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HEALTH RISK ASSESSMENT

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This manual provides guidance for all Air Force installations in performing health risk assessments for occupational and environmental health (OEH) threats in both home station and expeditionary operations.

This AFMAN applies to all Air Force personnel (at classified and unclassified locations) to include the Air Force Reserves, Air National Guard (ANG), and direct reporting units and field operating agencies not located on Air Force installations. This manual does not apply to employees and private contractors performing work under government contracts, or state workers. Contractors are solely responsible for compliance with Occupational Safety and Health Administration (OSHA) standards and the protection of their employees. This does not prohibit providing assessment information to contractors or state employees at ANG installations based on local arrangements.

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Chapter 1

INTRODUCTION

1.1. Overview.

1.1.1. This manual enables mission capabilities by providing guidance on performing health risk assessments (HRA) to prevent disease and injury to Air Force personnel. This manual also highlights the importance of analyzing and integrating health risk data within the operational risk management (ORM) framework as described in AFI 90-901, *Operational Risk Management*, and AFPAM 90-902, *Operational Risk Management (ORM) Guidelines and Tools*. When health risks are a focus in ORM, it allows commanders and decision-makers to balance operational risks with health risks ("commander" as used in this manual refers to commanders and decision makers within the chain-of-command at all levels--use of term does not deviate from official commander responsibilities). Integrating health risks with other risks provides information on the full spectrum of risks to the mission and personnel at home station and expeditionary locations. Commanders can then weigh mission requirements against short and long-term health risks to prevent injury and illness to personnel while managing operational risks to maximize mission success. Mission success may be predicated solely on health impacts.

1.1.2. In numerous traditional risk assessment and risk management frameworks, initial risk assessment activities are often conducted independent of risk management activities to ensure unbiased assessments are provided. Only later in the process do risk management activities overlap with the risk assessment. HRAs, as executed by the Air Force Medical Service (AFMS), must support mission and operational requirements and integrate those requirements early in the decision-making process. The goal of the HRA is to provide the commander a concise course of action (COA) that clearly articulates potential impacts and provides recommendations to maximize operations, and minimize health threats and negative health outcomes.

1.1.3. This manual is overarching guidance for the HRA process and standardizes terminology and execution. It is not a checklist on "how to conduct a HRA." Additional AFMAN volumes specific to chemical, biological, and radiological hazards will provide more definitive guidance covering the primary threat spectrum. Note: The "HRA" acronym for health risk assessment is used within the medical community for other tasks (e.g., health risk appraisal); therefore, ensure the correct acronym is recognized and "HRA" refers to health risk assessment unless otherwise noted.

1.2. Operational Health Risk Management.

1.2.1. Commanders are required to mitigate and manage health threats and risks using ORM (identifying, assessing, and controlling or reducing risks as well as evaluating the effectiveness of control measures). **Table 1.1.** lists the six steps of ORM and the corresponding HRA and HRM steps as outlined in **Figure 2.1.** HRA and health risk management (HRM) mirror ORM principles and are not considered different processes.

Table 1.1. Operational Risk Management Comparison

ORM	HRA
Identify Hazards	Identify Health Threats/Hazards
Assess Risk	Analyze Health Threats/Risks
	HRM
Analyze Risk Controls	Identify Engineering Controls Identify Administrative Controls Identify Protective Equipment
Make Control Decisions	Make Health Control Decisions
Implement Risk Controls	Implement Health Risk Controls
Supervise and Review	Same

1.2.2. Risk communication is a part of the ORM process to ensure health risks are effectively communicated to all personnel including commanders, family members, and communities.

1.3. Roles.

1.3.1. The Air Force Medical Operations Agency, Major Command, and installation medical subject matter expert HRA-related responsibilities are an extension of AFI 48-145 OEH responsibilities.

1.3.2. Installation or expeditionary Bioenvironmental Engineering (BE) leads HRA execution and incorporates chemical, biological, radiological and nuclear (CBRN), including toxic industrial chemicals/materials (TIC/TIM), threat analyses from intelligence (e.g., Armed Forces Medical Intelligence Center) and line functions into HRAs. BE's critical role is to communicate OEH HRA information and recommend COAs to commanders. Although identification and monitoring of risk controls are a part of traditional risk management, BE must ensure involvement in each HRM activity listed in Figure 1.1. Maintain clear lines of communication with commanders to cross talk emerging and identified health threats, risk controls, and the impact of both threats and controls to the mission.

1.3.3. Public Health (PH) provides HRA expertise regarding intervention strategies to prevent or mitigate health risks and assist in identifying emerging health threats through vector and disease surveillance programs, sanitation/public facility programs, force health protection data, and collaboration with civilian public health agencies.

1.4. Definitions. There are numerous terms and definitions for risk assessment and risk management. The following definitions apply to this AFMAN (this manual complements current regulatory guidance, but may increase the scope of definitions and associated intent).

1.4.1. Health Threat. Potential or actual condition that can cause short or long-term injury, illness, or death to personnel. A health threat can be occupational or environmental in origin; internal or external to the installation; or continuous, intermittent, or transient, and includes enemy capability and intent. This definition incorporates the definition of *hazard* as identified in AFPAM 90-902.

1.4.2. Health Risk. Health risk equals threat "combined with" vulnerability (health risk = (threat) "and" (vulnerability)). A health risk is an identified health threat and the vulnerability of the population at risk of coming into contact (i.e., completion of an exposure pathway) with the health threat.

The health risk is the site picture for the commander in relation to threats that may impact mission success. Note: This is not the health risk estimate (HRE) described in paragraph **1.4.3.** and expands the definition of risk identified in AFPAM 90-902.

1.4.3. Health Risk Estimate. HRE is the probability and severity of loss from exposure to the health threat (HRE is a function of probability and severity when either or both increase the HRE increases). The HRE is also referred to as a health risk level. As depicted in **Table 3.1.**, it is a measure of the likelihood of an adverse health effect to a given individual or population based on exposure scenario (and we determine this by comparing to different standards if available), weighted by the severity or seriousness of that potential health outcome.

1.4.4. Health Risk Assessment. HRA is the process of identifying and analyzing or evaluating (exposure and toxicity assessments) OEH threats in populations or at locations over time (HRA = *f* [(health risk) "+" (HRE) "+" (COA)]). The HRA "product" is the validated health threat, qualified by the HRE, and the COA which includes overall mission impact, recommended control options, associated uncertainties, risk mitigation estimate(s), and a cost-benefit analysis if applicable.

1.4.5. Health Risk Management. HRM is a decision-making process to evaluate and select COAs, minimize OEH risks, and maximize benefits for operations and missions. HRM is the health component of the ORM process and HRM recommendations and decisions are integrated into the commander's ORM decision-making.

1.4.6. Health Risk Communication. Health risk communication is the process of effectively communicating potential health effects, outcomes, and control measures to all stakeholders (i.e., commanders, supervisors, AF personnel). It provides detailed information about the HRA and should occur throughout the HRA process.

1.4.7. Exposure Assessment. An exposure assessment is a process of estimating or calculating potential exposure of a health threat for an individual or population at risk. The assessment includes professional judgment, calculations based on estimates or models, actual measurements, collection and analysis of samples, and statistical evaluation. Previous estimates of exposure from similar operations (whether co-located or not) should also be considered.

1.4.8. Toxicology Assessment. Process of estimating the human toxicological impact of a specific material based on published and unpublished literature sources and taking into consideration: uptake, metabolism/biotransformation, transport and storage, and excretion including acute (short-term) and chronic (long-term) human health endpoints.

Chapter 2

HEALTH RISK ASSESSMENT AND MANAGEMENT OPERATIONAL CONTEXT

2.1. Health Risk Assessment.

2.1.1. Health threats must be identified and analyzed within the operational context (i.e., specific missions or operations, geographical location, populations at risk, and time periods). Key points regarding operational context include (but are not limited to):

2.1.1.1. Type of mission.

2.1.1.2. Living conditions (e.g., field, hardened facilities, hotel).

2.1.1.3. Geographical location and conditions (e.g., temperature, humidity, altitude).

2.1.1.4. Threat characteristics (e.g., toxicity, volatility, transmissibility, communicability).

2.1.1.5. Exposure parameters (e.g., pathway, frequency, duration, concentration, exposures from unrelated activities).

2.1.1.6. Personal protective equipment or individual protective equipment (e.g., mission oriented protective posture).

2.1.1.7. Length of deployment and employment (both CONUS or OCONUS).

2.1.1.8. Medical treatment sources (e.g., US forces, coalition, local, non-governmental organizations).

2.1.1.9. Response capabilities.

Operational Context

Scenario 1: Depot Maintenance

The demand for operational aircraft in the area of responsibility is high; therefore, the Air Logistics Center is requiring "24/7" operations. This increase in work hours necessitates the health risk assessor to consider different potential exposure scenarios (i.e., exposure duration) and the effect on workers. In addition, the need to ensure minimal interference with work practices is paramount with the requirement to "turn" aircraft back to the war fighter.

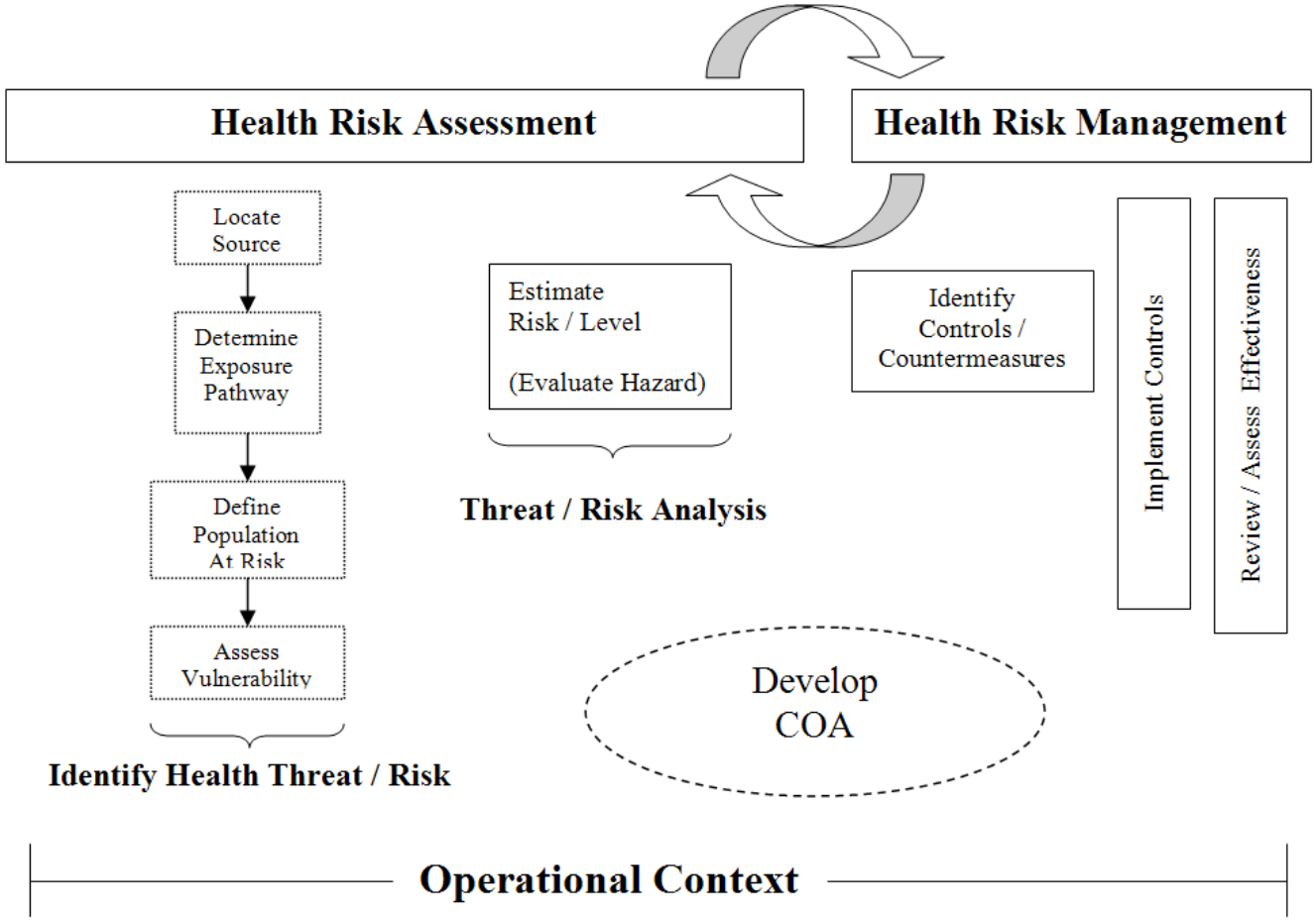
Scenario 2: Biological Warfare Attack

The wing commander's primary objective is to generate aircraft sorties; therefore, keeping flight line personnel in maximum protective equipment after attack may not be feasible. The goal of the health risk assessor is to balance the operational objective(s) with the need to protect personnel.

2.1.2. The HRE or level (extremely high, high, moderate, or low) of the health threat is determined prior to factoring in ancillary risks or transferred risks created with the implementation of controls or countermeasures (such as a safety risk created due to personal protective equipment). However, factoring in the operational context reduces the chance of the HRE over/underestimating the probability and severity (e.g., the probability may be influenced by exposure to an individual vs. a population). This factoring should not negatively influence the HRE; but facilitate COA development with an accurate HRE. The inclusion of the operational context also minimizes passing a single data point to the commander without a COA that does not benefit nor support the mission or operations.

2.1.3. HRAs are to be updated as new information becomes available which may modify the COA and specific recommendations; therefore, the push and pull of information affects the HRA and HRM decisions. Significant changes in operations (e.g., different mission parameters creating new exposure pathway and ineffective control) drive the need to review the HRA COA. Since ORM is cross-functional, if the HRA identifies safety or environmental risks, there is an inherent responsibility of the health risk assessor to identify these risks to other functionals.

Figure 2.1. Health Risk Assessment and Management Relationship



2.2. Health Risk Management.

2.2.1. Commanders will determine which control options will be implemented based on mission requirements and resources. As previously stated, it is imperative to factor in the operational context while performing the HRA and either developing or assisting with the development of the COA. In determining control options, engineering controls are the preferred option over protective equipment as in the traditional occupational health program; however, providing control options that are not feasible does not support the commander's objective of completing the mission. Commanders may select a COA to immediately reduce the risk to a certain level while meeting mission requirements, with the intent to provide more definitive controls once limitations from resources or current operational plans are resolved.

2.2.2. Control options implemented should be evaluated for their effectiveness in controlling the risk after a specified time period and their potential to create ancillary or transferred risks. The operational context may influence the evaluation; therefore, consider it during COA development.

Chapter 3

HEALTH RISK ASSESSMENT EXECUTION

3.1. Identifying Health Threats.

3.1.1. Determine whether a potential or existing exposure poses a health threat to a specified population during a specified period and location. It is critical to understand the duties of the populations and sub-populations.

3.1.2. Health threats include the following (but are not limited to):

3.1.2.1. CBRN agents and materials. CBRN in this context includes "traditional" hazardous materials, TIC/TIM, and infectious diseases.

3.1.2.2. Physical hazards (e.g., heat stress, noise).

3.1.2.3. Animals and plants.

Health Threat Integration

Scenario 3: Corrosion Control Facility Operations and Threats

Aircraft corrosion control activities (i.e., de-paint and paint processes) present multiple threats. Bioenvironmental Engineering identifies, evaluates, and recommends controls for chemical health threats or hazards; Safety identifies and controls "slips, trips, and falls"; and Civil Engineering evaluates and controls environmental issues associated with volatile organic emissions and hazardous waste disposal. Functional experts provide the commander threat information through risk assessments and the commander focuses on completing operations required to refurbish the aircraft. The commander is responsible for integrating different risk assessments into a single COA to successfully execute and complete the mission.

Providing the commander or decision maker a HRA positively affects operational-related decisions on depaint/paint tasks. The commander's ORM will factor in the health risk(s) and make the appropriate decision(s) based on the mission imperative.

3.1.3. Determine the potential or actual health threats to the population at risk without consideration of countermeasures or controls necessary to reduce the health threat (inherent ability to cause harm).

3.1.4. Assess the vulnerability for each potential health risk identified. This step in the sequence is essential in focusing resources on credible health threats and not tracking or assessing threats with minimal or no impact to the mission, operations, or personnel.

3.2. Analyzing Health Threats and Risks.

3.2.1. Place the health threat into the context of the mission and operational requirements (e.g., support of sortie generation, initial bed down of forces, acceptance of follow-on forces, emergency response, OEH compliance) to influence the COA. HRAs may require quick reactions and recommendations based on limited information. Using available information to develop a COA is considered better than providing no COA when uncertainties exist; however, professional judgment must be exercised when minimal data exists. It is the commander's decision to accept, reject, or attempt to control a health risk.

3.2.2. Determine why the health threat is a potential or actual problem (e.g., Can it cause immediate or long-term health consequences? Does the threat impact operational capability or is it a nuisance?). Identify other potential threats surrounding the problem and involve other functional areas such as intelligence for CBRN threat analysis, PH for infectious disease threats, or pest management for vector threats. Determine if the potential for exposure changes due to contributing factors such as weather, movement of personnel into other locations, or working between several shops while performing similar functions.

3.2.3. There are numerous factors to consider during the analysis when determining health impacts.

3.2.3.1. Determine how the health threat affects personnel, mission, and operational requirements. Discuss the risk and the consequences of accepting or controlling the health risk with commanders.

3.2.3.2. Consider how the health threat will affect the mission, personnel, or other populations over a period of time if the health risk is accepted. Determine the adverse health effects and whether the effect is imminent, delayed, or reversible.

3.2.3.3. Identify plausible outcomes associated with exposure levels as identified by the exposure assessment. The exposure assessment is completed by comparison to a standard as conducted in traditional industrial hygiene or environmental health activities. If a standard is not available, a qualitative exposure assessment should be completed based on available information or communicated within the context that no standard is available to quantify or better qualify the exposure assessment.

3.2.3.4. Collect qualitative data through observations, discussions with personnel (e.g., unit commanders, host nation personnel, intelligence officers, etc.), questionnaires, and surveys (e.g., previous illness accounts, environmental contamination reports).

3.2.4. Provide recommendations to commanders regardless of whether a standard exists. Decision-makers require recommendations to minimize the health threat(s) identified. Negligible health threats will be briefed to the chain-of-command at the appropriate times dictated by operational tempo and available resources.

3.2.5. Determine the HRE by estimating the probability and severity of the health threat.

3.2.5.1. The probability of the health threat should be estimated in terms of how often the event is expected to occur such as frequently, likely, occasional, seldom, or unlikely (**Table 3.1.**, "Probability" column).

3.2.5.2. The severity of the potential health threat should be estimated in terms of its potential impact (catastrophic, critical, moderate, or negligible) on personnel and the mission (**Table 3.1.**,

"Severity" row). The severity declaration of the estimate includes factoring in whether completion of the pathway causes a health outcome (e.g., cell damage from radiation exposure). The health risk assessor needs to initially distinguish between the individual and the mission when calculating the severity.

3.2.5.3. These two estimates (probability and severity) form the HRE, which is represented as a relative risk level (extremely high, high, moderate, low) (**Table 3.1.**, column and row intersects). The HRE provides a common format for determining which health risks may have the greatest impact to the individual and mission. There are other processes or estimating conventions (e.g., DoDI 6055.1, *DoD Safety and Occupational Health (SOH) Program*, Enclosure 7) that assist in deriving severity and probability based on known data (e.g., concentration greater than the action level). If another process provides greater fidelity in determining those categories, ensure the application is appropriate and translate the output into the commander's ORM format. Document use accordingly.

Table 3.1. Health Risk Estimate Matrix (adopted from AFPAM 90-902).

			Probability				
			Frequently	Likely	Occasional	Seldom	Unlikely
Severity	Catastrophic	I	Extremely High	Extremely High	High	High	Moderate
	Critical	II	Extremely High	High	High	Moderate	Low
	Moderate	III	High	Moderate	Moderate	Low	Low
	Negligible	IV	Moderate	Low	Low	Low	Low

Risk Estimate/Level

3.2.6. Commanders can assist in qualifying the risk by providing information such as the number of personnel required to perform a task or activity. This type of information is beneficial to characterize the health risk. For example, the functional will not be able to perform mission essential tasks if one of the three individuals assigned is not available due to injury, illness, or death. Although this is a HRM decision point, the health risk assessor factors in this data when developing the COA if this type of information is presented during COA development.

3.2.7. Professional judgment is necessary in determining which assessment method(s) (e.g., quantitative or qualitative; estimates, measurements, or models) to use and to what extent previous results from similar operations should be used to represent an assessment of current threats.

3.3. Accounting for Uncertainties or New Data and Information.

3.3.1. Account for uncertainties to include direct and indirect exposures, exposure dose, frequency, duration, and susceptible and sensitive populations. Catalog these or use them as a filter to interpret results.

3.3.2. Key areas that need to be considered (adapted from US Army Center for Health Promotion and Preventive Medicine, Technical Guide 248):

3.3.2.1. Sampling or data quality.

3.3.2.2. Actual exposures of personnel.

3.3.2.3. Unit attributes (e.g., demographics, activity patterns (i.e., troop movements and actions).

3.3.2.4. Comparability of standard guideline assumptions (e.g., exposure duration and frequency) to expected field exposure patterns.

3.3.2.5. Expected symptoms of exposure (i.e., hazard severity), including consideration of exposure to multiple hazards.

3.3.2.6. Whether the predicted health outcome is plausible, given the weight of evidence or real-world experiences.

NOTE: Paragraph **3.4.** is included in this chapter due to its relationship with analyzing threats and developing the COA, but is a component of HRM.

3.4. Recommending Control Options.

3.4.1. Determine options for controlling or reducing the health risk, ancillary risk, or transferred risk. Options may include immediate, short, or long-term mitigation. The term "control" in this section is used to convey control, reduction, or mitigation of the health risk.

3.4.2. Develop one or more options for control or countermeasures that either eliminate the risk or reduce the probability or severity. Identify resources needed to control the risk, working with available assets as much as possible. Include commanders in determining feasible control options or whether the impact of the risk is acceptable. Discuss with other functional areas to identify and deconflict control options.

3.4.3. Consider the following issues when determining control options and include in the COA, or internally document answers as a part of the decision-making record:

3.4.3.1. Does controlling the health risk transfer the risk to another population or increase another health risk (e.g., reducing the risk of mosquito-borne diseases by spraying pesticides may increase the risk of exposure to pesticides)?

3.4.3.2. Does accepting the health risk transfer the risk to another population or delay the effects in the exposed population (e.g., latent illness such as an exposure to a carcinogen due to environmental contamination)?

3.4.3.3. Does controlling the health risks also coincidentally reduce another risk?

3.4.3.4. Do the control measures reduce the risk with the expected benefits (i.e., how effective will the controls be in mitigating the risk?)?

3.4.3.5. Are resources to control the risk available and is implementation of the control measure timely and easy?

3.4.3.6. What is the impact on personnel and mission objectives given the health risk, ancillary risk, and recommended controls?

3.4.3.7. Have other functional areas provided input on how the health threat and control options impact other operational threats or activities?

3.4.4. Determine and discuss the level of acceptable risk and the trade-offs for controlling or not controlling the risk.

Health Threat Identification, Analysis, and Control Recommendation

Scenario 4: Drinking Water HRA

During weekly drinking water sampling of the base distribution system, 10 of 15 samples resulted in positives on the Colilert test. The positive samples are random throughout the distribution system (adequate sampling techniques were used). BE notified CE utilities shop of the sampling results and the shop found the chlorinator off line for at least 24 hours. Whether or not the chlorinator was intentionally or accidentally damaged could not be determined.

The primary missions of the base are to fly 12+ hour combat sorties and to maintain security at a weapons storage area. The average ambient daytime temperature is 105^{o} F for this time of year in an arid environment--heat stress is a major concern. Parts to fix the chlorinator will take 3 days to arrive and an alternate drinking water source is not available for over 12 hours.

Initially, the drinking water appears to be contaminated with a form of E. coli. Incubation periods, effective dose of the organism and effectiveness of prophylaxis are per the coliform type. The incubation periods range from 0.5 to 10 days and the most common type coliform incubation period is 2 to 4 days.

It will take a minimum of 48 hours to speciate the organism if the needed equipment and expertise is available. The presumed effective dose for the most virulent species is 10 organisms with a 10-day incubation period. The most virulent type organism is linked with animal wastes with surface water sources around farms. The most common species have a presumed effective dose of 10M organisms.

Ciprofloxacin is an effective prophylaxis; however, if the organism is the most virulent species then the medication may cause a hemolytic reaction (especially in the very young and very old populations). The clinic has 50 doses of ciprofloxacin on hand and can receive 50 more doses in 12 hours and 1,000 doses in 24 hours.

The following health risk assessor issues/questions are notional and are not comprehensive, but represent an approach of a health risk assessor. The commander’s issues/questions are also notional, and represent the types of questions commanders may ask in order to provide anticipated needs.

Health Risk Assessor:

*Identify Health Threat (**Figure 2.1.**)*

What is the potential or actual health threat?

What population is at risk?

What tasks will be accomplished regardless of potable water?

What other functionals can assist with health threat validation and control options?

Will the exposure pathway be completed?

*Estimate Risk (**Figure 2.1.**)*

What is the potential impact to the mission?

What is the HRE based on the task scenario?

*Recommend Controls / Countermeasures (**Figure 2.1.**)*

Are there control options for this scenario?

Are there countermeasures and what is their probability for effectiveness?

Are there ancillary or transferred risks pending control recommendations?

Commander:

What tasks need to be accomplished to support the mission?

What is the mission impact due to non-potable water?

Is there a vulnerability on the site?

Is the broken chlorinator an act of terrorism?

Is the risk acceptable in drinking potentially contaminated water?

Increased risk of heat stress with a reduced intake of fluids for aircrew, ground crew and security forces in the weapons storage area

Is the sortie priority greater than the health risk of exposure?

What control options need to be implemented to mitigate the risk?

Who receives medical countermeasures (i.e., limited doses of medication)?

When does the HRA need to be reaccomplished?

3.5. Communicating Health Risk Assessment Results.

3.5.1. Communicate the HRA for integration with other operational risks.

3.5.2. Ensure qualitative and quantitative data is translated into understandable information for commanders and depicts the estimated health risk in relation to the mission. For example, if the risk is “one in a million” for the general population, then put the risk into the operational context for the true

population at risk such as "there is an increased risk of cancer as a long-term health effect for exposed personnel."

3.5.3. Anticipate the issues and questions the chain-of-command may have and provide the implications of the health risks based on knowledge and scientific evidence. When communicating health risks in a public forum or through the media, ensure collaboration with Public Affairs and PH. Provide recommendations on when the public should be notified of the identified health risk and the associated impacts to the base populace and community.

3.5.4. Use caution when comparing risks. This includes 1) comparing which risk is greater between estimates from multiple scenarios and 2) the operational risk of factoring in/not factoring in the health risk COA due to resources (e.g., the cost of implementing the controls versus not implementing the controls). Programs and projects are funded based on the mitigation of the risk and the base's ability to sustain the program or project.

Health Threat Identification, Analysis, and Control Recommendation

Scenario 5: Securing an Airfield

The mission is to secure a remote airfield. If the enemy succeeds in establishing a defensive fighting position, thousands of lives will be lost. Time is critical. The commander has the choice of two routes to reach the airfield. One is a rugged road that poses a threat to the mission because of potential vehicle rollover, mechanical failure, and other terrain impacts on vehicles. The other route is paved but goes by a chemical plant that has structural damage due to a friendly strike and may be leaking a chemical. Chemical X causes irritation of the mucous membranes and respiratory system, headaches, and nausea that could impair the function of the troops. In addition, the chemical X is associated with potential long-term health effects. The commander needs to know the potential terrain risks versus the chemical risks to the unit. For the terrain risks, the commander will be provided with a risk assessment of whether enough vehicles will be disabled during the rugged terrain crossing such that an insufficient number of troops and equipment will be able to reach and secure the airfield. For a comparable HRA of chemical X, a HRA is needed on whether the exposure incurred by passing the chemical plant will disable enough troops to the extent they could not perform their duties. The chemical HRA may not be comparable to the terrain assessment, because the relevant exposure guidelines for chemical X will not be a casualty estimate but a health protective guideline. The short-term guideline for the chemical will define a level at which respiratory irritation, headache, and nausea would begin to occur, and using that as a benchmark in conjunction with the risk-assessment matrix, would result in overestimating the risk that chemical X poses to the mission. In addition to the assessment of risks to the mission, the commander will also need to be informed of the long-term health risks posed by the chemical.

The following COA issues are notional and not comprehensive, and represent questions that require answering in order to present a suitable COA to the commander.

What HRA inputs into the COA need to be considered?

- Is the health threat validated?
- Will the exposure pathway be completed?
- Is an exposure assessment possible?
- Does the incapacitation estimate impact defense of the airfield (w/o IPE)?
- Are there controls available to mitigate exposure?
- Does IPE mitigate the exposure?
- Are there countermeasures available if exposure occurs?
- Are there other avenues to minimize exposure?
- Are there ancillary or transferred risks based on control options?

What COA needs to be presented to the commander?

- Health risk is/is not validated.
- HRE is/is not accurate based on available information.
- Control recommendation is/is not feasible.
- Uncertainties do/do not exist.
- Mission impact is/is not significant based on control or IPE implementation.

Chapter 4

HEALTH RISK MANAGEMENT

4.1. Health Risk Management Interface.

4.1.1. HRM and ORM decisions are based on operations and scenarios; therefore, a HRA may provide a COA that interferes with mission objectives. Decisions that include differing objectives, knowledge, and perceptions of those affected by the decision (i.e., workplace supervisors, unit commanders, personnel, safety, and other functional areas) may appear to disregard the HRA; however, it is the responsibility of the commander to deconflict competing risks. Commanders will determine if a risk will be accepted or controlled and what tradeoffs are necessary. The health risk assessor must expect tradeoffs as the chain-of-command determines the priority of the controls to be implemented, if any. BE's responsibility is to complete the HRA without bias and clearly communicate the health risks and recommendations. If recommendations are modified or are not accepted, continue to evaluate the current situation, update the HRA as new information becomes available, and communicate increases or decreases in risk to the appropriate level within the chain-of-command.

4.1.2. Part of the HRA may include a cost-benefit analysis for the commander. Ensure this analysis is clearly understood and can be defended at a later date, particularly, if a long-term health risk was accepted to accomplish the mission at that time.

4.1.3. Decisions on COAs may be influenced by indirect health-related considerations (i.e., OSHA compliance). Noncompliance with various requirements, when a health risk is minimal, is an option depending on the operational context; however, commanders must understand the implications and select COAs accordingly.

4.2. Implementation of Controls.

4.2.1. Commanders mitigate risks and impacts on the mission by implementing controls and countermeasures. At the same time, commanders accept ancillary risks and impacts on the mission, if any, by implementing controls or countermeasures. Establish a clear assignment of accountability to implement, monitor, and identify controls. If controls are found to be inadequate, redirect resources to control the health threat or re-evaluate the risk. Ensure the health risk is prioritized again with the mission and operational requirements when reimplementation of a control is necessary.

4.2.2. Various stakeholders will perceive risks and the controlling of risks differently; therefore, it is important to anticipate any negative outcomes due to perceptions of the health risk within the population at risk, surrounding populations, or other individuals.

4.3. Review and Assess.

4.3.1. Those responsible for the review process need to determine whether the risks and mission are balanced and continually evaluate the effectiveness of the controls as well as transfer of risks. BE will be available to assist the commander in adjusting the balances if required.

4.3.2. Monitor controls periodically to ensure the controls are mitigating the risk.

4.3.3. As new information becomes available (e.g., sampling data), update and re-evaluate health threats and update the HRA.

4.4. Documentation. Ensure decisions to accept or control the health risk are documented. In addition to conducting HRAs, OEH exposure and sampling data must be linked to exposed personnel and documented for future analyses. PRD-5 requires DoD "to establish mechanisms to collect and maintain military personnel data, including demographic and occupational data, and longitudinal records of service members' military experiences, including pertinent data on OEH exposures and events." These procedures are described in AFI 48-145, *Occupational and Environmental Health Program*, AFI 48-120, *Deployed Health Surveillance*, and AFMAN 48-146, *Occupational and Environmental Health Program and Information Management* when published.

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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

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Abbreviations and Acronyms

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFMOA—Air Force Medical Operations Agency

AFMS—Air Force Medical Service

AFPAM—Air Force Pamphlet

AFRMIS—Air Force Records Information Management System

ANG—Air National Guard

BE—Bioenvironmental Engineering

COA—Course of Action

CONUS—(In) continental United States

CBRN—Chemical, Biological, Radiological, and Nuclear

DOD—Department of Defense

HRA—Health Risk Assessment

HRE—Health Risk Estimate

HRM—Health Risk Management

OCONUS—(Outside) Continental United States

OEH—Occupational and Environmental Health

ORM—Operational Risk Management

OSHA—Occupational Safety and Health Administration

RDS—Records Disposition Schedule

PH—Public Health

TIC—Toxic Industrial Chemical

TIM—Toxic Industrial Material

TG—Technical Guide

Terms

Exposure Assessment—An exposure assessment is a process of estimating or calculating potential exposure of a health threat for an individual or population at risk. The assessment includes professional judgment, calculations based on estimates or models, actual measurements, collection and analysis of samples, and statistical evaluation.

Health Risk—Health risk equals threat "combined with" vulnerability (health risk = (threat) "and" (vulnerability)). A health risk is an identified health threat and the vulnerability of the population at risk of coming into contact (i.e., completion of an exposure pathway) with the health threat. The health risk is the site picture for the commander in relation to threats that may impact mission success.

Health Risk Assessment (HRA)—Health risk assessment is the process of identifying and analyzing or evaluating (exposure and toxicity assessments) OEH threats in populations or at locations over time (HRA = *f* [(health risk) "+" (HRE) "+" (COA)]). The HRA "product" is the validated health threat, qualified by the HRE, and the COA which includes overall mission impact, recommended control options, associated uncertainties, risk mitigation estimate(s), and a cost-benefit analysis if applicable.

Health Risk Communication—Health risk communication is the process of effectively communicating potential health effects, outcomes, and control measures to all stakeholders (i.e., commanders, supervisors, AF personnel). It provides detailed information about the HRA and should occur throughout the HRA process

Health Risk Estimate (HRE)—Health Risk Estimate is the probability and severity of loss from exposure to the health threat (Health Risk Estimate is a function of probability and severity when either or both increase the Health Risk Estimate increases). The Health Risk Estimate is also referred to as a health risk level.

Health Risk Management (HRM)—Health risk management is a decision-making process to evaluate and select COAs, minimize OEH risks, and maximize benefits for operations and missions. Health risk management is the health component of the ORM process and Health risk management recommendations and decisions are integrated into the commander's ORM decision-making.

Health Threat—Health threat is a potential or actual condition that can cause short or long-term injury, illness, or death to personnel. A health threat can be occupational or environmental in origin; internal or external to the installation; or continuous, intermittent, or transient, and includes enemy capability and intent.

Toxicology Assessment—Process of estimating the human toxicological impact of a specific material based on published and unpublished literature sources and taking into consideration: uptake, metabolism/ biotransformation, transport and storage, and excretion including acute (short-term) and chronic (long-term) human health endpoints.