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SECRETARY OF THE AIR FORCE

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Space, Missile, Command, And Control

SAFE-RANGE PROGRAM METHODOLOGY

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction, in conjunction with AFI 13-201, *Air Force Airspace Management*, implements AFPD 13-2, *Air Traffic Control, Airspace, Airfield, and Range Management*. It applies to all Air Force, Air National Guard (ANG), and Air Force Reserve Command (AFRC) Range Operating Agencies (ROA). It provides guidance on the SAFE-RANGE Program and training weapon safety footprints for air-to-surface ordnance delivery. AFI 13-212 is in three volumes: Volume 1, *Range Planning and Operations*; Volume 2, *Range Construction and Maintenance*; and Volume 3, *SAFE-RANGE Program Methodology.* This publication is influenced by the Paperwork Reduction Act of 1974 as amended in 1996. Maintain and dispose of records created as a result of processes prescribed in this publication in accordance with AFMAN 37-139, *Records Disposition Schedule.*

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

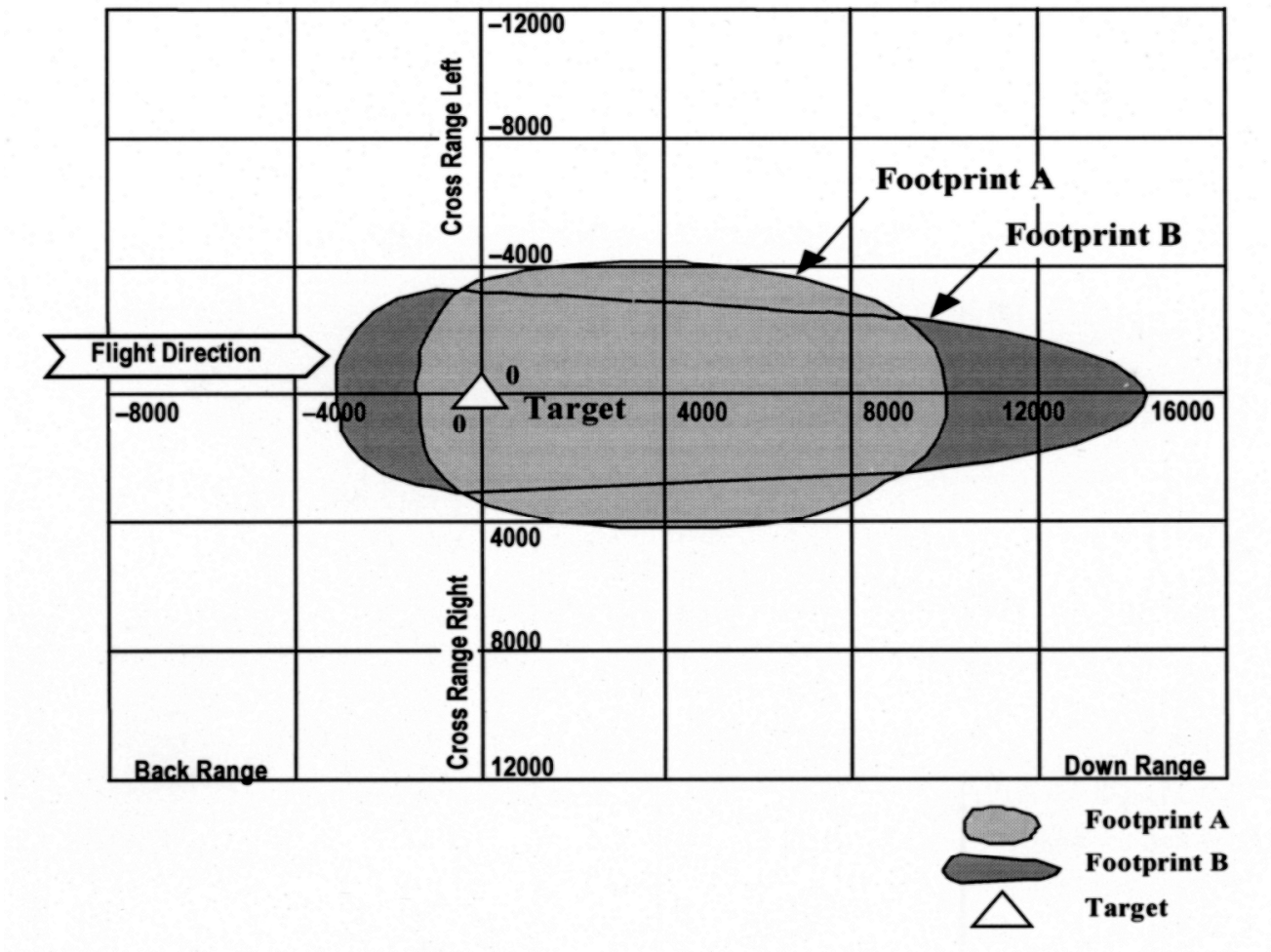
This revision of AFI 13-212 reflects a more integrated operational and engineering approach to range management and provides clearer guidance on roles and responsibilities in the management of Air Force range operations. The following is a change: the current list of approved mission and training weapon safety footprint parameters, without graphics, can be found on the ACC/DOR homepage.

Chapter 1

DEVELOPMENT PROCESS AND METHODOLOGY

1.1. Introduction. This instruction provides basic information about the SAFE-RANGE Program Methodology for the ROAs and other users. It explains the development process for training weapon safety footprints and the integration of these footprints with a range mapping system, which are parts of the SAFE-RANGE Program. This instruction is not intended to provide a complete tutorial of the footprint development process or to be a user's manual for the SAFE-RANGE Program. See **Figure 1.1.** for an example of a simple Composite Footprint.

Figure 1.1. Example of a Simple Composite Footprint.

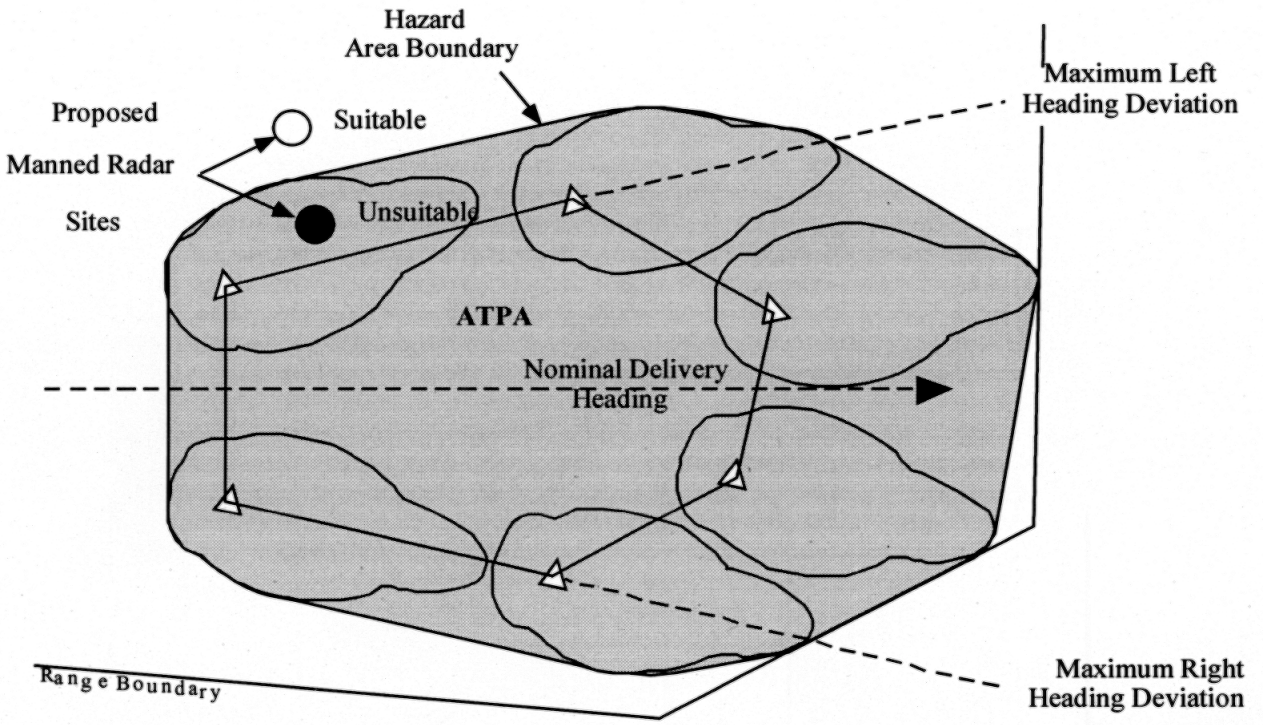


1.2. Background. The Air Force Comprehensive Range Planning process, as outlined in AFI 13-212, Volume 1, *Range Planning and Operations*, requires all ranges to address the issues involved in air-to-surface weapons operations. One of the principle objectives of this program is to identify problem areas or potential conflicts between Air Force range operations and other land users. The process is designed to assist the Air Force range planner in making informed decisions regarding the hazards to which land users are subjected due to Air Force operations and preserve USAF ranges.

1.2.1. Methodology. The methodology relies on the use of training weapon safety footprints that were developed from a combination of actual weapon impact data and simulation results. These footprints define the minimum land requirements needed to safely employ given munitions, from a specific type aircraft, at specified release conditions, over a variety of soil densities and target types.

1.2.2. SAFE-RANGE Program. The SAFE-RANGE Program helps the range planner identify possible target locations, modify allowable attack headings to eliminate hazards, identify the best location for range improvements, or design a new target area or range. To accomplish these tasks, the range planner must have a basic understanding of what a training weapon safety footprint is and how it was developed, as well as an established procedure for applying the footprints to address a potential land use conflict. See **Figure 1.2.** for an example.

Figure 1.2. Define a Range Hazard Area Using Example Composite Footprint.



1.2.3. SAFE-RANGE Program Defined. The SAFE-RANGE Program has two major components, the Footprint Impact Tool (FIT) and Range Information & Mapping (RIM). (FIT + RIM = SAFE-RANGE). FIT addresses the Training Weapon Safety Footprint Areas (WSFA) piece of the SAFE-RANGE Program methodology. FIT contains modules that model five different types of weapons. The modules: Guns, Bombs (gravity), Rockets, Precision Guided Munitions (PGM), and “Side Fire” (models weapons that are fired from side-delivery vehicles). Contained within the FIT program are the weapon algorithms, gross error rates, actual drop data and the simulations used to calculate the training WSFAs. The RIM piece allows the user to take the FIT developed training WSFAs and overlay them on a Geospatial Information System (GIS) which includes National Imagery Mapping Agency maps of various scales, as well as data overlays, which include geographic, cultural and other range related Areas of Critical Concern (ACCs), as well as range noise contour mapping functions and Laser Safety Footprints developed by the Brooks ORS Team.

1.2.3.1. FIT Defined. FIT allows the user to calculate forward and reverse engineered training WSFAs from previously certified and approved legacy training WSFAs. In the forward engineering mode, the user has the ability to choose range type (controlled, low threat, high threat), target type (hard or soft), soil type, aircraft dive/climb angle at release, altitude at release (feet--above ground level), aircraft heading and airspeed at release (knots indicated airspeed) within original user specified values. In the reverse engineering mode, the SAFE-RANGE Program outputs a unique training WSFA that fits on the specified range, given an unique: aircraft type, delivery type, employment parameters (to include aircraft heading/range of headings), a specific target and it's geographic relationship to the range boundaries. Additionally, the program factors in significant terrain features (e.g. mountains, hills, curvature of the earth, etc.), vegetation, soil type and other variables, which may affect the outcome of the training WSFA. As new weapons and tactics are fielded, ACC/DOR shall ensure the FIT program is appropriately updated.

1.2.3.2. RIM Defined. The primary function of RIM is to facilitate user manipulation of FIT developed training WSFAs on GIS maps. RIM graphically shows the training WSFA coverage and permits their manipulation on ArcView, ArcIMS, and Falcon View digital maps. The FIT/RIM map interface also supports all SAFE-RANGE Program functions to include the percent probability of hazard on any user-defined area or point within the training WSFA contour. RIM also supports the Military Operating Area (MOA) Range NOISEMAP (MR_NMAP) and NOISEMAP programs to analyze subsonic aircraft noise impacts in special use airspace and restricted areas, and MicroBNOISE to develop blast noise contours for ordnance delivery. Finally RIM integrates the Laser Safety Footprint program developed by the Brooks ORS Team into the SAFE-RANGE family of capabilities. The Laser Safety Footprint Program has two modes; ground-to-ground and air-to-ground footprint generation.

1.3. Training Weapon Safety Footprint Development Process . The footprint development process begins with the collection of the raw data from the available sources. Data sources have historically included actual impact data from the Red Flag Database, the Precision Guided Munitions Database, Primary Training Ranges, Combat Readiness Training Centers, and simulations that are used to fill in data voids. The collected data is then analyzed and sorted into individual databases to match aircraft type, delivery parameters, weapon type, and delivery tactics from which the footprint is developed.

1.3.1. Data Calculation. Using this collected data, the initial impact statistics can be calculated for both down range (long and short) and cross range (left and right) errors. The data is treated in this manner to allow for the bimodal nature of the errors as discussed in the Joint Munitions Effectiveness Manual (JMEM). The statistics of interest are generally the mean and the standard deviation. Given these statistics, it is possible to match the actual distribution of the raw initial impact data. This distribution is then simulated to develop a database of ricochet impacts based on the initial impact condition of the weapon and the target/terrain type for which the footprint is being developed. Ricochet impact points are developed using simulation since actual ricochet impact points are rarely plotted in a training environment.

1.3.2. Ricochet Impact Points. Once the ricochet impact points are simulated, it is possible to develop the distribution statistics for the combined initial/ricochet impact database. Using the combined statistics, it is now possible to develop the footprint parameters of interest.

1.3.3. Historical Data. Training weapon safety footprints are generated from a combination of historical and computer simulated impact data for a specific weapon delivery event (e.g. aircraft type,

weapon type, delivery tactic, threat environment, target type, soil type, etc.). The actual size of the footprint is driven by the magnitude of weapon ricochets and gross error impacts. However, ricochet impacts are almost never recorded and are not a part of the historical record. Gross error impacts, which occur infrequently, are often not seen, not recorded, or haven't yet occurred during the historical data acquisition period. Since estimates for this data are essential for the development of training weapon safety footprints, these data voids must be filled by simulating the entire weapon delivery process. The simulation process used employs statistical models that account, in both frequency and magnitude, for all of the aircrew, delivery system, and weapon system errors that can occur. It represents the deterministic portion of the weapon delivery process with a fidelity commensurate with the desired accuracy of the footprint. The simulation-derived, random variables are combined with the historical data to generate a weapon impact point sample that represents a ten to fifteen year period of operation. Generation of a sample of this size and in this manner assures that both the ricochets and the infrequent gross errors, along with the good drops, are adequately and accurately represented so that statistically valid inferences about the footprint can be made. The inference, which is made, is that the footprint will contain at least 99.99 percent of the specific weapon delivery event impacts plus ricochets at a 95 percent confidence level.

1.4. SAFE-RANGE Program Application. The SAFE-RANGE Program provides the ROA with a defensible basis for making range planning decisions that promote safe operations. It is designed primarily to identify and avoid land-use conflicts and minimize hazards. The methodology is a step-by-step procedure to determine the impact point and hazard levels. The results are displayed in a graphic format and can be used in the development of the Comprehensive Range Plan. The actual calculations are accomplished by the FIT Program and then overlaid on GIS maps by RIM. These programs use the range geographic database and the training weapon safety footprint database to perform all calculations. The methodology can be used to address the following types of range problems:

Assessing the adequacy of range land areas to support current and future missions.

Identifying permissible weapon-tactic combinations for a given range area or target.

Identifying any land-use conflicts for a specific range or mission.

Identifying suitable locations for range facilities such as instrumentation sites, roads, and buildings.

Identifying alternatives to be used in resolving conflicts.

Identifying range boundaries for new ranges based on allowable target placement areas or conversely, identifying the allowable target placement areas if range boundaries are previously established.

1.4.1. Alternatives. When a range conflict or hazard is identified, the formulation and selection of alternatives may hinge on numerous factors in addition to safety and may require more detailed analysis. In cases where specific input data is missing, such as aircraft release altitude or airspeed, interpolation between or extrapolation beyond footprint parameters significantly lowers the level of confidence of the analysis. If footprints are not available for a particular CAF aircraft, weapon, or delivery tactic, the ROA should request new footprints through their appropriate CAF MAJCOM range manager to ACC/DOR. New requirements should not be levied until the footprints are available. Request any necessary waivers from USAF/XOOR until the footprints are established.

1.4.2. Application Overview. A step-by-step procedure for applying the training weapon safety footprints to range planning problems is presented below. **Figure 1.3.** through **Figure 1.7.** depict the decision matrix for applying the SAFE-RANGE Program methodology. The four top-level steps used to

determine the adequacy of a range or target to support a given mission are outlined as follows and are shown in **Figure 1.3.**

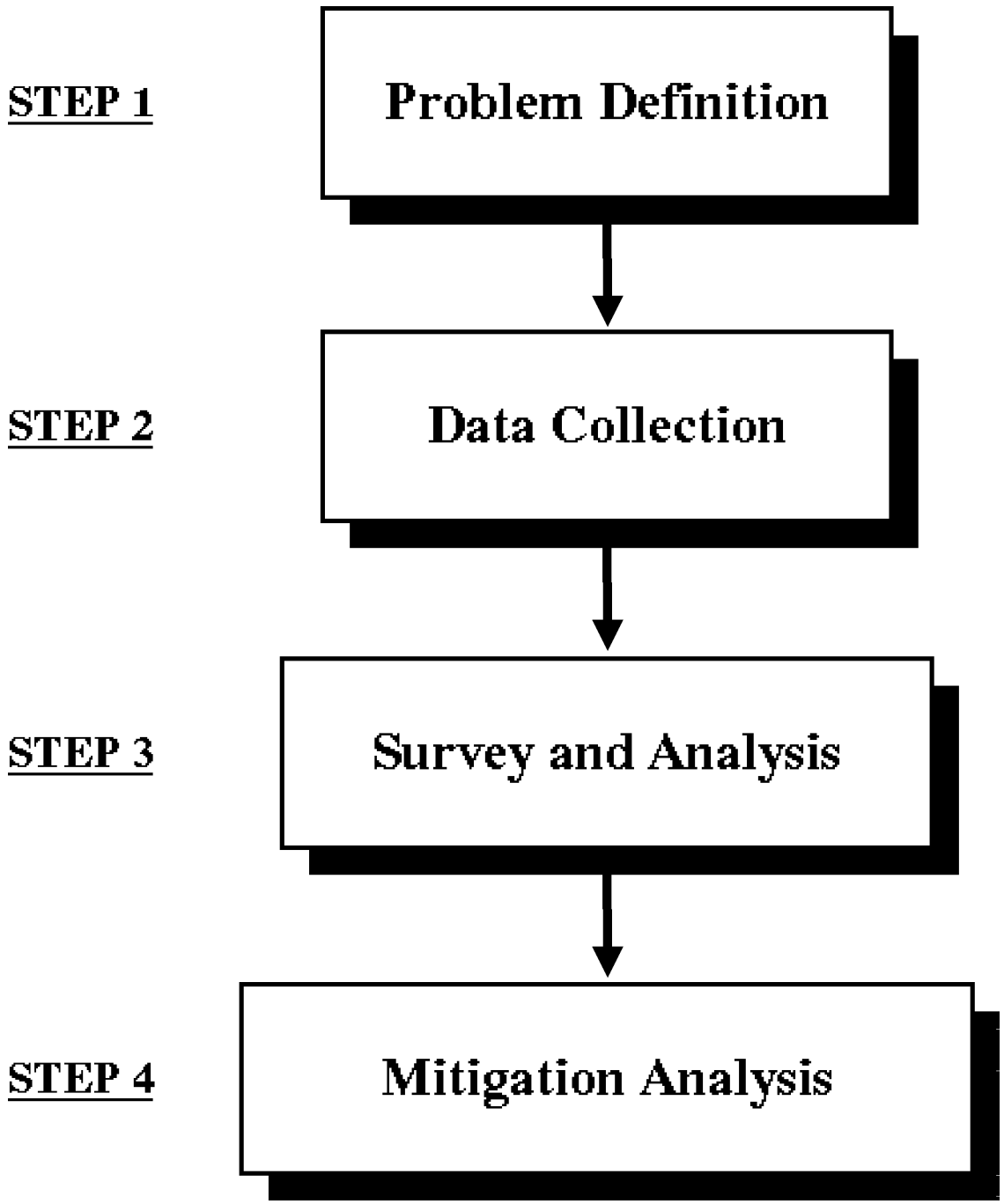
STEP 1: Problem Definition.

STEP 2: Data Collection.

STEP 3: Survey and Analysis.

STEP 4: Mitigation Analysis.

Figure 1.3. SAFE-RANGE Program Methodology Steps.



1.4.3. SAFE-RANGE Program Methodology Application.

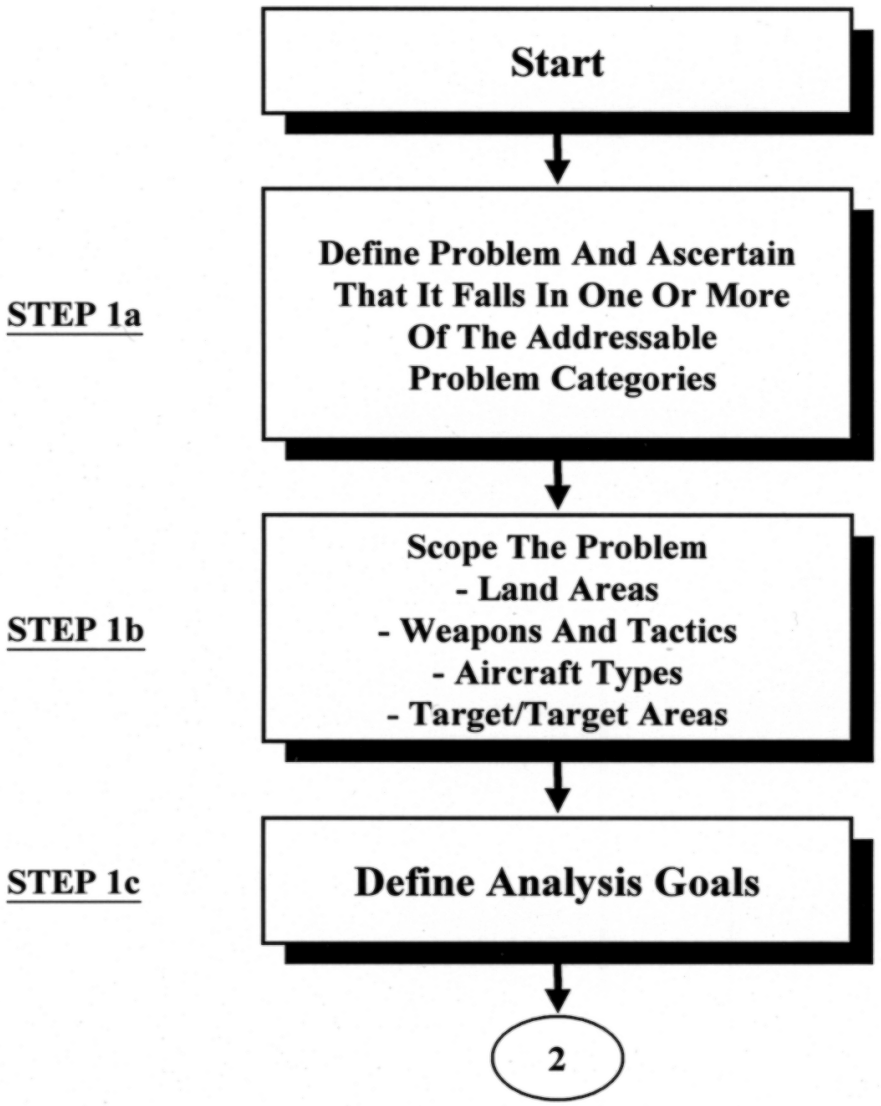
STEP 1: Problem Definition (Figure 1.4.).

Step 1a: Define the Problem. Define the problem and ascertain that it falls in one or more of the addressable problem categories.

Step 1b: Scope the Problem. Identify the land areas to be investigated, weapons and tactics to be used, aircraft types to be flown on the range, and the specific targets/target areas to be analyzed.

Step 1c: Define Analysis Goals. For example, an analysis goal may be to determine the allowable attack azimuths that will ensure that a specific manned emitter site will not be within the Hazard Area.

Figure 1.4. Problem Definition Steps.



STEP 2: Data Collection (Figure 1.5.).

Step 2a: Identify Data Requirements. Ensure the geographic database in the SAFE-RANGE Program is current and complete for the analysis to be performed. This includes range boundaries, roads, waterways, targets/target areas, and Areas of Critical Concern (ACCs) such as buildings, instrumentation, manned sites, and other assets of value. All ACCs need to have associated size, construction type, and cost data provided. Additionally, all information pertaining to the proposed mission or missions to be analyzed should be identified. All land use requirements must be identified for inclusion into the analysis. Land use may include commercial uses, such as grazing or forestry activities; recreational uses, such as hunting, hiking, camping, fishing, and use of recreational vehicles; and private use of lands adjacent to the range.

Step 2b: Request Data Through User Agencies. User agencies may include individual squadrons/ wings/MAJCOMs for weapons and tactics information, the parent base for range geographic data and maps, and the ROA for information on ACCs. Other user groups (federal, civilian, or military) may be able to provide data pertaining to other land uses such as commercial, recreational, or private.

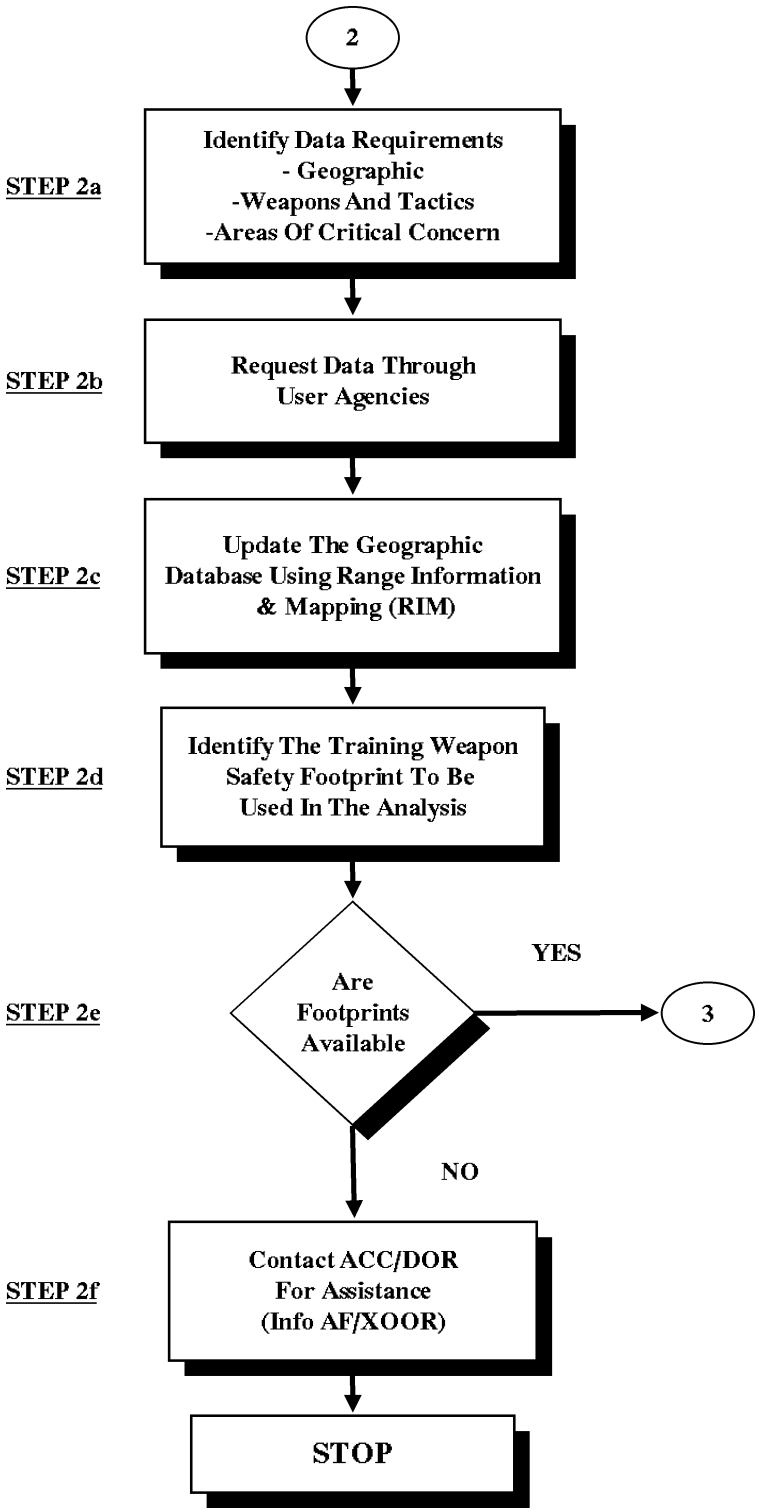
Step 2c: Update the Geographic Database Using RIM. The RIM Program is used to electronically modify and printout specific database layers to add new boundaries, roads, buildings, ACCs, and other geographic features. RIM allows the use of a mouse or digitizing board to update the geographic database from existing maps obtained from the user agencies.

Step 2d: Identify Training Weapon Safety Footprints to be Used in the Analysis. Based on the weapons and tactics data collected, identify the training weapon safety footprints to be applied. Footprints are available in the SAFE-RANGE Program (FIT) for specific aircraft, weapons, tactics, and range combinations.

Step 2e: Are Footprints Available? If the training weapon safety footprints are available in the footprint database, proceed to Step 3 and perform the Survey and Analysis steps using the SAFE-RANGE Program family of capabilities. If footprints are not available, continue to Step 2f.

Step 2f: Contact ACC/DOR for Assistance. If training weapon safety footprints are not available in the footprint database, the SAFE-RANGE Program methodology can not be used to perform the required analysis. Assistance will be required to develop the required footprint, or to perform additional analyses to evaluate and address the problem. Contact ACC/DOR (info AF/XOOR) for assistance and information on how to obtain the new footprints or analysis capability.

Figure 1.5. Data Collection Steps.



STEP 3: Survey and Analysis (Figure 1.6.).

Step 3a: Apply Footprints to Assigned Targets. Using the SAFE-RANGE Program (RIM), apply the identified training weapon safety footprints to the specific targets/target areas. The user may elect to

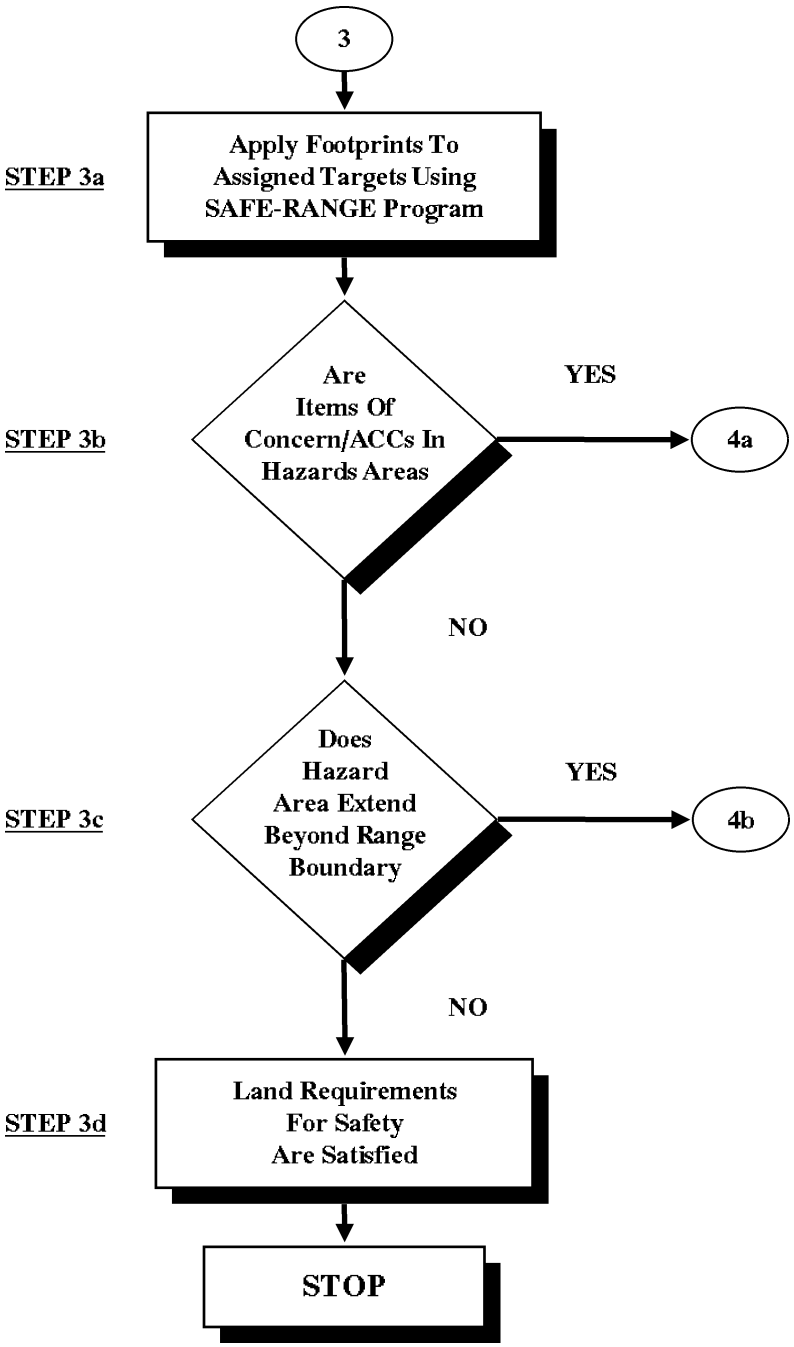
produce graphic outputs at this point to assist in evaluating the results of this step. Plots can be created directly from the SAFE-RANGE Program on several different output devices.

Step 3b: Are Items of Concern/ACCs in Hazard Areas? If so, proceed to Step 4a to investigate mitigation alternatives. If items of concern/ACCs are not in the Hazard Area, continue with Step 3c.

Step 3c: Does Hazard Area Extend Beyond Range Boundary? If so, proceed to Step 4b to investigate mitigation alternatives. If the Hazard Area is contained within the range boundaries, continue to Step 3d.

Step 3d: Land Requirements for Safety are Satisfied. The proposed event/target combinations analyzed satisfy the land requirements for safety and can be accommodated on the range. Analysis is complete at this time and no further action is required.

Figure 1.6. Survey and Analysis Steps.



STEP 4: Mitigation Analysis (Figure 1.7.).

Step 4a: Can Items of Concern/ACCs be Relocated to Resolve the Hazard? If so, proceed to Step 4g. If not, continue to Step 4b. Relocation of items of concern/ACCs involves moving the hazarded item such that it is no longer within the Hazard Area or the hazard is minimized.

Step 4b: Can Mission Parameters be Modified to Resolve the Problem? This can be done using the forward and reverse engineered footprint function in FIT. If so, proceed to Step 4h. If not, continue to Step 4c. Modification of mission parameters can include relocation of the target, changing the allow-

able run-in to the target, selection of a different set of release parameters, or accomplishing the required event on another range or target.

Step 4c: Calculate the Probability of Impact for Hazard Areas. In those instances where either moving the item of concern and/or modifying the mission parameter does not eliminate the hazard, the SAFE-RANGE Program can be used to calculate the relative risk for each item of concern and/or each off-range release. Based on these calculations, the range operating agency can make an informed decision on the acceptability of the hazard.

Step 4d: Is the Hazard Level Acceptable? If so, proceed to Step 4i. If not, continue to Step 4e. The decision of acceptable risk is the responsibility of each range operating agency and must satisfy established Air Force guidelines for safety.

Step 4e: Mission Cannot be Accommodated Safely. If the hazard level is not acceptable and no further changes to item of concern location and/or mission parameters is possible, then the mission cannot be accommodated safely. Further analysis may be necessary to determine other alternatives to solve the stated problem.

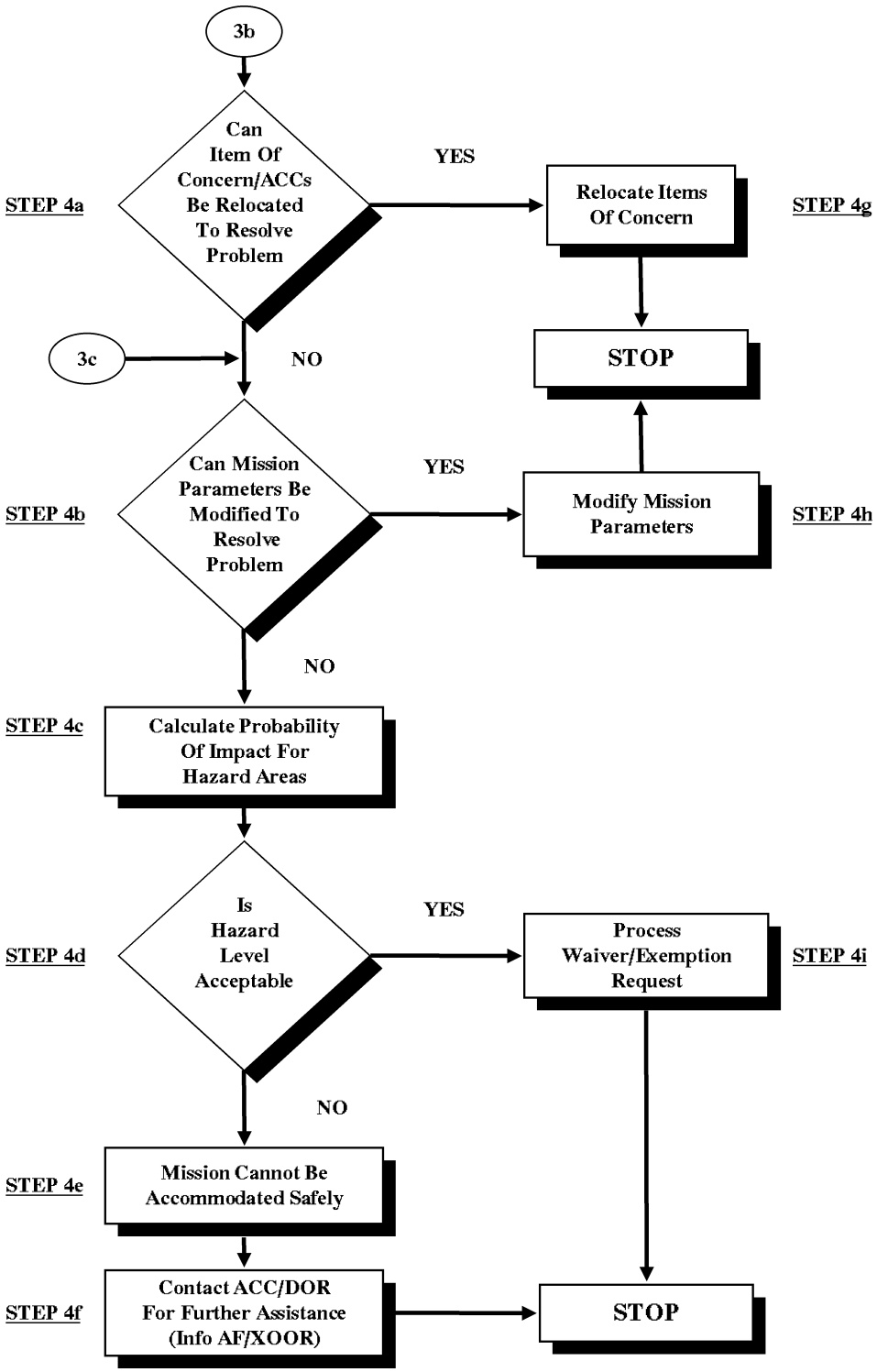
Step 4f: Contact ACC/DOR for Further Assistance. Further analysis and assistance can be obtained through ACC/DOR (info AF/XOOR) for a more in-depth analysis of the stated problem to determine if there are additional mitigating factors available beyond the scope of this methodology.

Step 4g: Relocate Items of Concern. If it is possible to move items of concern which are subject to hazards, it is suggested that the items be relocated and the new location be analyzed, using this same methodology for all allowable missions. Another option may be to provide the item of concern with some level of protection to minimize the hazard potential. This can be accomplished through the use of hardening techniques, a protective berm, or protective facilities. Each alternative must be evaluated using the SAFE-RANGE Program methodology to determine the relative risk for each option.

Step 4h: Modify Mission Parameters. If it is possible to modify the mission parameters, it is suggested that they be modified to either eliminate or minimize the hazard. Modification of mission parameters can include relocation of the target, changing the allowable run-in to the target, selection of a different set of release parameters, or accomplishing the required event on another range or target.

Step 4i: Process Waiver/Exemption Request. If the hazard cannot be eliminated, but the relative risk is deemed acceptable by the ROA, then the range must process a request for waiver or exemption. All requests must be processed in accordance with AFI 13-212 procedures.

Figure 1.7. Mitigation Analysis Steps.



1.5. Summary. The SAFE-RANGE Program methodology can be used to address a multitude of range problems when properly applied. In all cases, the user must understand the limitations of the methodology. If any problems arise during the analysis process that are not explained in this instruction, contact ACC/DOR for assistance.

Chapter 2

MISSION AND TRAINING WEAPON SAFETY FOOTPRINT PARAMETERS IN THE FIT PROGRAM

2.1. Footprint Information. This chapter outlines the terms used to identify and describe mission and training weapon safety footprint parameters and specifies where current FIT Program software and data is maintained.

2.2. Mission Parameters. The following mission parameters are used in the FIT Program.

2.2.1. Footprint Identification. This is the identification number assigned to each training weapon safety footprint found in the Index to Weapon Safety Footprints. The spreadsheet version of the Index is on the ACC/DOR homepage. Footprints in the FIT Program database use the same identification number.

2.2.2. Aircraft Type. If specific aircraft are listed, the footprint applies only to those aircraft. If "All" is specified, the footprint will be used for all tactical fighter/bomber aircraft operational, on or before, the date of this instruction.

2.2.3. Event Type. This is a description of the weapon delivery event as it is commonly known to Air Force flying, range, and staff personnel.

2.2.4. Weapon Type. This specifies the ordnance for the event. When the type of ordnance is described in the “Event Type”, this column specifies the size of the ordnance to clarify the specific ordnance item.

2.2.5. Range Type. There are three types of ranges considered when developing training weapon safety footprints.

2.2.5.1. Controlled Range. A controlled range has specified run-in headings and patterns, a capability to score events from the ground and a dedicated Range Control Officer (RCO). There are numerous visual cues to aid aircrews in identifying targets such as run-in lines, foul lines, plowed bomb circles, etc. A controlled range provides aircrews with basic proficiency in weapons delivery. Conventional and simulated nuclear ranges are examples of this type of range.

2.2.5.2. Low-Threat Tactical Range. Low-threat tactical ranges permit varied tactics and attack headings, and allow aircrews to operate under their own control or FAC control. There are limited visual cues to aid aircrews in identifying targets. Simulated enemy air defenses are limited or non-existent.

2.2.5.3. High-Threat Tactical Range. High-threat tactical ranges are similar to low-threat tactical ranges except they contain significant simulated enemy air defenses, which demand more aircrew attention during attack and weapons delivery.

2.2.6. Target Type. Targets are categorized as either soft or hard. Soft targets pose a minimal effect on ricochets and are located on or over a soft surface, such as soil. Examples are CONEX containers, aircraft wing tanks, targets constructed of wood, and vehicles with engines and transmissions removed. Hard targets pose a high potential for ricochets. Examples include tanks, runways, and vehicles with engines and transmission intact. A soft target located on a hard surface must be treated as a hard target.

2.2.7. Dive/Climb Angle. This specifies a range of dive or climb angles, in degrees, that make the footprint valid. A negative number (-) indicates the aircraft is diving toward the earth at weapon release. A positive number (+) indicates the aircraft is climbing away from the earth at weapon release.

2.2.8. Release Altitude (Ft. AGL). This is the aircraft's vertical distance, in feet, above the ground at weapon release. For strafe events, it indicates slant range, in feet, to the target when the cannon/gun is fired.

2.2.9. Release Speed (KTAS). This is the true air speed of the aircraft at weapon release.

2.3. Training Weapon Safety Footprint Parameters. The following training weapon safety footprint parameters are used in the SAFE-RANGE Program.

2.3.1. Long (A). This is the extent of the footprint down-range of the target, relative to the aircraft attack heading. See **paragraph 2.3.5.** for strafe events.

2.3.2. Short (B). This is the extent of the footprint short of the target, relative to the aircraft attack heading.

2.3.3. Cross (C). This is the extent of the footprint on either the left or the right side of the target area, relative to the aircraft attack heading, for footprints described by an ellipse. For footprints described by a cosine rose, it describes the left or right side of the initial impact portion of the footprint, relative to the aircraft attack heading, but not the ultimate left/right extent of the footprint. See "Maximum" explanation below on cosine rose footprints.

2.3.4. Maximum. This is the maximum extent of the footprint on either the left or the right side of the target area, relative to the aircraft attack heading. For footprints described by an ellipse, it will be the same as the "Cross" parameter. For footprints described by a cosine rose, it will be a larger number due to the dispersion characteristics of ordnance after initial impact. The “Maximum” parameter is not included in the Index to Weapon Safety Footprints because it varies between events with respect to the target location. See the individual footprint plots for application of the “Maximum” footprint parameter.

2.3.5. Runaway Gun Limit. This describes the down-range extent of the footprint altered by a runaway gun. This footprint parameter must be accommodated by available land space on the range and must be considered when planning roads, facilities, and other improvements. The “Runaway Gun Limit” parameter is not included in the Index to Weapon Safety Footprints. See the footprint plots for this footprint parameter.

2.4. SAFE-RANGE Program. The SAFE-RANGE Program is a Windows-based PC application designed to display training weapon safety footprints on air-to-surface ranges. The application contains training weapon safety footprint, ACCs, target, and geographic databases. After entering the application, by identifying a specific range, the user can model target/footprint combinations to determine specific safety concerns regarding weapons impacts.

2.4.1. SAFE-RANGE Program Software and Data. The SAFE-RANGE Program is available on the Air Force Research Laboratory (AFRL) SAFE-RANGE website. For quick reference, an excel spreadsheet containing the most current list of approved mission and training weapon safety footprint parameters without graphics can be found on the ACC/DOR homepage at

http://do.acc.af.mil/dor/dorrpage.htm. A link to the ARFL website can also be found on the ACC/DOR website.

2.4.2. Specialized Footprints. Specialized footprints for Air Force Special Operations Command (AFSOC) aircraft are available in the Sidefire program for the MH-53 and the Gunship Safety Footprint program for the AC-130H/U. These programs were developed IAW **paragraph 1.3.** at the 99.99% containment and 95% confidence level. The cognizant functional for these programs and the resulting weapon safety footprints is HQ AFSOC/DOXT, Hurlburt Field, Florida.

2.4.3. Other Footprints. Navy, Allied, and Low Density High Demand mission and training weapon safety footprint parameters are available through a link on the ACC/DOR homepage at **http://do.acc.af.mil/dor/dorrpage.htm.**

ROBERT H. FOGLESONG, Lt General, USAF
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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

NOTE: The user of this instruction is responsible for verifying the currency of the cited documents.

US Government Agency Publications

FAA Handbook 7610.4, *Special Military Operations*

FLIP, *Flight Information Publication*

Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*

Air Force Publications

AFDD 1-2, *Air Force Glossary*

AFPD 13-2, *Air Traffic Control, Airspace, Airfield, and Range Management*

AFI 13-201, *Air Force Airspace Management*

AFI 13-212, Volume 1, *Range Planning and Operations*

AFI 13-212, Volume 2, *Range Construction and Maintenance*

AFI 32-7061, *The Environmental Impact Analysis Process*

AFMAN 37-139, *Records Disposition Schedule*

Abbreviations and Acronyms

AAA—Anti-Aircraft Artillery

ACC—Air Combat Command

ACCs—Areas of Critical Concern

AFI—Air Force Instruction

AFM—Air Force Manual

AFPD—Air Force Policy Directive

AFRC—Air Force Reserve Command

AFREP—Air Force Representative

AFRL—Air Force Research Laboratory

AFSOC—Air Force Special Operations Command

AGL—Above Ground Level

ANG—Air National Guard

ANGRC—Air National Guard Readiness Center

ATC—Air Traffic Control

CAF—Combat Air Forces

CFA—Controlled Firing Area

DMPI—Designated Mean Point(s) of Impact

DoD—Department of Defense

EC—Electronic Combat

ECM—Electronic Counter-Measures

ECR—Electronic Combat Range

EIAP—Environmental Impact Analysis Process

ESS—Electronic Scoring Site

EW—Electronic Warfare

FAA—Federal Aviation Administration

FAC—Forward Air Controller

FAR—Federal Acquisition Regulation

FIT—Footprint Impact Tool

FLIP—Flight Information Publication

GIS—Geographic Information System

IAW—In Accordance With

IFR—Instrument Flight Rules

IR—IFR Route

JMEM—Joint Munitions Effectiveness Manual

KIAS—Knots Indicated Airspeed

KTAS—Knots True Airspeed

MAJCOM—Major Command

MOA—Military Operations Area

MSL—Mean Sea Level

MTR—Military Training Route

NEPA—National Environmental Policy Act of 1969

OPR—Office of Primary Responsibility

PDO—Publishing Distribution Office

PEM—Program Element Monitor

PGM—Precision Guided Munitions

RCO—Range Control Officer

RIM—Range Information & Mapping

ROA—Range Operating Agency

SAF—Secretary of the Air Force

SAM—Surface-to-Air Missile

SUA—Special Use Airspace

TP—Training Projectile

VFR—Visual Flight Rules

VR—VFR Route

WSFA—Weapon Safety Footprint Area

Terms

NOTE:
The purpose of this glossary is to help the reader understand the terms used in this publication. It does not encompass all pertinent terms. Joint Publication 1-02, *DoD Dictionary of Military and Associated Terms*, and AFDD 1-2, *Air Force Glossary*, contain standardized terms and definitions for DoD and USAF use.

Air Force Representative (AFREP) —An Air Force officer stationed at HQ FAA or a regional office and accredited by AF/XO to provide USAF representation to FAA on airspace/range and air traffic control matters.

Alert Area —Airspace designated to inform pilots of a high level of training activity or any unusual activity where prior knowledge would significantly enhance air safety. There are no restrictions placed on non-participating IFR or VFR aircraft.

Controlled Firing Area (CFA) —An area in which ordnance firing is conducted under controlled conditions so as to eliminate hazards to non-participating aircraft, and to ensure the safety of persons and property on the ground. Aeronautical charts do not depict CFAs.

Controlling Agency —Air Traffic Control (ATC) facility responsible for providing airborne control services in and around a designated airspace. With respect to a restricted area, the using agency may authorize transit through or flight within the restricted area according to a joint-use agreement.

Emitter, Simulator —Generic terms used to describe threat equipment operated at Electronic Combat Ranges (ECR) and Electronic Scoring Sites (ESS). However, ACC operates a variety of equipment including, but not limited to: Emitter only systems, Emitter-Receiver-Processors, and replica type systems. Carefully compare the similarities and features of different systems and consider operational requirements. Surface-to-Air Missile (SAM) and Anti-Aircraft Artillery (AAA) simulators include all manned and unmanned threat emitters.

Environmental Impact Analysis Process (EIAP) —The formal process, as outlined in the National Environmental Policy Act (NEPA), used to assess environmental impacts resulting from a proposed action.

Hazard Area —The area of a range defined by a composite of all weapon safety footprints for all authorized weapon delivery events, against targets located in a given sub-range or target complex. They encompass Target Areas, but do not include them.

Joint Use —With respect to ranges, Joint Use means other MAJCOMs or services may use, as long as they conduct operations IAW this instruction, as supplemented. With respect to range airspace, it means the use by civil or other military aviation when it is not active.

Major Command (MAJCOM) —A major subdivision of USAF assigned a major part of the Air Force mission. Major commands report directly to Headquarters United States Air Force (HQ USAF). The ANGRC/DO serves as the MAJCOM for Air National Guard ranges.

Military Operations Area (MOA) —Special Use Airspace allocated to the military to separate/ segregate certain military activities from Instrument Flight Rules (IFR) traffic, and to identify the location of these military activities to Visual Flight Rules (VFR) traffic. VFR aircraft are not restricted from transiting MOAs.

Military Training Route (MTR) —A low-level, high-speed training route established IAW criteria in FAA Handbook 7610.4, *Special Military Operations*. MTRs are used by DoD to conduct low altitude navigation and tactical training, in instrument and visual weather conditions, below an altitude of 10,000 feet MSL and at airspeeds more than 250 KIAS. Routes are established as IFR routes (IR) or VFR routes (VR). The FAA has approval authority to implement IRs and the appropriate MAJCOM approves VR implementation. Environmental documentation is required for implementation IAW AFI 32-7061. VRs are processed through the FAA via the AFREP. MTRs are published in FLIP AP/1B and charted on FAA Sectionals and DoD Low IFR charts. AFREPs assign all route numbers.

Ordnance

Training:

Boosted Munitions (forward firing)—Munitions such as the AGM-65 Maverick missile and the 2.75 folding fin rocket driven by propellant.

Full-scale Inert—Concrete-filled training bombs that match the full size and weight of the actual bomb. These bombs contain no explosives, pyrotechnics, or chemical agents.

Practice Bombs—Practice bombs may be full scale or miniature. Some practice bombs contain a small explosive charge or pyrotechnic that marks the point of impact with a small cloud of smoke or flash. For example, BDU-33 practice bombs contain a MK 4 spotting charge, and MK 82 practice bombs may contain 6.25 pounds of composition C-4 high explosive. British 1,000-pound class practice bombs may contain 50 pounds of TORPEX. These bombs normally use a fuse to initiate the high explosive fillers.

Training Projectile (TP)—Ammunition Ball projectile gun ammunition that has no explosive in the projectile.

Live Munitions—Munitions containing a fuse and high explosive material designed to detonate either prior to or upon impact with the Target Area. Munitions range from bombs, to missiles, rockets, and bullets.

Prohibited Area —A specified area over the land of a state, or territorial waters adjacent thereto, within which the flight of aircraft is prohibited in the interest of national security and welfare.

Range-Active —A military range that is currently in service and is being regularly used for range activities.

Range-ANG —For ANG ranges, the term range pertains to all buildings and property that is established

by the lease, license, permit or other written agreement, for either exclusive or joint use by the ANG for weapons delivery operations.

Range-Inactive —A military range that is not currently being used, but that is still considered by the military to be a potential range area, and that has not been put to a new use incompatible with range activities.

Range-Military —Designated land, and water areas set aside, managed, and used to research, develop, test, and evaluate military munitions, other ordnance, or weapons systems, or to train military personnel in their use and handling. Ranges include firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, Target Areas, and Hazard areas. It includes the airspace above the range.

Range Control Officer (RCO) —The person responsible for range operations and safety. Except in situations where the RCO delegates weapons release clearance to a qualified flight lead, individual pilot or Forward Air Controller, or other briefed person.

Range Operating Agency (ROA) —The agency designated to operate and maintain the range. The ROA may delegate the daily scheduling, management, and maintenance of the range to any appropriate subordinate unit.

Restricted Area:—

An area (land, sea or air) in which there are special restrictive measures employed to prevent or minimize interference between friendly forces or an area under military jurisdiction in which special security measures are employed to prevent unauthorized entry.

Airspace where the flight of aircraft, while not wholly prohibited, is subject to restriction. When not activated by the using agency, the controlling ATC facility may authorize IFR or VFR operations in the area. If joint use is authorized, the name of the ATC controlling facility is annotated on the map.

An area that must contain all "Hazardous Activity" as defined by branch of service for specific type of aircraft using the range.

SAFE-RANGE Program Methodology —A systematic procedure for applying weapon safety footprints to perform a quantitative risk assessment of aircraft ordnance deliveries.

Shared Use —When participating (as defined by the using agency) and non- participating (civil or military) users share designated land and/or airspace areas on a noninterference basis.

Special Use Airspace (SUA) —Airspace of defined vertical and lateral dimensions wherein activities are confined. Certain limitations or restrictions may be imposed on non-participating aircraft. Except for Controlled Firing Areas, SUA is depicted on aeronautical charts. Types of Special Use Airspace include:

Alert Area.
Controlled Firing Area.
Military Operations Area.
Prohibited Area.
Restricted Area.
Warning Area.

Target Area —Target Area is the area on a range complex that immediately surrounds the target or designated mean point of impact. The Target Area demarcation should normally be no less than 1000 feet

from the center of the target or designated mean point of impact.

Warning Area:—

A specified area above, below, or within which there may be potential danger.

Airspace of defined dimensions over international waters that contain activity that may be hazardous to non-participating aircraft.

An area that must contain all "Hazardous Activity" as defined by branch of service for specific type of aircraft using the range.

Weapon Safety Footprint Area —A closed contour that defines the land area containing 99.99 percent (at a 95 percent confidence level) of all initial impacts and ricochets, resulting from the release of a specified weapon type during air-to-surface weapon delivery events.