessary to establish separate activities for “spraying polyurethane top-coat on aircraft sheetmetal” and “spraying primer on aircraft sheetmetal”.

4.3.4.2.3. Another example, “riveting” is too generic for an activity name since it does not describe any particular product. “Removing and replacing B-52 rivets” would be a better choice since it specifically describes the product being modified. On the other hand, establishing five separate activities in an aircraft ground equipment (AGE) shop to describe application of oils, greases and lubricants would be excessive if the hazards, PPE and medical surveillance requirements are all the same. If all activities have the same exposure hazard, establishment of one activity called “AGE lubrication” would streamline evaluation, documentation and reporting while appropriately capturing associated health risks.

4.3.4.2.4. Adequately describing the activities allows understanding by the supervisor and workers in all correspondence. In addition to the name, two attributes (common activity and method) must be associated with each activity. These attributes are critical to allow USAF level data analysis. The common activity describes “what” is being done while the method describes “how” it is being done. In the OHMIS, these values come from validation tables. The tables are linked in such a manner that you must select a value for the common activity before you can select a value for the method. The list of values for the method are then determined by the common activity that is selected. The common activity and method; however, don’t completely describe all aspects of the work being performed. For example, entering a fuel tank could simply be “*inspecting*” as the common activity and “*visual*” as the method. We would name this activity “Fuel Tank Entry” and define the hazards during the general assessment--confined space and chemical inhalation. Equipment required to accomplish activities must also be identified and associated with the appropriate activity, along with weapon system and other supporting data.

4.3.4.2.5. Adequately describing the activity is also necessary when conducting HAZMAT authorization as part of the HAZMAT Pharmacy process. BE will evaluate HAZMAT request for health risks to Air Force personnel and control options and authorize requested HAZMAT use as appropriate. BE should be able to directly correlate the HAZMAT request to the Risk Assessment and Unique Activity/Process data maintained in OHMIS. If the data doesn’t exist in the OHMIS, the information should be entered at the time of review or shortly after the review is completed. See the example

below for creating a unique Activity/Process ID that adequately identifies a hazardous material cleaning operation:

OHMIS

Common Activity	Title	Method	Title	Unique ID	Base Specific	Activity/Process Name	Activity/Process ID
CL	Cleaning/Washing	1017	Application-Hand Wipe	126	0222	Handwipe Cleaning F-16 parts	CL10171260222

Ultimately, the Hazmat Authorization process will be automatically tied directly to the OHMIS Unique Activity/Process. Once activities are defined, the next step is to establish similar exposure groups.

4.3.4.3 Similar Exposure Group.

4.3.4.3.1. Defining the hazards and exposures to workers performing numerous and diverse activities is facilitated by assigning workers performing similar activities into Similar Exposure Groups (SEGs). (Note: AFI 48-145 refers to Potential Exposure Group (PEG). The SEG and PEG are synonymous). A Similar Exposure Group (SEG) establishes a relationship between a group of workers and similar potential exposures from common activities they perform. By establishing SEGs, “representative” exposure assessments are applied to all personnel assigned to the SEG. SEGs can be established by observation and discussion with shop supervisors and workers, by hazard evaluations or by a combination of the two.

4.3.4.3.2. The most common approach is by observation, especially during the initial evaluation phase. Classifying by hazard evaluation is generally impractical and requires forming similar exposure groups after collecting all monitoring data. The measured exposure values are then used to classify workers into SEGs following statistical evaluations. The advantage to this classification method is objectivity. The disadvantage is the larger number of random sample points required with multiple measurements on individuals to accurately group exposures. Using this method alone is generally impractical.

4.3.4.3.3. A practical and accurate exposure assessment program will combine both the observational and the hazard evaluation approaches to defining SEGs. In practice the observation method is used initially to establish the SEG, with future refinement based on monitoring data and continued observation.

4.3.4.3.4. An in-depth discussion on SEGs is found in Chapter 4, Exposure Assessment: Establishing Similar Exposure Groups, A Strategy for Assessing and Managing Occupational Exposures, 2nd Ed, ISBN 0-932627-86-2, AIHA Press.

4.3.4.3.5. Prior to establishing the SEG(s), all the activities performed within a shop must be determined followed by who does what activities. If all workers conduct the

same activities, then establishing a single SEG is adequate. If different workers perform different activities, several SEGs may be necessary to accurately reflect “representative” exposures. Each SEG must be categorized similar to the shop categorization as described in Table 2.1 of AFI 48-145. This categorization is important, especially when “administrative” SEGs are established in a shop.

4.3.4.3.6. “Administrative” SEGs are appropriate to clearly identify workers assigned to that shop (organization) whose function is only administrative. This ensures that exposures tied to industrial/maintenance SEGs are not attributed to administrative personnel, and medical surveillance is focused on personnel who require it based on a documented exposure.

4.3.4.3.7. Once SEGs are determined, an accurate personnel roster must be associated with each SEG. Personnel may be assigned to multiple SEGs and/or assigned to a SEG outside their organizations, e.g. HAZMAT response may have matrixed personnel outside the supervisor’s organizational chain.

4.3.4.3.8. Deployment data must also be documented in order to capture all exposures. Before a person deploys, BE will document the individual has departed the home base SEG, and reinstate it when they return from deployment. Public health will provide the dates of deployment and redeployment based on the pre- and post-deployment process. Deployment exposures will be documented in the Global Expeditionary Medical System (GEMS). GEMS is a worldwide medical surveillance network that detects trends in symptoms and diagnosis among thousands of deployed military patients. GEMS is made up of three software modules: the patient encounter module (PEM), the theater epidemiology module (TEM), and the theater occupational module (TOM). The TOM includes modules: the Environmental Health Baseline System (EBS) and IH. A summary of the deployed person's exposure shall also be included in the individual's medical record (see DODI 6490.3, JCS Memo 1 Feb 02, and applicable combatant command health surveillance guidance).

4.3.4.4. Hazards.

Hazards are identified under the general assessment in the OHMIS. The general assessment is a simple step performed to identify potential hazards associated with an activity and with a particular group of employees when the hazard crosses multiple activities. In the OHMIS, a hazard list similar to the following will be present:

- ☒ ☒ Biological
- ☒ ☒ Confined Space
- ☒ ☒ Chemical – Inhalation
- ☒ ☒ Chemical – Ingestion
- ☒ ☒ Chemical – Absorption
- ☒ ☒ Chemical – Contact
- ☒ ☒ Ergonomics
- ☒ ☒ Ionizing

- ☞☞ Noise
- ☞☞ Non-Ionizing – RF
- ☞☞ Non-Ionizing – Laser
- ☞☞ Non-Ionizing – Other
- ☞☞ Thermal
- ☞☞ Other

The user will simply check whether or not a potential hazard(s) is present. Some considerations on whether or not to check an item for further evaluation are as follows:

- ☞☞ Is there a potential exposure to any type of body fluid or excrement?
 - Does the bloodborne pathogen standard apply?
 - Is there a potential exposure to fecal matter (sewage treatment worker exposed to fecal matter)?
 - Does the nature of the work place the worker on the Hospital Employee Health Program?
 - Does the process include first responders' activities (a fireman exposed to blood is associated with a emergency response process they perform)?
- ☞☞ Does a complete pathway exist? Is there exposure to the product or is the operation totally enclosed and there is no potential for exposure?
- ☞☞ Does a potential exposure exist due a process the worker performs? For example, a confined space exist in the crawlspace under the industrial workplace; however, entering the confined space is not a function performed by this shop, therefore do not check the box.
- ☞☞ How much of the product is used? A few drops of relatively low toxic material used once a week would probably not warrant concern.
- ☞☞ Thermal may be checked due an exposure from the environment or from the process (heat plant). Thermal would not normally be checked for administrative workers.
- ☞☞ Does the shop own, operated or do maintenance on radiation emitters? If so, check the appropriate category.
- ☞☞ Is the worker potentially exposed to sound levels above 80 dBA?

This step in the basic characterization process ensures all potential hazards are captured and systematically addressed. The general assessment is similar to the hazard identification phase in the ORM process and is the foundation of the risk assessment. This step is performed at the activity level, with the exception of hazards that cross multiple activities. These hazards should be associated at the “SEG” level since the hazard applies across all or

a majority of the activities performed by the SEG. A good example is noise exposure for an aircraft maintenance shop. Noise hazards are common across all activities performed by the SEG and noise dosimetry performed to evaluate noise exposure would apply across many, if not all, activities. In this situation, it may be more appropriate to set a “noise” hazard at the “SEG” level and tie noise dosimetry to the noise hazard. All potential hazards, regardless of engineering controls or PPE, are identified. Typical hazards include chemical inhalation, noise, ionizing radiation, thermal stress, etc. **No characterization of exposure and associated risk should be accomplished at this step nor should the general assessment be changed at the conclusion of the risk assessment.** For example, the assessor believed there was a noise hazard. Noise dosimetry indicated that the TWA was below the occupational exposure standard. The assessor should describe operating characteristics of hazard sources as operated in this location (e.g. power settings used for an electrical generator). The assessor should update the qualitative risk assessment but should not change the “noise” hazard selection under the general assessment. The general assessment should only be changed when there is a process/activity change that eliminates the potential hazard source.

4.3.4.5. Controls.

BE is responsible for identifying controls in place and the adequacy of those controls. BE will make recommendations for controls in accordance with the following hierarchy: engineering controls, work practice controls, administrative controls, and personal protective equipment (PPE). Usually a combination of these is necessary to reduce exposure, particularly during the interim period while engineering controls are being designed and installed. If the operation is covered by technical order but control requirements are inadequate or inappropriate, BE shall provide assistance to the supervisor to notify the Technical Order manager so that the technical order can be updated to include recommended control information.

4.3.4.5.1. Engineering Controls. Whenever feasible, engineering controls shall be used to eliminate or reduce exposure. These include process elimination, substitution of less toxic material, process changes (automation, isolation and enclosure), design changes (tools, workstations and equipment), and ventilation (dilution and local exhaust). When engineering controls are not feasible, or do not adequately reduce exposure, additional control methods shall be implemented.

4.3.4.5.2. Work Practice Controls. Work practice controls include changes to tasks and activities that reduce contaminant generation. Some examples are using a high efficiency vacuum cleaner or wet mopping instead of cleaning with compressed air. Work practices that are required to control exposure should be documented in safety rules and work procedures and enforced by supervisors.

4.3.4.5.3. Administrative Controls. Administrative controls involve management and employee interventions designed to reduce exposure. Examples include job rotation, job transfer, limiting exposure time, preventive maintenance, housekeeping, personal hygiene and education and training. Because the success of administrative controls is largely

based on compliant employee behavior, they are most effective when used as part of a broader control strategy.

4.3.4.5.4. Personal Protective Equipment (PPE). The use of PPE shall be considered last in the control hierarchy unless other methods are not feasible. This may be the case while engineering controls are being designed and installed, or during non-routine operations including maintenance and emergency response. For other than military unique workplaces, PPE requirements shall be assessed in accordance with 29 CFR 1910.132 (reference (k)) to identify tasks where PPE is required and to ensure that the proper equipment is selected and used.

4.4. Risk Assessment.

The risk assessment in the routine surveillance process consists of a risk determination (taking into consideration confidence in controls, confidence in hazard characterization, and hazard severity) and project identification.

4.4.1. Risk Determination.

4.4.1.1. Once the general assessment has been accomplished and the potential hazards have been identified for a given activity, a risk determination is performed. This risk determination incorporates three factors:

- 1) the assessors' knowledge of the exposure levels, (confidence in hazard characterization-Table 4.1 below),
- 2) how effectively the existing controls mitigate the hazard (confidence in existing controls-Table 4.2 below), and
- 3) the consequences or severity (health hazard severity-Table 4.4 below) of uncontrolled exposure to the hazard. Confidence in hazard characterization and confidence in controls are factors currently outlined in AFI 48-145 for special surveillance assessment.

4.4.1.2. The assessor's knowledge of exposure level is the qualitative answer to the question: "Do I know enough about the exposure to reach sound conclusions?" In determining confidence, the assessor should consider the existence and completeness of quantitative data compared against the OEL, professional knowledge, and data from similar operations, either local or AF-wide.

4.4.1.3. Confidence in controls includes an assessment of the type of control in place, the condition of controls, the perceived level of workplace emphasis on proper use of controls, and the effectiveness of controls. The level of confidence directly correlates to OSHA's hierarchy of controls: engineering, work practice, administrative, and PPE.

4.4.1.4. Severity is the estimate of consequence of unprotected exposure to an individual. It is defined based upon the environmental conditions of exposure without regard to PPE.

Severity is a function of **dose** (magnitude and frequency of exposure) and **response** (expected health outcome associated with that particular hazard). Severity is the last factor needed to complete a risk assessment and assist in project prioritization. For example, exposure to noise above 85 dBA for 8 hours may result in hearing loss (critical). PPE is applied to control exposures and protect workers and the ability of the PPE to function should be captured in the confidence in controls selection that is made. The severity code is not selected solely based upon identified occupational illness, but rather, it is based upon the potential for a given environment to produce a given medical effect.

4.4.1.5. The outcome of this assessment will determine a number of possible actions including: no action, the collection of more exposure assessment data, recommendations for additional/different controls or modification of the activity itself to reduce the consequences of exposure. Guidance on assigning each of these factors is given in the tables below. Attachment 2 and 3 also contain general “guidelines” to use in determining confidence.

Table 4.1. Confidence in Hazard Characterization.

Low	Potential health outcome based solely upon a qualitative review of the workplace. No quantitative data available for this or similar activities. The source of the hazard has the potential to generate exposures above the action level
Medium	Potential health outcome based upon a detailed administrative and onsite review of activities within the workplace and application of professional judgment supported by application of objective based engineering principles. Screening samples or initial air sampling results are within acceptable limits, but not totally conclusive.
	Comparison to similar, characterized USAF and or private sector operations (qualitative or quantitative).
High	The “Medium” rating supported by sufficient quantitative evaluation, or detailed technical reports where environmental factors do not influence exposure. Further quantification is not required.
	The source of hazard does not have potential to generate significant exposures (for example: soldering with low-output irons).

Table 4.2. Confidence in Controls.

Low	Controls inadequate to control exposure.
	Controls in poor state of repair/non-operational/not actively used.
Medium	Controls will control worker exposure to acceptable level when adhered to. Examples are reliance solely on administrative controls and/or PPE.
High	Engineering controls/work practice controls in place and fully operational. Evaluations completed to demonstrate adequate exposure control.

For each hazard, the combination of confidence in hazard characterization and confidence in controls generates exposure probability factors A through D as shown in Table 4.3.

Table 4.3. Exposure Probability Factors.

Confidence in Hazard Characterization	Confidence in Existing Controls		
	<i>Low</i>	<i>Medium</i>	<i>High</i>
<i>Low</i>	A	A	B
<i>Medium</i>	A	B	C
<i>High</i>	B	C	D

Table 4.4. Health Hazard Severity.

<i>Catastrophic</i>	Death or incapacitating or irreversible acute occupational illness or injury.
<i>Critical</i>	Severe occupational injury/illness. Includes chronic (e.g. cancer), acute (e.g. sensitization), and/or hearing loss.
<i>Moderate</i>	Minor occupational illness (e.g. nausea, headache, dermatitis,) that results in reduced capacity to perform.
<i>Negligible</i>	Less than minor occupational illness, (e.g. irritation).

Combining the exposure probability and severity factors yields an operational risk for the hazard evaluated (Table 4.5.).

Table 4.5. Operational Risk Analysis Matrix.

Severity	Exposure Probability			
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
<i>Catastrophic</i>	0	0	1	2
<i>Critical</i>	0	1	2	3
<i>Moderate</i>	1	2	2	3
<i>Negligible</i>	2	3	3	3

4.4.2. Project Identification.

Hazard Operational Risks calculated from Table 4.5 are rolled up into an activity hazard prioritization score. Table 4.6 provides project prioritization for special surveillance scheduling and this information will be documented in OHMIS. Projects may be either internal or external.

Table 4.6. Mission Impact.

Hazard Risk Rating	Project Prioritization
0-Extremely High	0-Must Do (Mission Failure)

Hazard Risk Rating	Project Prioritization
1-High	1-Mission Critical
2-Medium	2-Mission Enhancement
3-Low	3-Nice to Do

4.4.2.1. Internal Projects. Internal projects require action by BE for completion within a specified time frame (for example, air sampling, noise surveys, research for chemical substitution, etc.). There are many factors to consider when planning a special surveillance sampling strategy. Whatever tools you incorporate, whether modeling, literature reviews, etc., also consider the nature and quantity of the chemical as well as its toxic effects. Is the OEL based on acute or chronic effects? The modeling and literature review you do for the prioritization can also be helpful in determining expected concentration so that the sampling method, flow rate, and collection time ensure sufficient mass will be detected by the laboratory analysis. What is the duration and frequency of the activity? The strategy should allow easy implementation with flexibility to optimize resources (manpower, equipment), and it should be cost effective (for sampling, NOT for occupational physicals). For example, it is usually cheaper to use passive dosimeters for organic vapors and sample several people if the activity has sufficient time/concentration. All of these considerations feed into the overall exposure assessment, where the acceptable risk of an activity is determined. In OHMIS, use the free text Project Description field to document preliminary information needed to complete the surveillance. The Project Description may include chemical, physical or biological hazard assessment information and should address the following elements:

- ☞☞ Specific chemical or physical hazard to be measured (e.g., chromates in primer)
- ☞☞ Type of sampling or surveillance (direct reading, etc.)
- ☞☞ Area or personal samples
- ☞☞ Worst case or representative sample
- ☞☞ Synergistic or additive effects
- ☞☞ Sampling and analysis method (ensure sample is meaningful; e.g., the sample volume is sufficient to measure the desired concentration level below the occupational exposure limit (OEL) based on the detection limit)
- ☞☞ Number of samples needed to assess exposure

4.4.2.2. External Projects. External projects are those assigned to the shop for completion (e.g., recommendation to obtain and use different PPE, recommended engineering control maintenance or installation, or recommended updates to a standard operating procedure (SOP) or local operating instruction (OI)). Although, the task is assigned to the workplace, closure is tracked by BE. BE will consider issuing Risk Assessment Codes (RAC) whenever necessary to drive funding to eliminate a health hazard and/or get commander visibility for the hazard. The BE flight/element should also issue a RAC when action external to the BE flight is required to effectively manage the risk. Guidance on the management of RACs is found in AFI 91-301, Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) Program. The identification of

projects is the end of the risk assessment process. Project prioritization, scheduling, completion and reporting are part of the special surveillance process, Chapter 5.

4.4.3. Risk Rationale.

The assessor will record in the appropriate section of the OHMIS, his/her rationale for selecting their confidence in hazard characterization, confidence in controls, and health hazard severity. This process ensures subsequent assessors understand the decisions made, especially in circumstances relying solely on qualitative assessments, or when no action is indicated. In this manner, needless rework is eliminated during future surveys since only changes to an assessment or new assessments need to be recorded.

4.5. Compliance Assessment.

4.5.1. Compliance assessments are performed with three objectives: 1) to protect and enhance human health, 2) assist commanders in complying with federal, state and Air Force occupational health and environmental regulations, standards, and policy, and 3) to increase mission effectiveness through fact-based risk management decision making.

4.5.2. The results of the compliance assessment provide an integral part of the overall risk assessment and management picture for a specific shop. Compliance assessment trends can indicate areas that require improvement or attention during routine surveillance or may drive the need for special surveillance.

4.5.3. Utilize the Assessment Menu in the OHMIS to access a standard list of occupational health compliance programs and checklists for occupational health program areas. Examples include: respiratory protection, confined space, HAZCOM, ergonomics, and ionizing radiation. While these checklists may be used in the deployed setting, the focus should be on risk assessment rather than compliance.

4.5.4. For each shop, identify applicable occupational health program areas to be evaluated. Document the selections in the OHMIS.

4.5.5. Document compliance or non-compliance in the OHMIS. BE has the option of adding additional or unique checklist items to meet shop or installation specific criteria. Proposed modifications to the standard checklist items should be submitted through the MAJCOM to the appropriate Functional Users Group.

4.6. Communication.

Communication is a mechanism to convey health hazard information, workplace exposures, compliance assessments, and other health risks to workers, commanders and medical staff. Communication is performed at all levels of the surveillance process through a multitude of means. Communication can be as simple as making a phone call or completion of a form or it can be as detailed as completion of an initial survey report describing all facets of an industrial operation. Communication also provides a record of individual medical exposure history to

meet requirements of Presidential Review Directive 5, "Improving the Health of Our Military, Veterans, and Their Families". The general types of Communication correspondence are:

- ✍ ✍ Opening and Closing Conference discussions
- ✍ ✍ Routine Surveillance Reports
- ✍ ✍ Special Surveillance Reports
- ✍ ✍ Occupational Health Workplace Exposure Data (old AF Form 2755)
- ✍ ✍ Compliance Reporting
- ✍ ✍ Conversations held on the phone or with worker during a shop visit and e-mail correspondence. This communication must be documented the Chronological Record of Workplace Contact (NOTE: the AF Form 2754 is not the communication, the interaction with the shop is)

4.6.1. Closing Conference. At the conclusion of the routine surveillance, schedule a closing conference with the shop supervisor or their representative. Attendees should include the same individuals invited to the opening conference (refer to paragraph 4.3.3). The purpose of the closing conference is to advise the shop supervisor of any unsafe or unhealthful working conditions identified during the survey. Discuss non-compliance issues and recommendations to correct those issues, and actions that may be taken to increase mission effectiveness and optimize the protection of health. Allow personnel at the conference to provide any pertinent information regarding conditions in the workplace or occupational health hazards or concerns they may have.

4.6.2. Commander Out brief and Executive Summary. The unit or squadron commander should be provided an out brief and written executive summary at the conclusion of scheduled routine surveillance. If routine surveillance is conducted on a squadron basis and addresses multiple shops and exposure assessments, it is recommended to consolidate all unit or squadron information into a single executive summary and do one out brief, in lieu of providing multiple out briefs and executive summaries of individual routine surveillance reports. The out brief and written executive summary should address all significant issues identified during the routine surveillance of shops/workplaces within the unit or squadron. This summary should address relevant trends, compliance issues, and propose appropriate solutions to assist the unit or squadron-level leadership maintain the health of their personnel. .

4.6.3. Routine Surveillance Reports.

4.6.3.1. The purpose of BE routine surveillance reports is to describe what activities were surveyed and what actions, if any, the shop needs to take to minimize health risks or to achieve regulatory compliance. The report cover letter should key on new or updated information and open action items. The attachments should contain all current information to provide the shop with a consolidated and holistic report. Generating attachments electronically from the OHMIS is encouraged. The routine surveillance report is not meant to provide detailed occupational health training to commanders or work centers. Health training is provided via separate training programs. In the deployed setting, reports should be streamlined and should be kept unclassified to the maximum extent possible to facilitate

communication. Considerations and suggested content of routine surveillance reports include:

- ✍✍ Cover letter to the shop supervisor containing, as a minimum, shop name and office symbol, survey dates, individual(s) performing the survey, follow-up actions required, recommendations, and description of attachments. If any areas of non-compliance are identified during the survey and/or recommendations requiring follow-up on the part of the shop, the letter should also request that the shop supervisor reply to findings in writing and establish a firm date for doing so. The cover letter must require the workplace supervisor to make the survey report and attachments available to all employees. Advise the workplace supervisor to use the certified PPE listing as part of health and safety training and consider posting the PPE listing on the workplace safety board.
- ✍✍ Certified PPE listing that links PPE to work center activities
- ✍✍ Compliance Assessment Checklist that contains program areas evaluated and compliance requirements and status for each area. The occupational health information management system provides a summary of the shop's occupational health program compliance for the last three compliance assessments. Negative trends should drive additional attention during routine and/or special surveillance in the shop. Negative trends are indicative of inadequate engineering, work practice, administrative, or personal protective equipment controls and/or lower hazard characterization. Non-compliant items should factor into confidence levels for hazard characterization and controls. A RAC may be appropriate to call attention to repeat non-compliance areas that represent a chronic compliance and therefore, increased health or mission risk.
- ✍✍ Risk Assessment Report as an attachment that contains for each SEG activity: a description of the activity, hazards associated with the activity, controls and adequacy of controls. (Note: The certified PPE listing may be included in this report.)
- ✍✍ Electronic or original signed copy to workplace supervisor.
- ✍✍ The BE will determine which attachments, if any and how much content is distributed to other offices and agencies. Consider sending an electronic copy via email to the squadron commanders, Base Safety Office, Public Health, Civil Engineering Environmental Flight (if there are environmental compliance issues), and the Occupational Medicine (optional coordination according to local procedures). As always, follow the chain-of-command.

4.6.3.2. Routine surveillance will be considered complete when the survey report is sent to the workplace supervisor. A goal should be that no more than 30 calendar days elapse between the opening conference and delivery of the completed survey report to the shop supervisor.

4.6.4. Occupational Health Workplace Exposure Data. The purpose of the OHWED (old AF Form 2755) is to summarize potential hazards associated with a SEG member to medical providers. The OHWED contains exposure assessment data, identifies existing controls in the workplace, and provides an assessment of the adequacy of those controls to protect the worker. It is updated as part of the routine and special surveillance process or whenever there is a change to exposure data, existing controls, or adequacy of controls. BE shall review the OHWED using the same frequency schedule as followed for routine surveillance (Cat 1 every 12 months, Cat 2 every 24 months, Cat 3 as necessary) and ensure sufficient data is loaded into the OHMIS to generate the form. After the review, a list of recently surveyed shops is forwarded to PH. Public Health will generate the OHWED from the OHMIS and in conjunction with the Occupational Health Working Group, will use the data to identify workers' medical examination requirements.

4.6.5. Compliance Reporting. Respiratory protection, hazardous noise areas/hearing conservation, and radiation program evaluations shall be reported annually to the Base Combined Safety Council or ESOH Council, or equivalent. Other program areas may also be reported if deemed necessary by BE.

4.6.6. Chronological Record. A chronological record of every contact with a workplace shall be documented. The record must include the date, individual contacted, type of contact (telephone, email, shop visit, letter sent/received), and a brief description of information discussed. In briefs and out briefs with the commander and opening and closing conferences with the shop personnel must be documented in the chronological record. Electronic records are encouraged. Each entry must be dated and signed (OHMIS automatically documents who made the change and places a date and time stamp with all data entries).

4.7. Re-evaluation.

Repeat the exposure assessment process (figure 3.1) with the goal of improving previous assessments, and thereby continuing to reduce risk. Routine surveillance of shops is performed every 12 months for category 1 shops, at least every 24 months for category 2 shops, and as needed for category 3 workplaces. All tasks required to complete routine surveillance should be documented and suspended. Special surveillance items such as recurring ventilation surveys, prioritized air sampling lists, etc., should also be part of the Annual Planning Cycle. Revisions may be required as additional routine and special surveillance requirements are identified and adjustments will be made based on risks. Establish procedures for organizations to notify BE of process changes or new ambient health hazards rather than waiting for the next scheduled visit.

Chapter 5

SPECIAL SURVEILLANCE

5.1. Special Surveillance.

During routine surveillance, BE may identify the need to better characterize risk, improve hazard controls, or improve compliance with specific regulatory requirements. Special surveillance evaluations are identified to fill these needs. Unscheduled requests identified or brought to the attention of BE that can't be completed as part of the routine surveillance process or that need additional sampling, surveys or evaluations, are performed as special surveillance. Some items are considered special surveillance, even if the task is performed on a recurring basis. Recurring evaluations (quarterly ventilation surveys, regulated area inspections, mandated OSHA substance specific sampling, etc.) are considered special surveillance.

5.2. Accomplishing Special Surveillance.

Special surveillance is accomplished to satisfy a need identified during routine surveillance and consists of project prioritization, exposure assessment, a risk assessment, and communication, as depicted in Figure 3.1 above. The steps within each phase of special surveillance are described in greater detail below.

5.3. Project Prioritization.

Projects are identified according to paragraph 4.4.2. Once a project is identified, it is initially prioritized based on the ORM matrix in Table 4.5. The priority may be adjusted based on mission and local considerations other than health risk (for example, projects related to regulatory compliance or command/commander needs). Projects will be suspended based on assigned resources against the highest risk internal projects.

5.4. Exposure Assessment.

5.4.1. The keystone of the Occupational Health Management Information System (OHMIS) is valid exposure assessment data. The American Industrial Hygiene Association publication "*A Strategy for Assessing and Managing Occupational Exposures*" provides a thorough discussion on numerous tools and methods that can be used to gather and analyze data and ensure its validity. The primary reason for performing an assessment is to increase confidence in controls or confidence in hazard characterization. Confidence in controls is a qualitative, and maybe quantitative assessment, on how well and how consistently the hazard is controlled. In some ways, this measures the probability of the control preventing exposures. In determining your confidence in hazard characterization, a number of factors should be considered. These factors include (but are not limited to): sampling and analytical error, variability in sampling results, similarity to results from similar operations, and representation of the activity analyzed.

5.4.2. Confidence in controls can be increased by ensuring the correct control is in place for the particular hazard and that it meets design criteria or other standards, through routine checks

such as quarterly ventilation surveys, recurring respirator fit testing, and documentation of workplace emphasis and use of PPE.

5.4.3. Confidence in hazard characterization can be improved through several methods. Some methods include exposure assessments performed at other Air Force bases or by AFIERA, civilian assessments published in journals or performed by NIOSH, modeling by theoretical calculations, qualitative assessments such as smell, housekeeping, and general professional judgment, and finally quantitative measurement. All of these methods may or may not be used to aid BE in gaining confidence in hazard characterization. If quantitative measurements are determined necessary, statistical tools are useful to both describe data sets and to infer conclusions about the underlying exposure distribution.

5.4.3.1. Literature Reviews. The simplest methods of characterizing exposures are literature reviews. So long as one can be reasonably certain that the exposure conditions are similar to the activities documented by AFIERA, NIOSH, or other sources, and so long as the consequences of the remaining uncertainty are acceptable, the BE can support professional judgment with literature reviews. If the conditions are not similar, or the associated risk is unacceptable, more confidence may be gained by modeling.

5.4.3.2. Modeling. Modeling can be very useful for little effort. Very simple models with conservative assumptions can show maximum exposures well below an action level (AL). The vapor pressure of a given chemical vapor hazard may reveal that even under saturation conditions overexposure is unlikely. Conversely, modeling potential flammable vapor concentrations far exceeding the OEL or even the lower explosive limit (LEL) may quickly garner necessary attention for a hazardous activity so that control options can be considered. If modeling fails to give confidence in hazard characterization, qualitative observation of the activity may add confidence. If the workers are diligent and tidy, room mixing is good, there is a lack of surface contamination, uniformity of worker experience, etc., professional judgment may allow for greater confidence in hazard characterization.

5.4.3.3. Quantification/Interpretation of Results. Once the above simple characterization methods have been tried and found lacking, BE may elect to perform quantitative measurements. Results interpretation is ongoing as they come in. The first step is to identify the applicable OEL according to AFOSH Standard 48-8. If the main exposure effect of concern is acute in nature, the OEL is likely set to limit upper ends of the exposure distribution. If the main effect of concern is chronic in nature, the OEL is likely set for the average exposure limit. Many substances have both acute and chronic effects and the OEL will generally consider both of these. Information regarding OELs and rationale behind the values is available in such documents as the ACGIH *Documentation of the Threshold Limit Values and Biological Exposure Indices*.

5.4.3.4. Screening. The next step in quantitative assessment is to perform some sort of screening sampling to get initial understanding of the activity hazard. Professional judgement dictates the number of screening samples, but as a general rule of thumb, three samples of the activity's hazards are required to make an initial assessment. If possible, three different workers should be selected for sampling. Worker, shift (see below), and day

selection can be worst case or random, remembering that worst case sampling cannot be included in later detailed analysis data sets, but still may be used for overall judgments. Sampling methodology can be direct-reading instrument or traditional indirect method, understanding that the measurement error associated with direct-reading instruments is often much larger. Either is acceptable so long as it has been validated by a recognized agency, such as OSHA, NIOSH, or EPA (per AFOSH Std. 48-8). Conditions of the sampling (e.g., ventilation system usage, type of materials used, application methods, general ambient conditions, etc.) must be fully documented. If all individual daily exposure screening samples have upper confidence levels (UCL)s less than the established action level, one can be 95% confident that no more than 5% of daily exposures will exceed the OEL. (See attachment 5 for more discussion of action levels.) If any daily exposure has a UCL greater than the OEL, controls may be considered immediately, or a detailed analysis plan may be enacted to better describe the exposure distribution. If no daily exposures have an UCL above the OEL, but any are above the AL, a detailed analysis plan should be prepared and enacted. Controls may also be considered at any point to reduce exposure.

5.4.3.5. Detailed analysis. Should screening sampling prove inconclusive, a detailed analysis plan should be developed. The plan should provide a sample strategy (# of daily exposures to sample, set of variables to randomize, etc.) and tactics (tube or filter change out schedule, analysis method, etc.) in sufficient detail for BE personnel to conduct the sampling. As results come in, descriptive statistics should be compiled to describe the distribution of daily exposures from which the sample days were drawn. When 6-10 daily exposures have been completed, inferential statistics can be used to estimate likelihood of overexposures. Refer to attachment 5 for statistical tools and examples.

5.4.4. It is also beneficial to understand the contribution of each work activity to the overall exposure during a work shift. Sampling may be conducted for the time period that the activity is actually performed or for the entire work shift, covering one or more activities repeated throughout the day. Regardless, all exposures during an 8 hour work shift must be accounted for prior to comparing results to the 8 hour TWA OEL. This may be done through the use of single, full or partial period sampling or by consecutive sampling tied to specific activities, if possible. The person conducting the assessment will evaluate the data using the best means available considering the type of data available (i.e., statistical, consensus, judgement, experience, etc). Then it will be necessary to make a conclusion on the acceptability of the particular exposure based upon the appropriate OEL and the likelihood that exposures will exceed the OEL. It may also be necessary to identify recommendations to control the hazard.

5.4.5. The conventional work shift is five consecutive eight-hour workdays, followed by two days off. Most exposure standards for airborne contaminants have been developed for the conventional work shift; however, these standards may be inappropriate where there are altered or "unusual" or extended work shifts. To compensate for the extra hours worked, and hence the increased exposure period, and the reduced "recovery" period where there is no occupational exposure, a number of adjustment models have been developed. There are three

main models used in the adjustment of occupational exposure standards for extended shifts. These are:

- ✍ ✍ **Brief & Scala Model** Accounting for increased exposure time and reduced recovery time;
- ✍ ✍ **OSHA Model** Substance categorization and application of a simple proportion based on either the daily shift length or work cycle; and
- ✍ ✍ **Pharmacokinetic Models** Using relatively complex formulas and substance-specific biological data.

5.4.6. Each model has its advantages and disadvantages and applicability, depending upon the nature of the contaminant. The Brief and Scala Model is generally preferred because it is simple to use, takes into account both increased hours of exposure and decreased exposure free time, and is more conservative than the OSHA Model or Pharmacokinetic Model. For additional information on each model, refer to attachments 4. If exposures to chemicals that have additive effects occur, analysis across activities is required. If exposure levels trigger compliance requirements, a compliance assessment must be done according to paragraph 4.5. Attachment 5 also provides some statistical analysis tools to use when performing exposure assessments.

5.5. Risk Assessment.

A risk assessment will be conducted in the same manner as described for routine surveillance. The assessor will reevaluate risk rationale for selecting the appropriate confidence in controls and characterization, and document if confidence levels change.

5.6. Communication.

5.6.1. Special surveillance reporting is accomplished in much the same manner as routine surveillance reporting. Analysis and evaluation of shop health hazards, adequacy of controls and recommendations to improve health and/or compliance shall be reported.

5.6.2. Reports shall describe the type of survey performed, hazard evaluated, associated activity, controls in use at the time of evaluation, assessment of worker exposure, adequacy of controls and recommendations. Paragraph 4.6 describes the communication process for routine surveillance. Special surveillance communication follows the same principles, including update of the Occupational Health Workplace Exposure Data (old AF Form 2755) if the survey identifies any significant changes to exposure and/or required protective controls. The risk assessment (including sampling results) will be communicated to shop workers and supervisors. Only those surveys that cause a change in the Occupational Health Workplace Exposure Data require communication to the Occupational Health Working Group (OHWG). The report only needs to address the findings of the special surveillance, not all items addressed in routine surveillance. If special surveillance results are above an action level or OEL, or are extremely high risk, BE shall communicate that risk to the squadron commander and consider assigning a risk assessment code in accordance with AFI 91-301, Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) Program.

5.6.3. For air sampling and hazardous noise assessments, BE shall establish procedures for ensuring workers are provided written notification of results within mandated timeframes. Procedures must include requirements for documenting the date sample results are received, requirement for QA/QC review and steps for tracking special surveillance report completion. Worker notification of air sampling results must be completed within 15 days from receipt of sample results unless more stringent time-frames prescribed by law or other governing regulations (e.g. lead, and OSHA expanded standard samples) apply. Hazardous noise exposure results must be provided to the supervisor within 30 days after final determination. AFOSH Standard 48-8, Controlling Exposures to Hazardous Materials, and AFOSH Standard 48-19, Hazardous Noise Program, identify worker notification timelines.

5.6.4. As a minimum, reports will be distributed to the shop supervisor, the individual monitored, and those personnel whose exposures are represented by that monitoring. Consider sending reports to Public Health, Base Safety, and the affected squadron commander especially if there are significant uncontrolled exposures, immediate health concerns and/or required actions that must be taken to protect worker health. Also consider sending reports to the Occupational Medicine, Civil Engineering Environmental Flight (if environmental issues are identified), medical group commander, and affected group commander, as necessary.

Chapter 6

DATA QUALITY AND MANAGEMENT

6.1. Data Quality Standardization.

Data quality is critical to ensure that information accurately reflects the data and analysis captured in any management information system. Data quality involves standardization and data review. Data quality standardization involves establishing and using common data sets by all users. This includes pick lists that limit the choices, but ensure all users can utilize the data. Data review involves reviewing the collected data and verifying its accuracy and meaning using the appropriately skilled reviewer.

6.1.1. Standardized Data Sets. Standardized data sets simplify and streamline data entry, standardize OH data collected for base-level offices, and standardize information collected across the AF. The goal is to improve data consistency across the AF, streamline data collection, avert duplication, and reduce data input time. AFIERA is responsible for ensuring completeness of OHMIS data sets and any modification to a standardized data set must be made through a Functional User Group request, captured and reviewed by AFIERA, and approved by AFMOA. Data sets include but are not limited to:

- ✍ ✍ USAF industrial hygiene surveillance equipment data list. Examples include: ionizing radiation survey equipment, radio frequency radiation monitoring equipment, air sampling equipment, noise dosimetry equipment, etc.
- ✍ ✍ AF industrial equipment list with associated hazard evaluations and recommended controls. Examples include: radio frequency radiation sources with corresponding emission parameters, hazard distance calculations, measurement data, and typically required controls; laser producing equipment with corresponding emission parameters, hazard distances calculations, and required controls; and noise producing equipment with operational parameters and sound-level measurements at various reference locations.
- ✍ ✍ Occupational exposure limits (OEL) list that include limits established by the Occupational Safety and Health Administration (OSHA), American Conference of Government Industrial Hygienists (ACGIH), National Institute for Occupational Safety and Health (NIOSH), and AF unique. AFOSH Standard 48-8, *Controlling Exposures to Hazardous Materials* should be referenced for occupational exposure limits for home station use and service guidance should be referred to for deployed situations.
- ✍ ✍ Standard weapon system list with associated activities and hazards.
- ✍ ✍ Master four-digit base code listing, Workplace Identifier Organization and Work Function Codes.

✍️ Master activity codes.

6.1.2. Data Review. A qualified reviewer shall review all exposure assessment data (e.g. air sampling) input into the AFMS OHMIS and all reports sent to organizations for accuracy and completeness. The qualified reviewer is generally the Bioenvironmental Engineer or 7-level BE technician (7-level or higher, or civilian equivalent), however there may be exceptions based on current manning levels. The determination of “qualified reviewer” is a local decision (if no MAJCOM policy applies), but must not conflict with existing instructions or guidance.

6.2. AFMS OHMIS Utilization.

The approved AFMS OHMIS must be used to capture all OH data. This ensures the maximum utilization of AF-wide data and ensures continued process improvement based on user inputs. Utilization of non-standard management information systems, e.g. Excel spreadsheets, Access programs, etc., that duplicate AFMS OHMIS capabilities is strictly prohibited and represents a misuse of limited resources. HQ AFMOA may waive this requirement based on the OHMIS not meeting requirements. This waiver remains in effect until modifications to the appropriate OHMIS are made.

6.3. Data Maintenance.

All reports and correspondence shall be maintained via electronic methods if possible. If not possible, a hardcopy record shall be maintained until the AFMS OHMIS can electronically store these reports/correspondence.

6.3.1. Each BE shop will establish an electronic files plan for IH correspondence (i.e. documents such as letters, reports, email correspondence, etc., that is not contained in the USAF’s centralized OHMIS). The information must be organized for easy data retrieval. One suggested method is to establish a folder for each shop, labeled by work center identification code, with subdirectories for different classes of information.

6.3.2. Users shall print and keep hardcopies of data from survey equipment such as noise dosimetry, dataloggers, etc., that can’t be downloaded into the OHMIS. Similarly, keep hardcopies of actual laboratory analysis reports. All key data that can’t be downloaded will be manually entered in the AFMS OHMIS.

6.3.3. The BE shop will also ensure a plan is in place and executed for appropriate back up of electronic records. AFMAN 37-139, *Records Disposition Schedule*, prescribes record retention and disposition procedures for electronic and hardcopy records. Refer to Table 37-18, Electronic Records, and Table 48-5, Bioenvironmental Surveys and Medical Inspection Reports, and other tables as necessary for proper disposition.

6.4. Data Repository.

Records of industrial hygiene workplace monitoring and surveys shall be retained for a minimum of 40 years. When such records identify exposed employees by name, they also become a part of the employee's medical file. Employee exposure records maintained in the OHMIS are required to be preserved, maintained, and readily accessible for data retrieval and analysis for a minimum of 40 years, or 30 years beyond employment, whichever is greater, or longer as prescribed by law. DoDI 6055.5, *DoD Safety and Occupational Health (SOH) Program* and 29 CFR 1910.1020, *Access to Employee Exposure and Medical Records* prescribe procedures for access to employee exposure and medical records. Employee exposure records include the following:

- ☞ Monitoring results of workplace air or measurements of toxic substances or harmful physical or biological agents in the workplace, including personal, area, grab, wipe, and/or other forms of sampling results.
- ☞ Biological monitoring results, such as blood and urine test results.
- ☞ Material safety data sheets (MSDSs) containing information about a substance's hazards to human health.

6.5. Performance Metrics.

AFIERA will produce performance metrics for all facilities that utilize the AFMS OHMIS including Direct Reporting Units and reserve component base/units. At the time of this publication, the AFMS OHMIS currently in use are: Command Core System (CCS), Team Aerospace Funding Requirements (TAFR) and Global Expeditionary Medical System (GEMS).

6.6. Air Force-Wide Information Analysis.

The emphasis on Air Force-wide information analysis shall be to improve base performance through standardization and guidance and to direct limited resources to high pay-off AF-wide risk reduction efforts. Standardization will also allow installations to devote more resources to unique operations where there is a high level of risk. Base level organizations will benefit through additional guidance and modification of OHMIS tools. AFIERA will conduct this analysis on an annual basis or as directed by HQ AFMOA. As a minimum, the following analyses are required, but may be modified as directed by HQ AFMOA.

6.6.1. Activity Standardizations. Common shops will receive a comprehensive activity standardization analysis to provide both guidance and confidence for base risk assessments and to reduce exposure assessment requirements. The emphasis of the analysis will be on category 1 shops. These standardized shops shall include information reflecting basic activity characterization, compliance assessment requirements, and common exposure assessments, with statistics to allow confidence assignment by bases. This provides a central clearing house to eliminate or reduce unnecessary base level quantitative risk assessment requirements through increased confidence in controls and hazard characterization. The common shop activity information shall be developed to appropriately reflect similar weapon systems, if applicable, and other factors, determined by AFIERA, that allow appropriate comparison among similar base activities. AFIERA shall monitor category 1 shop assessments and provide updates and

field guidance as applicable. This information shall be provided in a manner that allows clear input or reference within the AFMS OHMIS.

6.6.2. Risk Analysis. An annual report will be provided to AFMOA/SGZE that identifies risk analysis based exposure level recommendations, gaps concerning exposure assessments, and the appropriate controls to reduce hazard risk to workers. The objective is to provide the field guidance concerning future special surveillances, Medical Annual Planning and Programming Guidance (MAPPG) guidance, and continuous improvement through standardization across all common activities throughout the AF. AFIERA shall formulate their annual analysis and recommendations so that it supports three primary objectives and actions:

- ✍️ Assessment of exposure data from similar activities to allow the BE to confidently determine if both hazard characterization and controls are adequate from an AF-wide perspective. From this assessment, strategic recommendations are made for further exposure assessments and for AF-wide risk reduction opportunities.
- ✍️ Determining if currently identified activities accurately reflect shop processes and the degree to which the activities and exposures are similar across the Air Force, weapon system, or other relevant parameter. Developing standardized risk analysis exposure assessments and minimum preventive measures, and medical monitoring recommendations, as necessary.
- ✍️ Evaluating current policy for efficiency of action--does AF Surgeon General policy focus resources to maximize return on investment given current risk analysis data. From this analysis, AFIERA shall recommend to HQ AFMOA policy, guidance, and resource changes and enhancements.

6.7. Information Delivery.

AFIERA will deliver information analysis in two ways: 1) Web-based delivery with periodic information updates reflecting current program performance and risk-reduction status and 2) AF-wide analysis via written reports to impact future resource direction, guidance, or policy to better improve the Occupational Health services provided to AFMS customers.

6.8. Management Information Requirements.

Typically, new requirements are generated through one of three methods: 1) user-generated requirements determined via functional user groups and 2) other requirements generated as part of new regulatory or new USAF-unique requirements, 3) AF-wide level assessment. Based on guidance or policy changes, AFIERA shall conduct and report information system requirement gaps with recommended fixes to HQ AFMOA management.

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

29 CFR 1910.1020, *Access to Employee Exposure and Medical Records*
AFI 32-7086, *Hazardous Materials Management*
AFI 48-145, *Air Force Occupational Health Program*
AFI 90-901, *Operational Risk Management*
AFI 91-301, *Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) Program*
AFMAN 37-139, *Records Disposition Schedule*
AFMAN 91-201, *Explosives Safety Standards*
AFOSH Standard 48-8, *Controlling Exposures to Hazardous Materials*
AFOSH Standard 48-19, *Hazardous Noise Program*
AFPAM 90-902, *Operational Risk Management (ORM) Guidelines and Tools*
AFPD 90-8, *Environmental, Safety, and Occupational Health*
DoD 6055.5-M, *Occupational Medical Surveillance Manual*
DoDI 6055.1, *DoD Safety and Occupational Health (SOH) Program*
DoDI 6055.5, *Industrial Hygiene and Occupational Health*
DODI 6490.3, *Implementation and Application of Joint Medical Surveillance for Deployments*
MCM-0006-02, *Updated Procedures for Deployment Health Surveillance and Readiness*
A Strategy for Assessing and Managing Occupational Exposures, 2nd Ed, ISBN 0-932627-86-2, AIHA Press

Abbreviations and Acronyms

ACGIH—American Conference of Government Industrial Hygienists
AEF—Air Expeditionary Force
AFOSH—Air Force Occupational and Environmental Safety, Fire Protection, and Health
AFMS—Air Force Medical Service
BE—Bioenvironmental Engineering
BEE—Bioenvironmental Engineers
CFR—Code of Federal Regulation

DoD—Department of Defense
ESOH—Environmental, Safety, and Occupational Health
FECA—Federal Employee Compensation Act
FUG—Focused User Group
GEMS—Global Expeditionary Medical System
HAZMAT—Hazardous Material
HAZCOM—Hazard Communication
HMIRS—Hazardous Materials Information Resource System
IH—Industrial Hygiene
MAJCOM—Major Command
MAPPG—Medical Annual Planning and Programming Guidance
MSDS—Material Safety Data Sheet
NFPA—National Fire Protection Association
OH—Occupational Health
OHMIS—Occupational Health Management Information System
OI—Operating Instruction
OEL—Occupational Exposure Limit
OHE—Occupational Health Examination
OHWG—Occupational Health Working Group
OPM—Operational Risk Management
OSHA—Occupational Safety and Health Administration
PCM—Primary Care Manager
PEG—Potential Exposure Group
PH—Public Health
PPE—Personal Protective Equipment
PPM—Parts Per Million
QA—Quality Assurance
RAC—Risk Assessment Code
SEG—Similar Exposure Group
SOP—Standard Operating Procedure
STEL—Short Term Exposure Limit
TA—Team Aerospace
TAFR—Team Aerospace Funding Requirements

TWA—Time Weighted Average

TERMS

Activity—Any item of work or situation that may pose a risk, and may require evaluation and control. An activity is the lowest level of worker task evaluation necessary to accomplish adequate exposure and control assessments. It should also be noted that not all activities require materials or exist at a physical location. Some activities exist solely due to the location itself such as working near the flight line. Activities are not to be used as process flow-charting tools and are not hierarchical in nature. The term Activity and Process are synonymous.

Administrative Controls—Administrative controls involve management and employee interventions designed to reduce exposure and include job rotation, job transfer, limiting exposure time, preventive maintenance, housekeeping, personal hygiene and education and training. Because the success of administrative controls is largely based on compliant employee behavior, they are most effective when used as part of a broader control strategy. Administrative controls do not impact the generation of the hazard. They are focused on controlling the interaction of the operator with the hazard. (Source: DoDI 6055.5)

Assessment—A qualified occupational and environmental health (OEH) professional determines and documents worker exposures as being above or below a level requiring action (e.g., exposure controls, worker training, medical monitoring, etc.). An assessment is a professional judgment based on qualitative and quantitative information such as measurements, mathematical modeling, estimates based on similar operations, and observations of work activities. (Source: DoDI 6055.5)

Characterization—The collection and organization of information needed to describe the workplace, workforce and environmental agents so that exposures can be comprehended. (Source: DoDI 6055.5)

Clinical Surveillance—The process by which workers receive occupational health examinations (OHE) and the results of these examinations are analyzed to determine if Air Force operations are adversely affecting the health of the workers. Clinical surveillance is also required in specific instances to meet Occupational Safety and Health Act (OSHA) requirements for medical monitoring. Additionally, clinical surveillance can be used to assess the adequacy of protective measures. (Source: AFI 48-145)

Confidence—The assessor's risk assessment concerning sufficient hazard characterization and control. The confidence level can range from LOW, i.e. not comfortable with any of the information (which may prompt the assessor to require and prioritize extensive sampling) to HIGH, i.e. completely comfortable (where the assessor might require no further work or only minor additional data collection). The confidence level and resulting special surveillance requirements depend primarily on the experience of the assessor and his/her confidence in their professional judgment.

Confidence in Controls—A qualitative, and maybe quantitative, assessment, on how well and how consistently the hazard is controlled. In some ways, this measures the probability of the control preventing exposures. (Source: AFI 48-145)

Confidence in Hazard Characterization—A qualitative assessment of the question: “Do I know enough about the exposure to reach sound conclusions?” In determining your confidence, a number of factors should be considered. These factors include (but are not limited to): sampling and analytical error, variability in sampling results, similarity to results from similar operations, and representation of the activity analyzed. . (Source: AFI 48-145)

Control—An action taken to eliminate hazards or reduce associated risks. BE staff will follow the hierarchy of controls that include, in priority order, engineering controls, work practice controls, administrative controls, and personal protective equipment (PPE). Usually a combination of these is necessary to reduce exposure, particularly during the interim period while engineering controls are designed and installed.

DoD Contractor—A non-Federal employer performing under a DoD contract, whether as prime contractor or subcontractor. (Source: DoDI 6055.5)

DoD Personnel

Civilian On-Duty—Civil Service employees of the DoD Components (including Reserve Component military Reserve technicians and Reserve technicians, unless in a military duty status); nonappropriated fund employees (excluding military personnel working part-time to avoid dual reporting); Corps of Engineers Civil Works employees; Youth or Student Assistance Program employees; foreign nationals employed by the DoD Components; Navy Civil Service Mariners with the Military Sealift Command, and Army-Air Force Exchange Service employees. (Source: DoDI 6055.1)

Military—All U.S. military personnel on active duty, Reserve or National Guard personnel on active duty or performing inactive duty training, Service Academy cadets, Officer Candidates in Officer Candidates School and AOCS, Reserve Officer Training Corps cadets when engaged in directed training activities, and foreign national military personnel assigned to the DoD Components. (Source: DoDI 6055.1)

Engineering Controls—Whenever feasible, engineering controls shall be used to eliminate or reduce exposure. These include process elimination, substitution of less toxic material, process changes (automation, isolation and enclosure), design changes (tools, workstations and equipment), and ventilation (dilution and local exhaust). When engineering controls are not feasible, or do not adequately reduce exposure, additional control methods shall be implemented. (Source: DoDI 6055.5)

Evaluation—The process of ascertaining or judging the value or adequacy of an action or an outcome by careful appraisal of previously specified data in light of the particular situation and the goals or objectives previously established. (Source: DoDI 6055.1)

Exposure—The intensity, frequency and length of time personnel are subjected to a hazard. (Source: DoDI 6055.5)

Force Health Protection—A unified strategy that protects service members from all health hazards associated with military service. It is a cradle-to-grave continuum consisting of protection, monitoring, and management. (Source: DoDI 6055.5)

Hazard—Any real or potential condition or agent (stressor) that can cause injury, illness, or death to personnel or damage to or loss of equipment or property, mission degradation, or damage to the environment. (Source: DoDI 6055.1)

Health Threat—The potential for injury or illness to personnel based on current exposures to health hazards, including the protective effects provided by exposure controls currently being used. (Source: DoDI 6055.5)

Industrial Hygiene—The art and science devoted to the anticipation, recognition, evaluation and control of environmental factors arising in or from the workplace that may result in injury, illness, impairment, or affect the well being of workers and members of the community. (Source: DoDI 6055.5)

Industrial Hygienist

A DoD civilian employee who meets the requirements of the Office of Personnel Management's standard for the Industrial Hygiene GS-690 series, or

A DoD contractor employee, who has a college or university degree or degrees in engineering, chemistry, physics, medicine, or related physical and biological sciences, and who, by virtue of special studies and training, has acquired competence in industrial hygiene. Such special studies and training must have been sufficient in all of the above cognate sciences to provide the abilities: (1) to recognize the environmental factors and to understand their effect on man and his well-being; (2) to evaluate, on the basis of experience and with the aid of quantitative measurement techniques, the magnitude of those stresses in terms of ability to impair man's health and well-being; and (3) to prescribe methods to eliminate, control, or reduce such stresses when necessary to alleviate their effects, or

A military officer commissioned in the medical services or biomedical sciences corps with equivalent education, training, and experience as described above.

While the above definitions do not include certification by the American Board of Industrial Hygiene, the Department of Defense recognizes the need for such certification by every professional industrial hygienist as an appropriate hallmark by one's peers and strongly urges all eligible DoD personnel to obtain certification. (Source: DoDI 6055.5)

Inspection—The process of determining compliance with safety and health standards through physical surveys of workplaces, operations, and facilities. (Source: DoDI 6055.1)

Longitudinal Health Record-- The term used to describe the collection of information about an individual's health and healthcare, from assertion to retirement and beyond. It includes documented hazard and exposure assessment data (home station and deployment) collected over a number of sites and in a number of settings throughout an individual's military career. It combines both the information about patient contacts with primary healthcare as well as subsets of information associated with the outcomes of periodic care held in Electronic Patient Records (EPR's).

Occupational and Environmental Health (OEH)—All activities related to preventing injuries and illnesses for DoD operations and personnel. OEH includes but is not limited to industrial hygiene, ergonomics, occupational medicine, epidemiology, hearing conservation, radiation protection, environmental health surveillance in military operations, engineering, and operational risk management of health hazards. Excludes exposures to family members and the general public. (Source: Draft DoDI 6055.5)

Occupational Exposure Limit (OEL)—The exposure limit used by a health professional to determine whether an exposure is acceptable or not acceptable. "OEL" is a generic term used to apply to all exposure limits, to include: DoD standards from DoDI 6055.1, OSHA PELs, DoD Component standards, military deployment environmental health limits, ACGIH TLVs, NIOSH RELs and other exposure limits reviewed for potential use. (Source: DoDI 6055.5)

Occupational Illness—Any abnormal physical condition or disorder, other than one resulting from an occupational injury, resulting in adverse consequences and caused by occupational factors associated with employment. Includes all confirmed cases of acute and chronic illnesses or diseases caused by inhalation, absorption, ingestion or direct contact with suspect substances. (Source: AFI 91-204)

Occupational Medical Examination—Medical examinations performed to prevent work-related health problems by assessing the health status of individuals in relation to their work and making medical recommendations regarding worker placement, accommodation, and exposure controls. An occupational medical examination may include (Source: DoD 6055.5-M):

Occupational Medical History. Information regarding an individual's medical background including work history, specific occupational exposures, work practices, and work-related health problems. The occupational medical history augments the basic medical history in assisting the practitioner in determining if the worker has (or is at risk of developing) work-caused or aggravated health problems.

Physical Examination. The process of inspection, palpation, percussion, and auscultation of the body to detect pathologic conditions.

Clinical Laboratory Tests. Clinical tests and measurements used to characterize the status of specific organ systems and physiologic functions.

Biologic Monitoring. Analysis of a body component (blood, urine, expired breath, hair, etc.) to detect the presence of or the effect of an agent in the body and assess potential for health harm.

Operational Risk Management (ORM)—Operational risk management is a decision-making process to systematically evaluate possible courses of action, identify risks and benefits, and determine the best course of action for any given situation. ORM enables commanders, functional managers, supervisors, and individuals to maximize operational capabilities while limiting all dimensions of risk by applying a simple, systematic process appropriate for personnel and functions both on- and off-duty. (Source: AFI 90-901)

Personal Protective Equipment—The use of personal protective equipment shall be considered last in the control hierarchy unless other methods are not feasible. This may be the case while engineering controls are being designed and installed, or during non-routine operations including maintenance and emergency response. For non-military unique workplaces, PPE requirements shall be assessed in accordance with 29 CFR 1910.132 (reference (k))) to identify tasks where PPE is required and to ensure that the proper equipment is selected and used. (Source: DoDI 6055.5)

Physical Hazards—One of a wide variety of causes of adverse health effects based on physical action on the human body. Physical hazards include: noise, vibration, ergonomic (excessive force, excessive repetition, awkward position), ionizing radiation, lasers, radiofrequency radiation, light (infrared, visible, ultraviolet), cold, heat, hyperbarics and hypobarics. (Source: DoDI 6055.5)

Qualified Occupational and Environmental Health Personnel—Personnel, such as physicians, nurses, industrial hygienists, sanitarians, etc., who by virtue of education, training, and experience have acquired competence in protecting personnel from the effects of health hazards. DoD Components will determine qualification requirements and scope of practice for each specialty by balancing resource and personnel limitations with the competence required to adequately address the health hazard and resulting risk. (Source: DoDI 6055.5)

Risk—The chance of adverse outcome or bad consequence; such as injury, illness, or loss. The risk level is expressed in terms of hazard probability and severity. (Source: DoDI 6055.1)

Risk Assessment—A structured process to identify and assess hazards. An expression of potential harm, described in terms of hazard severity, accident probability, and exposure to hazard. (Source: DoDI 6055.1)

Risk Communication—The process of adequately and accurately communicating the magnitude and nature of potential environmental and occupational health risks to commanders and to Service members. (Source: DoDI 6490.3)

Routine Surveillance—The process where Bioenvironmental Engineering (BE) periodically assesses activities and identify: potential worker health risks; data required to characterize the health risk; additional evaluations needed to obtain those required data; occupational health

program costs; activities in which more current technology may be applicable; and compliance with occupational health program and regulatory requirements. (Source: AFI 48-145)

Shop—See Workplace

Similar Exposure Group (SEG)—A group of persons who experience exposures similar enough that assessing the exposures of any member of the group is predictive of exposures of all members of the group. Qualified OEH staff may establish SEGs by organization, activity being performed, event or situation, job series, geographic exposure location, or other methods. The term “SEG” is defined in the text of “A Strategy for Assessing and Managing Occupational Exposures”, replacing the previous term “Homogeneous Exposure Group (HEG) and also Potential Exposure Group (PEG) used in the Command Core System.”

Special Surveillance—The process where BE further characterize the health risk to the workers through specific monitoring such as sound level measurements, air sampling, ventilation surveys, thermal stress surveys, etc. The results of the additional monitoring are interpreted by comparison with health standards. The documented health risk assessment is then conveyed to the workplace for their information and action. (Source: AFI 48-145)

Unacceptable Exposure—A condition in which a significant risk (e.g., occupational illness) is associated with a similar exposure group's (SEG's) exposure profile; the probability of adverse health effects is significant, or there is evidence of adverse health effects associated with exposure to a threat agent. (adapted from “A Strategy for Assessing and Managing Occupational Exposures”).

Examples of unacceptable exposures include, but are not limited to, the following:

- ✍✍ The SEG exposure profile meets or exceeds an Occupational Exposure Limit (OEL):
 - ✍✍ for airborne contaminants: Upper Tolerance Limit (95th percentile, 95% confidence) \geq OEL
 - ✍✍ for noise dosimetry: Upper Tolerance Limit (90th percentile, 75% confidence) \geq OEL
- ✍✍ The average or upper extremes of the exposure profile for a given environmental agent exceed an OEL and controls are recommended (e.g., respiratory protection)
- ✍✍ The environmental agent has no OEL but the probability (qualitatively defined by knowledge, experience, and/or professional judgment; or determined by extrapolation from a similar activity and/or similar agent) of adverse health effects requires personnel to wear personal protective clothing and equipment (PPC&E) (e.g., respiratory protection, chemically protective gloves)
- ✍✍ The environmental agent or risk factor has no OEL, but the incidence and severity rates for the associated illness or injury (e.g., musculoskeletal disorders) exceed background rates, and the causative factor is known to be occupationally related.
- ✍✍ The observable presence of skin contact when dermal absorption is a significant route of exposure
- ✍✍ The observable potential for inadvertent ingestion when ingestion is a significant route of exposure

✍ ✍ A threat agent has a requirement for PPC&E that is independent of exposure levels. The environmental agent may or may not have an OEL.

(Comment: No OEL; pesticides, antineoplastic/cytotoxic agents e.g., pentamidine, certain molds (stachybotrys), Example of agents that have OELs: asbestos, 29 CFR 1926.1101)

Examples of exposures that should not be considered unacceptable include, but are not limited to, the following:

?? Exposures from activities that are controlled by engineering methods (e.g., ventilation, interlocks), but absence or malfunction of the control, would produce exposures that meet or exceed an OEL.

?? Exposures controlled by individual choice e.g., Voluntary Respiratory Protection Program or equivalent (Source: DoDI 6055.5)

Work Practice Controls—Work practice controls include changes to tasks and activities that reduce contaminant generation. Using a high efficiency vacuum cleaner or wet mopping instead of cleaning with compressed air is an example. Work practices that are required to control exposure should be documented in safety rules and work procedures and enforced by supervisors. (Source: DoDI 6055.5)

Work Activities—A set of activities or situations grouped and defined by an OEH professional for the purpose of associating this group of activities or situations with a corresponding set of potential hazards, exposures and exposed workers. The OEH professional may choose to establish work activity/operation groups by: organizational structure; physical location in a building, room or space; or by type of hazard to be found. (Source: DoDI 6055.5)

Workplace—A physically definable area where work is performed. This can be outdoors (i.e., an aircraft trim-pad), or indoors (i.e., a welding shop). Workplaces may be administrative or industrial.

Workplaces

Nonmilitary-Unique Workplaces and Operations—DoD military and civilian workplaces and operations that are comparable generally to those of the private sector. Examples include facilities involved and work performed in the repair and overhaul of weapons, vessels, aircraft, or vehicles (except for equipment trials); construction; supply services; civil engineer or public works; medical services; and office work. (Source: DoDI 6055.1)

Military-Unique Workplaces, Operations, Equipment, and Systems—DoD military and civilian operations and workplaces that are unique to the national defense mission. This includes combat and operation, testing, and maintenance of military-unique equipment and systems such as military weapons, military-unique aircraft, military-unique ships, submarines, missiles, early warning systems, military space systems, ordnance, and tactical vehicles. It also includes operations such as peacekeeping missions; field maneuvers; combat training; naval operations; military flight and missile operations; military-unique Research, Development, Test, and Evaluation activities; and actions required under national defense contingency conditions. (Source: DoDI 6055.1)

DoD Contractor Workplace—Any place, including a reasonable access route to and from, where work has been, will be, or is being performed by contractor employees under a DoD contract. "DoD contractor workplace" does not include any area, structure, machine, apparatus, device, equipment, or material therein with which the contractor employee is not required or reasonably expected to have contact; nor does it include any working condition for which OSHA jurisdiction has been preempted pursuant to Section 4(b)(1) of 29 U.S.C. 651 (reference (f)). (Source: DoDI 6055.1)

Workplace Visit—A formal inspection, staff assistance visit, walk-through survey, awareness briefings for the management and staff, risk management consultations, or any other activity that will enhance the health and safety of the people and the operation. (Source: DoDI 6055.1)

Attachment 2

DETERMINING CONFIDENCE IN HAZARD CHARACTERIZATION

To determine level of confidence in hazard characterization, each applicable criteria for that level must be met. If each applicable criteria cannot be met, move to the next lesser degree of confidence to determine if all criteria can be met.

HIGH: *High confidence in hazard characterization means that sufficient quantitative data has been collected to conclude exposure acceptability.*

1. Valid monitoring (i.e., air sampling, swipe sampling, scatter radiations measurements) has been performed, and no additional monitoring is required other than required periodic monitoring.
2. Professional judgment has been used to infer quantitative monitoring results from similar task that without question characterizes the hazard being assessed.

MEDIUM: *Medium confidence in hazard characterization means that valid quantitative data exists allowing preliminary determination of exposure acceptability, but additional monitoring is required to increase data confidence. Medium confidence may also result from qualitative assessment of a low risk hazard.*

1. Valid monitoring has been performed, but additional monitoring is required to increase data confidence.
2. Qualitative methods were used to characterize a low risk hazard (i.e., infrequent, insignificant contact with a mild skin irritant; or, low heat stress during mild work).
3. Professional judgment has been used to infer quantitative monitoring results from a similar task that indicates magnitude of exposure, but does not without question characterize the hazard being assessed.

LOW: *Low confidence in hazard characterization means that quantitative data does not exist, or is of questionable application.*

1. The task posing the hazard has not been fully described, preventing valid hazard characterization.
2. Qualitative assessment was used to characterize a medium/high risk hazard (i.e., skin absorption, significant ergonomic stress, exposure to carcinogens).

Attachment 3

DETERMINING CONFIDENCE IN CONTROLS

To determine level of confidence in Controls, each applicable criteria for that level must be met. If each applicable criteria cannot be met, move to the next lesser degree of confidence to determine if all criteria can be met.

HIGH: *High confidence in controls means that unacceptable exposure is prevented through a combination of effective engineering controls and regulated area enforcement. The human element has been removed from the exposure potential.*

1. There is no potential for unacceptable exposure. Controls are not required.
2. Chemical Inhalation – Exposure is controlled below the action level by engineering controls that have been proven effective through air sampling of exposure, and that are proven serviceable by periodic evaluation (i.e., quarterly ventilation surveys).
3. Chemical contact and absorption, and physical hazards – Exposure is controlled below exposure limits by engineering controls that are proven serviceable by periodic evaluation.
4. Administrative controls are in place to prevent access to regulated areas by unprotected, untrained personnel.
5. Medical surveillance has identified no unacceptable dose, verifying controls are effective.

MEDIUM: *Medium confidence in controls means that the exposure potential exists, but is controlled by applicable method, administrative controls or PPE. The human element remains making exposure possible if controls are not properly enforced.*

1. Chemical application method controls exposure (i.e., worker uses tongue depressor to apply sealant).
2. PPE is required to control exposure, and workers have been observed using required PPE effectively.
3. Medical surveillance has identified no unacceptable does, verifying controls are effective; or, workers have no complaints of symptoms associated with exposure.

LOW: *Low confidence in controls means that exposure is not adequately controlled, or we cannot conclude exposure is controlled given the information or data available.*

1. Chemical inhalation exposure controlled by engineering controls that **have not been** proven effective through air sampling, or have been proven ineffective by air sampling.
2. PPE is required to control exposure, but workers have been observed not using required PPE effectively, or using inadequate PPE (i.e., wrong type of glove).
3. Regulated areas are accessible by untrained, unprotected personnel.
4. Medical surveillance has identified unacceptable dose, such as temporary threshold shift; or, an occupational illness/injury report has been made; or, workers complain of symptoms associated with exposure, such as skin irritation or ergonomic strain.

Attachment 4

MODELS FOR ADJUSTING 8-HOUR TWA EXPOSURE STANDARDS

Several mathematical models have been proposed for adjusting exposure standards for use during altered work shifts. These models include the Brief and Scala Model, the US Occupational Safety and Health Administration (OSHA) Model, and the Pharmacokinetic Model of Hickey and Reist. All models provide valid methods for adjusting exposure standards. The main difference is the degree of conservatism. Selection of a model will depend on the information available and the expertise of the practitioner. It should be emphasized that adjustment of exposure standards may be complex and there is no scientific consensus on a universal adjustment regime.

It should be noted that exposure standard values do not represent a fine line between safe and dangerous exposures and therefore the application of precise adjustments is not appropriate. Where an exposure standard is set close to the Limit of Detection there may be difficulties in measuring exposure and demonstrating compliance if the value of the exposure standard is adjusted downwards.

The Preferred model for calculating adjustments of 8-hour TWA exposure standards is the Brief and Scala Model.

1. Brief and Scala Model

The Brief and Scala Model is based on the number of hours worked per 24-hour day and the period of time between exposures. This model is intended to ensure that the daily dose of the toxicant under an altered workshift is below that for a conventional shift to take account of the lessened time for elimination.

Information required: hours worked per 24-hour day.

Features include: involves a simple calculation; most conservative model; no detailed knowledge about the substance is needed.

Formula:

Adjusted exposure standard (TWA) =
$$\frac{8 \times (24 - \mathbf{h}) \times \text{Exposure Standard (8-hour TWA)}}{16 \times \mathbf{h}}$$

where **h** = hours worked/day

Worked examples:**Example 1**

Substance: Ethyl alcohol
 Exposure Standard: 1000 ppm, 8 -hour TWA
 Workshift: 12 hours

Solution

$$\begin{aligned}
 \text{Adjusted exposure standard for 12-hour workshift} &= \frac{8 \times (24-12) \times \text{Exposure Standard (8-hour TWA)}}{16 \times 12} \\
 &= \frac{8 \times 12 \times 1000 \text{ ppm}}{16 \times 12} \\
 &= 500 \text{ ppm (12-hour TWA)}
 \end{aligned}$$

Example 2

Substance: Chlorine
 Exposure Standard: 1 ppm, Ceiling Limit
 Workshift: 12 hours

Solution

No adjustment of the exposure standard is made for substances assigned with a Peak Limitation.

Example 3

Substance: Methyl ethyl ketone
 Exposure Standard: 150 ppm, 8-hour TWA; 300 ppm STEL.
 Workshift: 12 hours

Solution

No adjustment of the STEL is made. The 12 hour TWA will reduce to 75 ppm using a similar calculation to that used for ethyl alcohol.

2. OSHA Model

The US Occupational Safety and Health Administration (OSHA) Model categorizes air contaminants into one of six categories based on their toxic effects. Depending on the type of toxic effect, an appropriate adjustment procedure (including no adjustment) is selected and applied to the substance's exposure limit. This model is intended to ensure that for substances with acute or chronic toxicity, the daily dose or the weekly dose, respectively, during an altered workshift does not exceed the dose obtained in a conventional 8-hour workshift.

3. Pharmacokinetic Model (of Hickey And Reist)

There are several different pharmacokinetic models. These models take into account the expected behaviour of the hazardous substance in the body based on knowledge of the properties of the substance. The Hickey and Reist model requires knowledge of the substance's biological half-life. Pharmacokinetic models are less conservative than the Brief & Scala or OSHA Models, usually recommending less reduction of the established exposure. Whereas pharmacokinetic models are theoretically more exact than the simpler models, their lack of conservatism may not allow adequately for the unknown adverse effects on the body from nightwork or extended shifts that might affect how well the body metabolises and eliminates the substance.

PREFERRED MODEL FOR ADJUSTMENT OF 8-HOUR TWA EXPOSURE STANDARDS

The Preferred model for calculating adjustments of 8-hour TWA exposure standards is the Brief and Scala Model. The Brief and Scala Model is preferred because it is simple to use, takes into account both increased hours of exposure and decreased exposure free time, and is more conservative than the OSHA Model or Pharmacokinetic Model of Hickey and Reist.

Attachment 5

STATISTICAL TOOLS

Non-detects. For sample results below the limit of detection (LOD), neither ignoring nor assuming zero exposure is appropriate. If nothing is known of the exposure distribution, the very conservative method of treating non-detects as having the same value as the LOD is the method of choice. For data sets with a geometric standard deviation (GSD) <3 , assume the sample has a value of $0.7 \times \text{LOD}$. For data sets with GSD >3 , assume the sample has a value of $0.5 \times \text{LOD}$. This GSD determination is not a fine line. Data sets with GSD very close to 3 may have to consider both cases and compare implications.

Action Level (AL). This is typically set for 50% of the OEL, based on a coefficient of variation for the sampling and analysis method of 10%, and GSD of 1.22 from the NIOSH study published in *Occupational Exposure Sampling Strategy Manual*, Publication No.77-173. For measured exposures below $\frac{1}{2}$ the OEL, these assumptions generate a 95% confidence level that other exposures in that group will not exceed the OEL more than 5% of the time. This is very handy for many industrial applications, where process control is a must for efficiency. For the varied exposure profiles seen in the USAF, typical exposure profiles are at or above 2.0 for a GSD. For the same level of surety (95% certain that no more than 5% of the exposures will exceed the OEL), the curves in Fig. L-1 of the NIOSH publication would require the AL to be set at approximately $\frac{1}{10}$ of the OEL, that is 10% of the OEL. According to AFOSH Std. 48-8, the AL is $\frac{1}{2}$ the OEL except where OSHA indicates a different AL, but BE has the leeway to set a lower AL if statistical variability of sampling results suggests it.

If the screening sampling indicates exposures far exceed the OEL, BE may recommend controls without further quantification. Note that the implementation of engineering controls often changes the process to the point that previous quantitative data no longer apply. Also note that one need not necessarily wait for sampling results to recommend controls.

If any of the results has an upper confidence limit (UCL) greater than the AL, you can't be 95% confident that less than 5% of average daily exposures will exceed the OEL, so you are uncertain. Should the results of screening sampling prove uncertain, a more detailed analysis may be needed to gain confidence in the characterization of the hazard.

SCREENING SAMPLING RESULTS INTERPRETATION

Table A5.1. Acute or Chronic OELs (Screening Sampling).

Individual Daily Exposure UCLs	ACTION
$<AL$	Done
$>AL$ but $<OEL$	Uncertain: Perform detailed analysis (6-10 random samples)
$>OEL$	Consider controls or perform detailed analysis (6-10 random samples)

Detailed Analysis. A detailed analysis should be written in an exposure assessment plan for that specific activity. It may take as long as a year or more to execute depending on seasonal

variations and other variables. As a rule of thumb six to ten random samples are required to make a detailed analysis. Detailed analysis should be performed with an approved sampling method by NIOSH, OSHA, or EPA.

As sample results come in, they should be evaluated individually with upper confidence limit to ensure compliance with regulations, followed by interpretation in light of the previous data. Descriptive statistics will be used to determine the characteristics of the underlying distribution of the population of activity exposures from which were pulled six to ten samples. Once the underlying distribution is identified, the data can be used to infer conclusions about the population.

Descriptive Statistics. Descriptive statistics are used to summarize data—typically their central tendency (mean, median, and geometric mean) and their spread (range, minimum and maximum, standard deviation, and geometric standard deviation). Calculating these summary statistics helps us organize our monitoring data to begin understanding the exposures they represent. Many industrial hygiene data sets can be interpreted simply by comparing the OEL with descriptive statistics. The following descriptive statistics should be calculated routinely for all monitoring data:

Number of samples (n)	Maximum (max)
Minimum (min)	Range
Percent above OEL (% >OEL)	Mean (\bar{x})
Median	Standard deviation (s)
Mean of the logtransformed data (\bar{y})	Standard deviation of the logtransformed data (s_y)
Geometric mean (GM)	Geometric standard deviation (GSD)

Example data set: Eight random daily 8-hr TWA exposure measurements of n-Butyl Acetate, OEL = 150 ppm, OEL-STEL = 200 ppm.

Result (ppm), x_i	$\ln(x_i)$
20	3.00
45	3.81
53	3.97
55	4.01
60	4.09
100	4.61
110	4.70
<u>169</u>	<u>5.13</u>
Mean	76.50 4.16
Std Dev	47.36 0.65

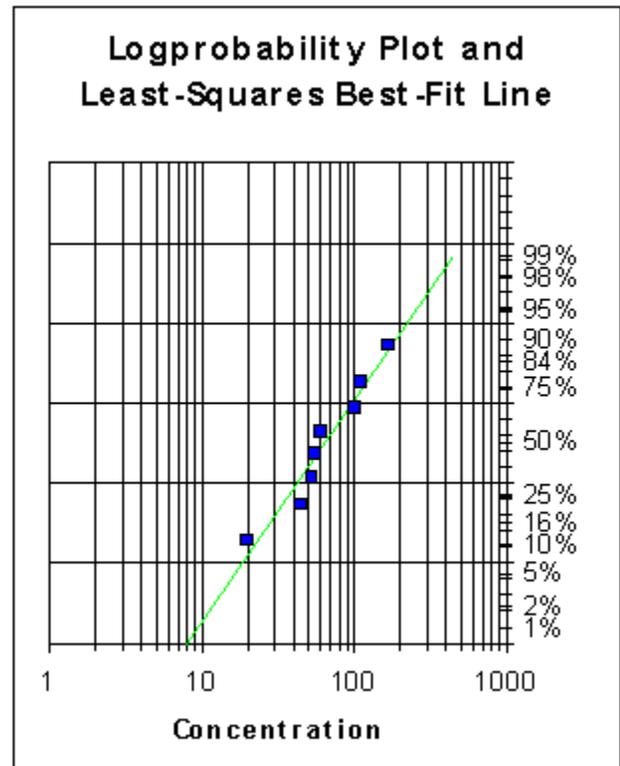
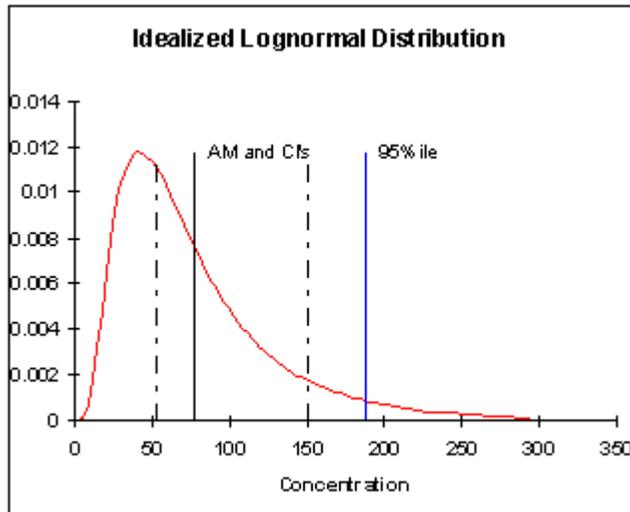
n = 8	Max = 169 ppm
Min = 20 ppm	Range = (169-20) = 149 ppm
Percent above OEL (% >OEL) = 12.5%	Mean (\bar{x}) = 76.5 ppm
Median = (55+60)/2 = 57.5 ppm	Standard deviation (s) = 47.4 ppm
Mean of the logtransformed data (\bar{y}) = 4.16	Standard deviation of the logtransformed data (s_y) = 0.65
Geometric mean (GM) = $\exp^{(\bar{y})} = 64.57$ ppm	Geometric standard deviation (GSD) = $\exp^{(s_y)} = 1.91$

Goodness of Fit to Underlying Distributions. While error associated with an individual sample is typically normally distributed, the daily exposures themselves are many times lognormally distributed. In order to infer anything about the data, one must first determine the goodness of fit to a particular distribution type. This can be performed with formal tests relatively easily via spreadsheet software. Lognormality can generally be assumed for most exposure data. As data come in, the BEE can log-transform the data and confirm “goodness of fit” by either the W-test or the simple log-probability plot method. General rules of thumb for a log-normal distribution of data are (1) GSD >1.44, (2) ratio of highest to lowest data exceeds 20, and (3) coefficient of variation (CV) >50%. Data sets log-transformed with a GSD <1.4 can usually be better described by a normal distribution. Note that many USAF data sets have a GSD >2.0, which indicates high variability.

When reviewing monitoring data for a SEG, consider making a probability plot. Probability plots are useful for several reasons:

- ☞ They indicate whether the exposure profile can reasonably be approximated by a lognormal or normal distribution.
- ☞ They can help identify potential outliers that may indicate that the SEG has not been well-defined.
- ☞ They are a simple and convenient method of forming a picture of the exposure profile indicated by the monitoring results. They provide direct estimates of the distribution geometric mean, geometric standard deviation, and various percentiles (e.g., 95th

percentile). This estimation can be performed even when some of the monitoring data results are below the analytical detection limit.



Inferential Statistics. Inferential statistics attempt to draw conclusions about the population data set based on the samples drawn. Randomness of the sample set is essential for detailed analysis. Guidelines for interpretation of screening and detailed analysis data are given in the tables below. Decision points rest on the 95 percentile for acute effects (since the upper tail of the exposure distribution is the concern for many acute hazards), and 95% UCL on the arithmetic mean (since for chronic effects the main concern is usually the mean exposure). The OEL-LTA stands for those OELs with long-term averaged effects. That is, the effects they are set to protect against have an averaging time greater than a week, so that they are considered “chronic” effects.

Although there are several methods to estimate the mean, find confidence limits, and upper tails, most of the time the following suffice. For estimating the mean of a lognormal distribution of data, the Minimum Variance Unbiased Estimate (MVUE) is the best for sample sizes of 5-500 and GSDs of 2-5. Once the mean is estimated, the confidence limits on the mean are needed, and Land’s “Exact” estimate of the arithmetic mean confidence limits should be used. Finally, for acute OELs, the 95 percentile, or the upper tolerance limit (UTL) are used. The formulae are below:

MVUE

$$\text{MVUE} = [\exp(\bar{y})] * [1 + ((n-1)/n)l + ((n-1)^3/(n^2(n+1)))(l^2/2!) + ((n-1)^5/n^3(n+1)(n+3))(l^3/3!) + \dots]$$

$$\text{Where } l = s_y^2/2$$

Land's 'Exact'

$$\text{UCL}_{1,95\%} = \exp [\ln(\hat{u}) + C (s_y/(n-1)^{0.5})]$$

$$\text{Where } \hat{u} = \exp(\bar{y} + 1/2s_y^2)$$

And C is found on the attached graphs in “*A Strategy for Assessing and Managing Occupational Exposures*” as a function of s_y , n, confidence (0.95 usually).

UTL

$$\text{Lognormal: UTL} = \exp(\bar{y} + Ks_y)$$

$$\text{Normal: UTL} = \bar{x} + Ks$$

Where K is a function of confidence (?), percentile (P), and number of samples (n). Typically, we will use ? = 0.95, and P = 0.95, and look it up in the attached tables in “*A Strategy for Assessing and Managing Occupational Exposures*”.

DETAILED ANALYSIS RESULTS INTERPRETATION

Table A5.2. Chronic OELs (Detailed Analysis).

UCL _{1, 95% on Mean}	ACTION
<OEL-LTA	Done
>OEL-LTA	Unacceptable exposure. Implement controls and conduct annual revalidation per AFOSH Std 48-8

Table A5.3. Acute OELs (Detailed Analysis).

UTL 95%ile	ACTION
<OEL	Done
>OEL	Unacceptable exposure. Implement controls and conduct annual revalidation per AFOSH Std 48-8

Categorize Exposures. The example n-Butyl Acetate data from a detailed analysis need to be categorized. The TLV basis is irritation, an acute effect, but all the inferential statistics will be performed on the data below. Since the GSD (1.91) is >1.44, and the coefficient of variation ($s/\bar{x} = 47.4\text{ppm}/76.5\text{ ppm} = 62\%$) is > 50%, these two rules of thumb suggest a lognormal distribution. The ratio of high to low is only $20/169 = 8.45$, less than the rule of thumb value of 20. The actual W test shows that the distribution could be normal or lognormal. Lognormality was assumed for the purposes of this exercise.

MVUE

$$\text{MVUE} = \exp(\bar{y})[1 + ((n-1)/n)l + ((n-1)^3/(n^2(n+1))(l^2/2!) + ((n-1)^5/n^3(n+1)(n+3))(l^3/3!) + \dots]$$

$$\text{Where } l = s_y^2/2$$

$$l = (0.65)^2/2 = 0.21$$

$$\text{MVUE} = \exp(4.16)[1 + ((8-1)/8)(0.21) + ((8-1)^3/(8^2(8+1))(0.21^2/2!) + ((8-1)^5/8^3(8+1)(8+3))(0.21^3/3!) + \dots]$$

MVUE = 64.1 ppm [1 + 0.18375 + 0.01688 + 0.00051] Figured to 3 factors, as they keep getting smaller.

$$\text{MVUE} = \underline{77.0 \text{ ppm}}$$

Land's "Exact"

$$UCL_{1,95\%} = \exp [\ln(\hat{u}) + C (s_y/(n-1)^{0.5})]$$

$$\text{Where } \hat{u} = \exp(\bar{y} + 1/2s_y^2)$$

$$\text{Where } \hat{u} = \exp(4.16 + 1/2(0.65)^2) = 79.1$$

And C is found on the attached graphs at $(s_y, n, 0.95) = (0.65, 8, 0.95)$, so that $C = 2.6$

$$UCL_{1,95\%} = \exp [\ln(79.1) + 2.6(0.65/(8-1)^{0.5})]$$

$$UCL_{1,95\%} = \underline{149.8 \text{ ppm}}$$

UTL

$$\text{Lognormal: } UTL = \exp(\bar{y} + Ks_y)$$

$$\text{Where } K(0.95, 0.95, 8) = 3.188$$

$$UTL = \exp(4.16 + (3.188)(0.65))$$

$$UTL = \underline{508.9 \text{ ppm}}$$

Therefore, this situation would be classified as acceptable (barely) for a chronic OEL-LTA, and unacceptable for an acute OEL.

Reassess Risk. The final step of the activity characterization is to reassess the risk based on AFI 48-145 Table 2.2. Using the example data, if the OEL was based on chronic effects, the confidence in hazard characterization would likely be "high," and confidence in controls would also be "high" since there are no controls required. This would result in a priority D(H, H) assessment. If the OEL was based on preventing acute effects, the confidence in characterization of the hazard would still be "high," but our confidence in controls is probably "low" since the exposures are not well controlled. This would give a priority B(H,L) assessment, and some controls should be implemented to reduce exposures, in the proper hierarchy of controls.