

**BY ORDER OF THE COMMANDER
SPACE SYSTEMS COMMAND**

**SPACE SYSTEMS COMMAND MANUAL
91-710, VOLUME 1**

27 DECEMBER 2022

Safety



**RANGE SAFETY USER
REQUIREMENTS MANUAL - SPACE
SYSTEMS COMMAND RANGE SAFETY
REQUIREMENTS AND PROCEDURES**

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

ACCESSIBILITY: Publications and forms are available for downloading or ordering on the e-Publishing website at www.e-Publishing.af.mil.

RELEASABILITY: There are no releasability restrictions on this publication.

OPR: HQ SSC/SEK

Certified by: HQ SSC/SEK
(Mr. John G. Orpen)

Supersedes: AFSPCMAN91-710V1, 3 November 2016

Pages: 87

This manual implements AFI 91-202, *The U.S. Air Force Mishap Prevention Program*, and is consistent with the *Memorandum of Agreement between the Department of the Air Force and the Federal Aviation Administration for Launch and Reentry Activity on Department of the Air Force Ranges and Installations*. This publication describes the range safety program employed at Space Systems Command (SSC) ranges and implemented by the Space Launch Deltas (SLD). It defines safety responsibilities and authorities, delineates policies, processes, required approvals and approval/waiver levels for all activities from or onto SSC ranges, as describes investigating and reporting mishaps and incidents to include instructions for standing up a mishap interim safety board and impounding data. Range activities include any activities Range Users plan to perform on SSC ranges (aeronautical tests/operations, missile tests/operations, space launch, pre-launch processing, reentry activities, etc.). These range activities include the life cycle of launch vehicles, reentry vehicles (RVs) and payloads from design concept, test, checkout, assembly and launch to orbital insertion including space vehicle (or payload) separation from launch vehicle, reentry from orbit for reusable launch vehicles (RLVs)/RVs, flyback/landing of launch vehicle components not reaching orbit, or impact. This publication also defines Headquarters Space Systems Command (HQ SSC), Space Launch Delta (SLD) and Range User responsibilities and describes Space Launch Delta Safety Office (SLD/SE) and Range User interfaces for SLD 30 [Western Range (WR)] at Vandenberg Space Force Base (VSFB), California and SLD 45 [Eastern Range (ER)] at Patrick Space Force Base (PSFB), Florida. Range Users should familiarize themselves with SSCI

91-701, *The Space Systems Command Launch and Range Safety Program*, to fully understand the overall SSC range safety program, the capabilities of the ranges and range management activities.

This manual applies to all Range Users conducting or supporting operations on the SSC ranges. Range Users include, but are not limited to, any individual or organization that conducts or supports any activity on resources (land, sea or air) owned or controlled by SSC ranges. This includes such organizations as US government agencies, commercial and foreign government agencies and other foreign entities that use SSC range facilities and test equipment. Commercial users intending to provide launch services and use SSC ranges shall have a license or license application in process from the Department of Transportation's Federal Aviation Administration (FAA) or a DoD sponsorship and be accepted by the DoD to use the ER or WR. Foreign government organizations or other foreign entities shall be sponsored by an appropriate US government organization or be a customer of a Range User. This publication does not apply to the Air National Guard or to Air Force Reserve Command units. Requirements identified in this volume for expendable launch vehicles (ELVs), ballistic or suborbital vehicles or space vehicles may also apply to RLVs and RVs depending on their similarity in launch preparation, operations or phase of flight. Range Users should consult with SLD/SE to determine the applicability of safety requirements to RLVs/RVs. In addition to the applicability of ELV requirements to RLVs and RVs, this publication contains requirements unique to RLVs and RVs; which are identified in this document.

In accordance with SSCI 91-701, *The Space Systems Command Launch and Range Safety Program*, all tailored versions of SSCMAN 91-710 are approved by the SLD Commander.

The authorities to waive SLD/unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. Waiver authority of non-tiered requirements may not be delegated below the SLD Commander level unless specifically stated in this publication. See DAFMAN 90-161, *Publishing Processes and Procedures*, and any SSC supplements for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the Publication OPR. Ensure all records generated as a result of processes prescribed in this publication adhere to AFI 33-322, *Records Management and Information Governance Program*, and are disposed IAW the Air Force Records Disposition Schedule, which is located in the Air Force Records Information Management System. Refer to [Attachment 6](#) of this publication for submitting/recommended supplemented changes and questions to HQ SSC Directorate of Safety (HQ SSC/SE) using the SLD/SE approved change request form or DAF Form 847, *Recommendation for Change of Publication*. Route the change request form through the appropriate functional chain of command.

This publication may be supplemented, but all supplements must be approved by HQ SSC/SE prior to certification and approval for publishing. Each range may incorporate SLD-unique or program-unique requirements into documents other than a supplement, such as an operating instruction, which is only required to be coordinated internally within the local SLD organization structure and approved at the local Chief of Safety level.

Note: Volume 7 contains a glossary of references, acronyms and abbreviations, and terms for use with all the volumes. Special publication formatting features are described in **Chapter 8** of this volume.

SUMMARY OF CHANGES

This document has been updated primarily to reflect organizational changes associated with the establishment of SSC as a USSF Field Command (FLDCOM), and the re-alignment of launch and range safety program management from the former Air Force Space Command publication to an SSC publication. Edits from the previously published guidance memorandum have been incorporated, and various other administrative updates have been made.

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Chapter 1

INTRODUCTION

1.1. Overview. This manual establishes safety requirements for SSC Range Users to ensure the public, launch area and launch complex personnel and resources, recovery area and recovery site personnel and resources are provided an acceptable level of safety and all aspects of prelaunch, launch, and reentry operations adhere to applicable public laws (federal, state and local) and directives. The mutual goal of the ranges and Range Users shall be to conduct their missions safely, with a strong commitment to public safety. Acronyms, references, and definitions of terms used in all the volumes of SSCMAN 91-710 are contained in Volume 7.

1.2. Applicability.

1.2.1. Range Users. The requirements, processes, procedures and approvals defined in this publication are applicable to all Range Users conducting or supporting operations on the SSC ranges, unless the programs are covered under previous range safety regulations (e.g. AFSPCMAN 91-710, EWR 127-1). This publication does not apply to “on alert” operational missile systems, however, does apply to operational missile processing activities prior to being placed on alert. Currently, per 14 CFR Part 400 series, if the FAA has assessed the Federal launch range, through its launch site safety assessment, and found that an applicable range safety-related launch service or property satisfies Department of the Air Force (DAF) and FAA common requirements, then the FAA will treat the Federal launch range's launch service or property as that of a launch operator without need for further demonstration of compliance. For non-licensed launch activity, to include reentry and landing, carried out by the United States Government, on behalf of the United States Government, FAA regulations will not apply. For licensed launch activity, to include reentry and landing, SSC may choose to use its safety standards or standards established by other government agencies. SSC, in cooperation with the FAA, is working to streamline licensed launch provider access to SSC services and capabilities in order to improve efficiency, remove duplication, and minimize unwarranted constraints. The SSC/FAA partnership is long standing and has resulted in well-documented common standards and processes. The processes of both agencies however are predicated on interagency support and will take time to further streamline. As FAA processes and approvals for launch activity in support of commercial launch activity on federal ranges evolve, independent of SSC, SSC will continue to review all activity on, and in the proximity of, SSC operations and facilities to protect personnel, property, and national security interests.

1.2.2. Tailoring. Based upon this document, a tailored edition may be developed for each specific Range User's program. The tailored edition shall be placed on the Range User's contract or applied through the applicable range Universal Documentation System (UDS). For FAA licensed launches or permitted operations, the tailored version of SSCMAN 91-710 is enforced through a Commercial Space Operations Support Agreement (CSOSA). Use of a tailored edition of this document is recommended and is beneficial to both the Range User and Wing Safety. See [Attachment 2](#) for further tailoring instructions.

1.2.3. New Programs. This publication is applicable to all new programs with Program Introduction (PI) submittals dated after the date of this publication. Range Users are encouraged to perform PIs at the earliest possible time. Formal PIs for launch vehicles and RVs are submitted to Range Safety through the SLD Plans and Programs office (SLD/XP).

Informal PIs, such as those for payloads not going through the formal UDS process, may be provided through the sponsoring Range User. Before the PI, informal meetings to discuss safety requirements and their impact on conceptual designs may be arranged directly with the office of the Chief of Safety at the applicable range. Programs that began significant design before the PI should approach Range Safety to discuss applicable requirements. Formal meetings with Range Safety shall be made through the SLD/XP office.

1.2.4. Previously Approved Programs. Existing program tailoring and noncompliance approved prior to the date of this publication will be honored. **Exception:** Existing programs shall comply with the latest version of applicable range safety requirements when the following occurs; (1) major modifications affecting the launch vehicle's operation or safety characteristics; (2) new applications of previously approved components, systems or subsystems; (3) discovery of previously undetected non-compliances; and (4) where hazard analyses, mishaps, incident investigations or other sources (i.e. as determined by Range Safety) indicate the implementation of all or parts of the latest version of applicable range safety requirements are necessary.

1.3. General Description of the Eastern and Western Ranges.

1.3.1. Eastern Range (ER).

1.3.1.1. The ER is part of the National Launch Range facilities, operated by Space Launch Delta 45 (SLD 45), part of Space Systems Command, and located at Patrick Space Force Base (PSFB), Florida; the range includes the operational launch and base support facilities located at Cape Canaveral Space Force Station (CCSFS), Florida; owned or leased facilities on downrange sites such as Ascension; as well as the Jonathan -Dickson Missile Tracking Annex (Jupiter, Florida), and in the context of launch operations, the Atlantic Ocean. For reentries/flyback at the ER, the ER may be expanded to involve the land, sea and air space within the reach of the RV during its descent until it impacts or is recovered.

1.3.1.2. Range management activities are concentrated at PSFB, Florida.

1.3.1.3. Launch vehicle and payload prelaunch and launch activities are concentrated at CCSFS, Kennedy Space Center (KSC), and miscellaneous outlying support locations.

1.3.1.4. Launch activities conducted by ER personnel operating outside the geographical limits described above may occur under DoD or DAF direction or under the auspices of agreements made by these agencies. In such cases, the term ER is expanded to include prelaunch, recovery, launch area, recovery area and impact area.

1.3.2. Western Range (WR).

1.3.2.1. The WR is part of the National Launch Range facilities, operated by Space Launch Delta 30 (SLD 30), part of Space Systems Command, and located at Vandenberg Space Force Base (VSFB), California. The WR consists of the launch head at VSFB and extends along the West Coast of the continental US westward through the Pacific and Indian Oceans. For reentries/flybacks intended at the WR, the WR may be expanded to involve the land, sea and air space within the reach of the RV during its descent from orbit until it impacts or is recovered.

1.3.2.2. Range management activities as well as launch and prelaunch processing activities are concentrated at VSFB in California.

1.3.2.3. Launch and reentry activities conducted by WR personnel operating outside the geographical limits described above may occur under DoD or DAF direction or under the auspices of agreements made by those agencies. In such cases, the term Western Range or WR is expanded to include these situations and apply, as required, to the specific mission, launch, recovery, launch area, recovery area and impact area.

1.3.3. Range Differences. Range safety requirements are the same at both the ER and WR, however, implementation of these requirements may differ due to operational and geographical differences. When safety requirements differ, involving other federal agencies (e.g., Navy, NASA, Missile Defense Agency), the Range User may standardize to the more stringent requirement or meet all requirements, whichever option is technically or economically more desirable. Specific WR and ER differences are noted throughout this publication.

1.3.4. Multi-Range/Location Operations. Operations involving the use of more than one range/location shall employ the lead range concept as described in DoDI 3200.18., *Management and Operation of the Major Range and Test Facility Base (MRTFB)*. The lead range will initiate discussions with the other affected ranges. The roles and responsibilities of each range shall be defined and documented by the lead range and coordinated with all affected organizations prior to the initiation of any operation.

1.3.5. Lead and Support Range Roles and Responsibilities. Lead and support range roles and responsibilities shall be defined and documented by the lead range. The following items (as a minimum) shall be addressed in the documentation: planning, launch safety analysis, flight/airspace/sea control, scheduling, mishap and investigation responsibilities, and flight safety system (FSS) certification and operation. The lead range, typically the range from which the operation originates, is responsible for interfacing with the range user and performs the integration function to ensure all tasks are accomplished in support of a program, test or series of tests, including flight safety. Support ranges/locations are additional ranges/locations, agencies with unique capabilities or designated authorities that provide support to the program's operations. Support roles and responsibilities may be defined for specific mission segments. A "mission segment" may be either a portion of the planned flight/operation/test, a vehicle involved in a multi-vehicle mission or an aspect of the mission requiring unique expertise or capability. The "lead range" ensures all mission support, including flight safety, is fully coordinated and integrated with all supporting ranges/locations and agencies involved in the program's operation. Support ranges/locations or individual agencies designated as the lead for a particular mission segment can be delegated full responsibility for the planning and execution of their particular mission segment, including ensuring compliance with applicable service and local regulations, policies and procedures. Although flight safety responsibilities may require separate memorandums of agreement (MOA), these agreements shall not interfere with individual range or agency authorities, responsibilities and liabilities.

1.3.6. Area of Responsibility (AOR) Handoff Points and Protocols. Geographical and organizational boundaries may result in an operation traversing more than one AOR or may involve areas with shared or overlapping responsibilities. The handoff points for these responsibilities shall be identified, agreed upon by all affected organizations, documented and signed by all responsible organizations and command authorities at the earliest time possible in the PI process. The final agreed to responsibilities and agreements shall be presented at a Mission Readiness Review.

1.3.7. Scheduling. The lead range shall establish scheduling and coordination groups to facilitate activities among the ranges/locations and affected organizations. These groups should meet on a routine basis to ensure inter-range/organization/location activities are thoroughly coordinated.

1.3.8. Mishaps and Investigations. A lead mishap investigation authority shall be presented at the Launch Readiness Review or equivalent meeting. Responsibilities, procedures and protocols may involve multi-range/location and/or multi-organization participation. Therefore, memorandums of understanding (MOUs) may be required to ensure all agencies are aware of their specific responsibilities. MOUs, if used, should identify each organization's responsibilities, participation and access to mishap investigation sites, material, meetings, etc. (e.g., *Memorandum of Understanding Between the National Transportation Safety Board, Department of the Air Force, and the Federal Aviation Administration Regarding Space Launch Accidents*).

1.4. Source Documents. This publication is consistent with or based on, but not limited to, the responsibilities or standards contained in or applied by the following laws and directives:

1.4.1. Title 42 United States Code (USC), Chapter 116, *Emergency Planning and Community Right To-Know*.

1.4.2. Title 51 USC, Chapter 509, *Commercial Space Launch Activities*.

1.4.3. Title 14, Code of Federal Regulations (CFR), *Aeronautics and Space*, Chapter III, *Commercial Space Transportation*, Subchapter C, *Licensing*, Parts 413-460.

1.4.4. Title 29, CFR, Subtitle B, Chapter XVII, Part 1910, *Occupational Safety and Health Standards*.

1.4.5. Title 40, CFR, Chapter I, Subchapter C, Part 68, *Chemical Accident Prevention Provisions*.

1.4.6. Title 40, CFR, Chapter I, Subchapter J, Part 355, *Emergency Planning and Notification*.

1.4.7. National Security Presidential Memorandum-20 (NSPM-20), *Launch of Spacecraft Containing Space Nuclear Systems*, 20 August 2019.

1.4.8. DoD Directive (DoDD) 3100.10, *Space Policy*.

1.4.9. DoDD 3200.11, *Major Range and Test Facility Base*.

1.4.10. DoDD 3230.3, *DoD Support for Commercial Space Launch Activities*.

1.4.11. DoD Instruction (DoDI) 3200.18, *Management and Operation of the Major Range and Test Facility Base (MRTFB)*.

1.4.12. AFPD 91-1, *Nuclear Weapons and Systems Surety*.

1.4.13. AFPD 91-2, *Safety Programs*.

1.4.14. AFPD 63-1, *Integrated Life Cycle Management*.

1.4.15. AFI 91-202, *The US Air Force Mishap Prevention Program*.

1.4.16. DAFMAN 91-110, *Nuclear Safety Review and Launch Approval for Space or Missile Use of Radioactive Material*.

- 1.4.17. AFMAN 91-221, *Weapons Safety Investigations and Reports*.
- 1.4.18. AFMAN 91-222, *Space Safety Investigations and Reports*.
- 1.4.19. DAFMAN 91-224, *Ground Safety Investigations and Reports*.
- 1.4.20. DAFI 91-204, *Safety Investigations and Reports*.
- 1.4.21. Defense Explosives Safety Regulation (DESR) 6055.09_AFMAN 91-201, *Explosives Safety Standards*.
- 1.4.22. SSCI 91-701, *The Space Systems Command Launch and Range Safety Program*.
- 1.4.23. *Memorandum of Agreement between the Department of the Air Force and the Federal Aviation Administration for Launch and Reentry Activity on Department of the Air Force Ranges and Installations*.
- 1.4.24. *Memorandum of Understanding Between Air Force Space Command and Federal Aviation Administration Office of Commercial Space Transportation for Resolving Requests for Relief from Common Launch Safety Requirements*.
- 1.4.25. Range Commanders Council (RCC) Standard 319, *Flight Termination Systems Commonality Standard*.
- 1.4.26. RCC Standard and Supplement 321, *Common Risk Criteria Standards for National Test Ranges*.
- 1.4.27. RCC Standard 324, *Global Positioning and Inertial Measurements Range Safety Tracking Systems*.

Chapter 2

RESPONSIBILITIES AND AUTHORITIES

2.1. General. Range safety is a joint responsibility of the United States Space Force (USSF), as the owner and operator of SSC ranges, the Range Users, and in instances of commercial launches, the Department of Transportation. The responsibility for protecting the public, launch area, recovery area, launch complex personnel and resources and recovery site personnel and resources is of paramount consideration in range operations.

2.2. Headquarters Space Systems Command Responsibilities. HQ SSC operates the SSC ranges, including providing base support, personnel and other government assets. The SSC Commander (SSC/CC) is responsible for establishing range safety policy for SSC ranges as outlined in SSCI 91-701, *The Space Systems Command Launch and Range Safety Program*. HQ SSC Directorate of Safety (HQ SSC/SE) is responsible for establishing common Range User safety requirements as outlined in this publication and 14 CFR Part 400 series (Commercial Space Transportation) for the SSC Space Launch Deltas to implement and enforce.

2.3. Space Launch Delta Responsibilities.

2.3.1. Space Launch Delta Commander (SLD/CC).

2.3.1.1. SLD/CCs have overall authority and responsibility for public safety at SSC ranges as directed by DoDI 3200.18 and delegated by the SSC/CC. This delegation is provided via the FLDCOM chain of command, specifically the SSC/CC, and AFI 91-202.

2.3.1.2. The SLD/CC shall establish and enforce the requirements of this publication as it applies to Range User programs on their range.

2.3.1.3. Where feasible, the SLD/CC shall coordinate all actions between the ranges to ensure consistent and standard range safety requirements and approvals are levied on all Range Users.

2.3.1.4. The SLD/CC shall ensure range-owned resources are protected. Where government property or facilities are leased to launch system operators, the SLD/CC shall ensure the government agency responsible for the resource identifies the requirements for resource safety in the appropriate lease agreements.

2.3.1.5. The SLD/CC or SLD Vice Commander (SLD/CV) for Operations shall approve or disapprove all waivers affecting public safety.

2.3.1.6. The SLD/CC or SLD/CV for Operations shall ensure users are notified of risks to their resources posed by the range or other range users when those risks exceed acceptable limits.

2.3.2. Space Launch Delta Chief of Safety. The Chiefs of Safety at SLD 30 and SLD 45, as the designated safety representatives for the SLD/CCs, are responsible for the following:

2.3.2.1. Establishing and enforcing the Safety Program.

2.3.2.2. Providing single points of contact at the range for each Range User safety program.

2.3.2.3. Ensuring the Safety Program meets the needs of the ranges and Range Users and does not impose undue or overly restrictive requirements on Range User programs.

2.3.2.4. Approving or disapproving waivers other than those affecting public safety.

2.3.2.5. Approve tailored versions of SSCMAN 91-710 that do not affect public safety.

2.3.3. Space Launch Delta Safety Offices. Unless otherwise noted, the use of the term “Space Launch Delta Safety” in this publication refers to SLD 30/SE and SLD 45/SE and is synonymous with the term “Range Safety”. The Space Launch Delta Safety Offices perform the following functions in support of range operations: 1) flight safety engineering assessment; 2) ground support equipment and facility safety engineering assessment; 3) launch site safety (operations); 4) termination system assessment/engineering; and 5) launch safety (flight and risk analysis). In addition, Space Launch Delta Safety provides direct support to the 1st Range Operations Squadron (1 ROPS) and 2nd Range Operations Squadron (2 ROPS) mission flight control function for all missions from or to the ranges that use ground commanded flight termination. The Space Launch Delta Safety Offices also provide traditional Department of the Air Force occupational, weapons, and flight safety programs. The responsibilities of the Chiefs of Safety or their designated representatives apply throughout all phases of a launch and/or reentry program (planning, generation, execution and recovery) and include, but are not limited to, the following:

2.3.3.1. Enforce safety requirements to ensure public safety, launch area safety, launch complex safety, recovery area safety and recovery site safety are adequately provided by and for all programs using SSC ranges.

2.3.3.1.1. Provide oversight, review, approval and monitoring for all public safety and launch area safety concerns during prelaunch operations at launch complex, launch vehicle and payload processing facilities.

2.3.3.1.2. Provide oversight, review, approval and monitoring for all public safety and recovery area safety concerns during reentry/flyback operations at recovery area facilities.

2.3.3.2. Program Planning Phase (Tailoring, Non-Compliance Resolution, Launch Safety Analysis)

2.3.3.2.1. Determine the need for and serve as approval authority for vehicle FSS; review and approve the design, ensuring compatibility with the ground instrumentation baseline to include recent and on-going changes to ground instrumentation resulting from upgrades, etc., test and documentation for vehicle FSSs; monitor and verify the installation, checkout and status of the flight termination system (FTS) IAW instructions and locations designated by Range Safety.

2.3.3.2.2. Determine criteria for flight termination action; assess risks to protect the general public, launch area, recovery area, launch complex personnel and property and recovery site personnel and property; develop and use mathematical models to increase the effectiveness of errant vehicle control while minimizing restrictions on launch and reentry vehicle flight; establish mission rules and criteria for flight termination action in conjunction with the Range User.

2.3.3.2.3. Approve or disapprove equivalent level of safety (ELS) requests.

2.3.3.3. Program Generation Phase (Vehicle, Payload, Ground Support Equipment, Range Safety System and Facility Design and Test; Program Operations Tests; and Range Safety Approval for Launch Operations Phase)

2.3.3.3.1. Review and approve flight plans, design, inspection, procedures, testing and documentation of all hazardous and safety critical launch vehicles, payloads, reentry/flyback vehicles, and ground support equipment, systems, subsystems, facilities and material to be used at the ER and WR. Review and approval shall be IAW the requirements of SSCMAN 91-710 volumes 2 through 6.

2.3.3.3.2. Audit operations at a launch complex or recovery site and associated support facilities for launch complex safety or recovery site safety concerns.

2.3.3.4. Program Execution Phase

2.3.3.4.1. Safety Review with the SLD/CC. Prior to each launch or reentry from orbit, Range Safety shall brief the SLD/CC of the safety status of the launch/reentry vehicle. The briefing shall include vehicle hazards, the status of any applicable waivers and any other issues contributing to the risk of the flight/reentry. The briefing may be accomplished at the Launch Readiness Review (LRR) or via a separate safety briefing.

2.3.3.4.2. Collision Avoidance (COLA). The SLD/CC shall establish the pre-launch and/or pre-reentry COLA process for the protection of manned spacecraft and active satellites as well as for avoiding debris (including inactive spacecraft) to minimize the generation of orbital debris. The process will implement the policy and direction defined in AFI 91-202 and higher headquarters direction, the guidance provided in RCC Standard 321 and the safety requirements and criteria specified in SSCMAN 91-710 Volume 6. For controlled reentries, the COLA process will consider the conjunction(s) of the reentering object (including RLVs) with any and all orbiting objects of a sufficient mass to compromise the integrity of the vehicle or alter its intended trajectory such as to create further hazards and risk to the public. More conservative miss criteria may be used to compensate for increased uncertainty in the location of the reentering object. For example, a larger miss distance to avoid manned objects in low earth orbit may be appropriate for pre-programmed upper stage reentry from a geo-transfer orbit. If not operationally responsible for implementing the SLD/CC COLA process, Range Safety will work with higher headquarters to aid in establishing collision avoidance guidance, requirements and criteria.

2.3.3.4.3. Launch Collision Avoidance (LCOLA). All launches from Space Force ranges and all Space Force launches from non-Space Force ranges shall accomplish LCOLA procedures accounting for all launched objects (e.g., booster segments, payloads, jettisoned components, and debris) with an altitude capability equal to or greater than 150km. COLA analysis may not be required if the three-sigma maximum altitude capability of the launch vehicle, jettisoned components or planned debris is greater than 50 km below the orbital perigee of a manned object or 25 km below an active satellite or 2.5 km below any other catalogued object.

2.3.3.5. Provide applicable Range Safety Operations Requirement (RSOR) and Operations Supplement (Ops Sup) documents; provide Range Safety launch operations approval at the

LRR; evaluate and issue safety approval for personnel authorized to remain in hazardous launch areas; and provide the final Range Safety approval to launch.

2.3.3.6. Provide Range Safety personnel to support launch and reentry operations; coordinate and maintain a close working relationship with Mission Flight Control Officers (MFCOs) to ensure waivers to requirements are followed; monitor MFCO actions during Integrated Crew Exercises for each mission; exercise safety operations waiver authority as delegated by the SLD/CC.

2.3.3.7. During the day-of-launch (DoL) countdown, Range Safety shall work safety waivers that are generated and will work real-time waivers. Documentation for any real-time waivers will be created and provided after the operation.

2.3.3.8. Support the Launch Emergency Operations Center (LEOC, ER only) and advise the on-site commander regarding disaster preparedness, response and as necessary provide technical assistance in the event of failures and mishaps.

2.3.3.9. Assess Range Safety Critical Launch Commit Criteria for launch operations and Reentry Commit Criteria for reentry/flyback operations.

2.3.3.10. Establish a configuration control process for maintaining range safety documentation in a timely, technically correct, easily understood manner accessible to Range Users, including tailored range safety requirements and standards developed jointly with other agencies.

2.3.3.11. IAW DoDI 3200.18, manage a safety program consistent with operational requirements, which includes the prevention of objects (including targets) from violating established safety, security, or range boundaries. When more than one activity is involved in supporting an event, the lead activity shall be responsible for the coordination of safety plans and for any safety issues arising during the event. For earth reentry of orbiting space vehicles, the safety responsibility rests with the activity controlling the recovery portion of the flight. Specific safety responsibilities include:

2.3.3.11.1. Establishment and enforcement of safety policies and procedures.

2.3.3.11.2. Coordination of safety plans and procedures with other agencies within the potentially affected areas and issuance of notices within the United States and to foreign governments on anticipated hazards from test activities.

2.3.3.11.3. Coordination of public affairs plans and assistance in disseminating appropriate information.

2.3.3.11.4. Establishment of allowable ground and flight safety conditions and appropriate action to ensure that test articles do not violate those conditions.

2.3.3.11.5. Prevention of objects (including targets and decoys) from violating established limits through impact or landing for vehicles with suborbital trajectories and through orbital injection or escape velocity for space vehicles.

2.3.3.11.6. Notification to the National Military Command Center if an accident or errant trajectory occurs that may have international implications.

2.3.3.11.7. Ensure safety is consistent with operational requirements, including preventing objects from violating established limits through impact for vehicles with

- suborbital trajectories, through orbital insertion or escape velocity for space vehicles and through final recovery for RVs.
- 2.3.3.12. Ensure public safety criteria are not exceeded through the end of Range Safety responsibility. Range Safety responsibility exists until the time of flight at which the launch/reentry/flyback vehicle/spacecraft achieves a sustainable orbit or reaches escape velocity for space vehicles or through final impact for vehicles with suborbital trajectories or until vehicle motion with respect to the ground stops for RVs and can be shown to pose no statistically significant additional safety risk.
- 2.3.3.13. Ensure the FAA is invited to participate in tailoring meetings for launch vehicles used for FAA-licensed launches, IAW MOU between AFSPC and FAA for Resolving Requests for Relief from Common Launch Safety Requirements.
- 2.3.4. Range Safety Relationship with Range Users. The Range Safety offices are responsible for initiating, establishing and implementing Range User interface processes to ensure that the requirements of this publication are met and, if desired by the Range User, tailored to meet individual Range User safety program requirements. To meet these responsibilities, SLD 30 /SE and SLD 45 /SE shall assign a point of contact (POC) for each new Range User program to act as the Range Safety single point of contact. The POC shall assist in identifying and establishing interfaces between the Range User and the applicable range support organizations required for the Range User safety program. The interface process is described in [Chapter 4](#).
- 2.3.5. Space Launch Delta Vice Commander for Operations. The SLD Vice Commander for Operations is responsible for the following:
- 2.3.5.1. Provide and ensure all required instrumentation, computers, communications, command systems and display systems necessary for Range Safety to carry out its functions perform to the prescribed level of reliability and meet specified design requirements.
- 2.3.5.2. Provide certified MFCOs and associated support personnel as required to implement the rules and requirements designed by Range Safety for protecting the public during launch and reentry operations.
- 2.3.5.3. Identify and coordinate with Range Safety on DoL range system failures and/or anomalies (non-compliances) that may affect the reliability of instrumentation critical to ensuring public safety.
- 2.3.5.4. Coordinate with the FAA to ensure the timely notification of any expected air traffic hazard associated with range activities, prior to launch and reentry and based on information provided by Range Safety. During the launch and reentry and in the event of a mishap, the Vice Commander is responsible for immediately informing the FAA of the volume and duration of airspace where an aircraft hazard is predicted, after coordinating with Range Safety. Similarly, the Vice Commander is responsible to coordinate with the US Coast Guard (USCG) to ensure timely notification of any associated ship traffic hazard and in the event of a mishap, to inform the USCG of the area and duration of navigable waters where a ship hazard is predicted with information provided by or coordinated with, Range Safety. The term “ship” includes boats and watercraft of all sizes.
- 2.3.5.5. Review and accept all prelaunch and launch operations procedures at Cape Canaveral Space Force Station (CCSFS) and Vandenberg Space Force Base (VSFB) for

Space Systems Command (SSC) acquired/managed programs, after ensuring the procedures have been approved by the Space Launch Delta Safety Office.

2.3.6. Space Launch Delta Vice Commander for Support. The SLD Vice Commander for Support is responsible for the following:

2.3.6.1. Determine, coordinate, and enforce fire safety, environmental management and explosive ordnance disposal requirements.

2.3.6.2. Provide certified Launch Emergency Operations Center (LEOC)(ER) or Launch Support Team (LST)(WR). The LEOC or LST Chief shall direct operations resulting from an accident with primary responsibility for directing lifesaving, protecting resources and preserving evidence. The LEOC/LST Chief serves as on-scene commanders for all LEOC/LST activities impacting public and government safety. The LEOC/LST Chiefs report and respond to the Incident Commander as specified in the National Response and Emergency Management Plan.

2.3.6.3. The Fire Department, Environmental Engineering and Explosive Ordnance Disposal organizations are responsible for establishing and implementing their programs in coordination with the offices of the Chiefs of Safety.

2.3.7. Commander, 30th Medical Group and 45th Medical Group. The Commanders of the 30th Medical Group (30 MDG) and 45th Medical Group (45 MDG) are responsible for determining, coordinating, and enforcing medical, biological and radiological health requirements. Radiation Safety Officers and Bioenvironmental Engineering are responsible for establishing and implementing their programs in coordination with the offices of the Chiefs of Safety.

2.4. Federal Aviation Administration Responsibilities. IAW 14 CFR Part 400 series, the FAA has responsibility for public safety of licensed or permitted launches and reentries. The launch safety requirements in this publication have been written with the intent of achieving commonality with the FAA requirements. SLD/CC discretion to accept higher risk for the launch or reentry of government payloads does not apply to licensed or permitted launches without a Range User obtaining relief from the FAA (see *Memorandum of Agreement between the Department of the Air Force and Federal Aviation Administration for Launch and Reentry Activity on Department of the Air Force Ranges and Installations*). FAA documents can be found on the FAA/AST website at <https://www.faa.gov/space/>.

2.4.1. The FAA and the applicable Space Launch Delta Safety Office shall jointly review and approve all 14 CFR Part 400 series non-compliance requests from Range Users/launch operators for FAA licensed or permitted launch operations. Neither agency may overrule the other's denial of a request for relief. The FAA shall document the findings/resolution of the joint review and provide copies to all participants. Range Safety shall act as the primary interface with the launch operator (Range User) for requests for relief and for tailoring.

2.4.2. The FAA has the responsibility and authority to oversee the conduct of all licensed or permitted launches and reentries and may prohibit, suspend or end immediately a licensed or permitted launch before flight if, at any time, the FAA determines the launch and/or reentry is detrimental to public health and safety, the safety of property or any national security or foreign policy interest of the US.

2.5. Range User Responsibilities. Range Users are solely responsible for complying with the requirements identified in this publication. The following are direct responsibilities of the Range User:

2.5.1. Range Safety Funding. Range Users and supporting agencies shall be responsible for full funding of activities associated with Range Safety support.

2.5.1.1. Funding shall be provided early in and throughout the program IAW funding requirements of DoDD 3200.11.

2.5.1.2. Programs intending to perform launch or reentry/flyback operations at both the ER and WR shall fund both ranges.

2.5.1.3. At the ER, Range Users shall provide funding and Range Safety shall provide cost estimates IAW 45 SWI 99-101, *45 SW Mission Program Documents*.

2.5.2. System Safety Program. The Range User Program Manager (PM) shall be responsible for developing and maintaining a safety management program encompassing all applicable Launch Safety requirements, identifying a qualified key system safety person with authority for resolution of identified hazards and direct access to the PM, and establishing and funding a supporting system safety organization/function with direct interfaces and access to other functional elements of the program. The Range User shall provide a System Safety Program Plan (SSPP), detailing the program described above, for review & approval IAW **Attachment 3**.

2.5.3. Design, Test, and Inspection Requirements. Range Users shall be responsible for the design, inspection, and testing of all hazardous and safety critical launch vehicle, RV (excluding ballistic missile RVs), payload and ground support equipment, systems, subsystems, facilities and materials to be used at the ranges IAW the requirements of this publication. Range User requests to eliminate or reduce testing shall be justified with clear and convincing evidence presented to Range Safety for submission to the SLD/CC or his designee for approval. Range User responsibilities include the following:

2.5.3.1. Provide safety systems, equipment, facilities, and material IAW this publication; ensure that each launch system has a capability that allows Range Safety to initiate a holdfire that prevents launch in the event of loss of range safety critical systems or violation of mandatory Launch Safety launch commit criteria (SSCMAN 91-710 Volume 6).

2.5.3.2. Develop and obtain Range Safety review and approval of all required data and/or documents necessary for planned operations. The review and approval for these documents, identified in **Chapter 5** and in SSCMAN 91-710 Volumes 2 through 6, shall be IAW the data submission lead times identified in this publication.

2.5.3.3. Submit data for mission rules, launch commit criteria, reentry commit criteria and flight control operations; obtain Range Safety launch operations approval at the LRR; participate in safety critical tests and operations; submit telemetry measurement lists and tape, the Range User Countdown Checklist and any special requirements for launch and reentry.

2.5.3.4. Ensure the FAA regulations 14 CFR, Chapter III are met for licensed or permitted launches and reentries.

2.5.3.5. Perform design and mission changes based on risk analyses performed by Launch Safety to maintain acceptable risk to the general public for deorbiting launch vehicles, upper stages, spacecraft, flyback, and RVs.

2.5.3.6. Coordinate their safety programs with Range Safety to ensure the activities of both organizations meet national policy goals and provide for public, launch complex, recovery site or recovery area safety and resource protection while minimizing impact on mission requirements.

2.5.3.7. Provide for crew safety in manned space launch systems and coordinating crew safety, procedures and activities with Range Safety.

2.5.3.8. Verify compliance with this publication. The use of subcontractors does not relieve the Range User of this responsibility. The Range User shall provide adequate contractual direction and monitor subcontractor performance to verify compliance.

2.5.3.9. As applicable, when involved in joint projects, interface and integrate actions with other Range Users or associated contractors in their safety programs.

2.5.3.10. Prepare a Safety Assessment Report (SAR). The SAR shall summarize the results of all hazards analyses performed IAW the requirements of this publication, as tailored and identify the program's residual risk, if any.

2.5.4. Radioactive Material Launches. Range Users shall be responsible for the following radioactive material launch and reentry activities:

2.5.4.1. Notify Range Safety and the Installation Radiation Safety Officer of any intended launch or reentry of radioactive materials during the concept phase of the program.

2.5.4.2. At the WR, request and obtain launch and reentry approval for radioactive materials through the Radiation Safety Committee (RADSAFCOM).

2.5.4.3. As applicable, ensure compliance with NSPM-20 as outlined in DoDD 3100.10, with implementation through DAFMAN 91-110 and any SLD supplements and providing certification as detailed in SSCMAN 91-710 volumes 2 and 3.

2.5.5. Conduct of Operations. Range Users shall be responsible for the conduct of operations as outlined below and in SSCMAN 91-710 Volume 6 and its attachments:

2.5.5.1. Conduct operations in a safe manner.

2.5.5.2. Plan and conduct hazardous and safety critical operations potentially affecting launch area personnel and/or public in accordance with Range Safety approved procedures and in accordance with the current edition of the applicable operations safety plan (OSP) for the launch complex, recovery site, facility, or area in use and for ordnance and propellant operations and areas.

2.5.5.3. Observe, evaluate, and enforce compliance with range safety requirements by all personnel within launch complexes, assembly and checkout areas, propellant and ordnance storage areas, recovery areas, recovery sites and other areas as deemed appropriate by Range Safety.

2.5.5.4. Maintain an accurate written or computerized log of events during the launch countdown and/or reentry/flyback for three years or three launches or three reentries, whichever is greater.

2.5.5.5. Provide formal correspondence to the Space Launch Delta detailing, for each orbital launch vehicle component achieving an altitude of at least 150 km, the time in flight when the Range User or other acceptable organization proposes to accept responsibility for on-orbit COLA. For vehicles planning to perform reentry operations, the Range User shall identify to the Space Launch Delta when they expect to relinquish on-orbit COLA responsibility to the organization/location approving deorbit operations.

2.5.6. Launch Complex Safety Control Authority Responsibilities. Range Users perform this function in leased/licensed launch complexes and facilities, and non-Air Force government facilities with full-time safety staffs. Space Launch Delta Safety offices perform this function for Department of the Air Force (DAF) programs/complexes on the range, and other organizations without a full-time safety staff (as specified in agreements). As defined in this publication, launch complex safety control authority includes areas within a complete launch complex (or missile silo), recovery site and adjacent facilities used by the control authority for launch vehicle, RV and/or payload processing. It applies to general industrial-type operations involving only standard industrial hazards with no impact on public safety (i.e., when hazardous procedures present a risk only to task essential personnel within a limited and well-defined hazard area completely inside the launch complex/facility boundaries, and are covered by one or more Occupational Safety and Health Administration (OSHA) regulations). The control authority shall also be responsible for any recovery site safety training and certification requirements. The control authority shall be responsible for the following activities (limited to launch complex, recovery area or recovery site safety):

2.5.6.1. Review and approve all procedures relating to the performance of any hazardous operation and safety critical operation.

2.5.6.2. Review and approve Facility Emergency Operating Plans (FEOPs) and OSPs.

2.5.6.3. Ensure hazardous facilities are periodically inspected and safety critical and hazardous operations are monitored, as required.

2.5.6.4. Monitor hazardous and safety critical operations, as required.

2.5.6.5. Define the threat envelopes of all hazardous operations and establish safety clearance zones to protect launch complex/recovery area/recovery site personnel and resources.”

2.5.6.6. Ensure that all personnel performing hazardous operations are provided adequate training to ensure proper conduct of their jobs and tasks.

2.5.6.7. Ensure that adequate personal protective equipment is provided to launch complex, recovery area, site personnel as defined by this publication and approved OSPs.

2.5.6.8. Ensure that all hazardous operations affecting launch complex safety and recovery area or recovery site safety are conducted using formal written procedures.

2.5.7. Occupational Safety and Health.

2.5.7.1. Per AFI 91-202, *The United States Air Force Mishap Prevention Program*, Range Users (contractors/licensed or permitted launch and reentry operators/foreign entities) are fully responsible for the safety and health of their employees in accordance with OSHA regulations/standards and other federal and state safety and health regulations. Further, they have a responsibility to protect government employee visitors when they are involved with contractor operations or on contractor-leased facilities. Space Launch Delta Safety offices, however, will continue to have oversight of unique hazards not covered by OSHA and hazardous operations with potential to endanger beyond the boundaries of the launch complex or hazardous processing facility. Space Launch Delta Safety offices shall assume no liability for Range User or contractor compliance or noncompliance with OSHA requirements.

2.5.7.2. DAF civilian and military personnel Range Users are required to comply with all DoD and DAF safety and health requirements. Other DoD and federal government agency Range Users shall comply with their applicable safety and health requirements.

2.5.7.3. All Range Users shall develop and coordinate an Accident Notification Plan with Range Safety (see SSCMAN 91-710 Volume 6, Chapter 4).

2.5.8. Resource Safety. Range Users are responsible for resource safety of Range User owned or leased facilities, equipment, and flight hardware.

Chapter 3

RANGE SAFETY

3.1. General.

3.1.1. Range safety requirements exist to ensure that the risk to the public, launch area, launch complex personnel and resources, and recovery area and recovery site personnel and resources is managed to an acceptable level. Range safety shall be implemented by employing risk management in five categories of safety: Public, Launch Area, Launch Complex, Recovery Area, and Recovery Site Safety.

3.1.2. The Range User shall endeavor to manage risk to the lowest level, consistent with mission requirements, and in consonance with SSC range launch risk guidance. Individual hazardous activities may exceed guidance based on national need after implementation of available cost-effective mitigation.

3.1.3. While the use of waivers is discouraged, the SLD/CC has the authority to tailor or waive any requirement in this publication for a specific mission based on national or mission needs. The ranges shall comply with risk criteria specified in **Table 3.1**. The standard acceptable risk criteria apply separately to the launch and reentry phases of flight IAW RCC 321 and AFI 91-202. Therefore, the standard acceptable risk criteria apply separately to the launch vehicle, upper stage reentry (for upper stages that achieve orbit), and payload reentry provided the requirements of SSCMAN 91-710 Volume 2 are satisfied.

3.1.4. Imminent danger situations are subject to the following:

3.1.4.1. Any operation, condition or procedure that presents imminent danger shall be brought to the immediate attention of the supervisor or individual responsible for the immediate area.

3.1.4.2. Immediate action shall be taken by the supervisor or individual responsible for the immediate area to correct the situation, apply interim control measures, stop the operation, and evacuate all personnel. The system, equipment or facility shall be immediately placed in the safest condition possible until the situation is resolved.

3.1.4.3. All imminent danger situations shall be reported to Range Safety not later than 1 hour from the time the situation is identified.

3.2. Public Safety. Range Safety shall ensure the risk to the public, including foreign countries personnel and resources), from range operations meets the criteria established in AFI 91-202 and this publication. **Table 3.1** shows the risk management criteria for personnel to be used for determining acceptable risk for individual launches and reentries IAW the flight plan approval process and risk budgets defined in SSCMAN 91-710, Volume 2. Allowable individual public risk criterion is an expected casualty (E_c) of $\leq 1 \times 10^{-6}$. The allowable collective risk to the General Public is an aggregated (all hazards, all people including personnel n ships) E_c of $\leq 100 \times 10^{-6}$. General Public risk that exceeds an E_c of 100×10^{-6} requires SLD/CC waiver approval. When the General Public mission risks exceed an E_c of $1,000 \times 10^{-6}$, the SSC/CC must be notified (see **Table 3.1**, note c). When the General Public mission risks exceed an E_c of $10,000 \times 10^{-6}$, SSC/CC approval is required. Launch Essential Personnel mission risks greater than an aggregated E_c of 300×10^{-6} require SLD/CC waiver approval. Based on national need and the approval of the

SLD/CC, non-FAA-licensed launches may be permitted using a predicted risk above 100×10^{-6} . Range Users will comply with FAA acceptable risk criteria for FAA-licensed or permitted launches. Refer to AFI 91-202 for DAF risk approval levels. RCC Standard 321 provides relevant background information on launch risk acceptability. The ranges and Range Users shall work together to determine mission risks based on data provided by the Range Users and Range Safety models. See [Attachment 5](#) for definitions of terms and further guidance.

Table 3.1. Launch and Re-entry Risk Criteria ^{a/b}.

Category	Type	Acceptable Limit		SLD/CC Waiver		SSC/CC Approval ^c	
		Individual	Collective ^d	Individual	Collective ^d	Individual	Collective ^d
General public ^e	E _C ^f	≤ 1 x 10 ⁻⁶	≤ 100 x 10 ⁻⁶	> 1 x 10 ⁻⁶ to ≤ 100 x 10 ⁻⁶ ^g	> 100 x 10 ⁻⁶ to ≤ 10,000 x 10 ⁻⁶ ^g	> 100 x 10 ⁻⁶	> 10,000 x 10 ⁻⁶
General public ^h (FAA-licensed launch)	E _C ^f	Refer to 14 CFR Part 400 series (FAA regulations)					
Launch essential personnel ^e	E _C ^f	≤ 10 x 10 ⁻⁶	≤ 300 x 10 ⁻⁶	> 10 x 10 ⁻⁶ to ≤ 1,000 x 10 ⁻⁶ ^g	> 300 x 10 ⁻⁶ to ≤ 30,000 x 10 ⁻⁶ ^g	> 1,000 x 10 ⁻⁶	> 30,000 x 10 ⁻⁶
Aircraft General public	P ₁ ⁱ	N/A	≤ 1 x 10 ⁻⁶	N/A	N/A	N/A	N/A
Aircraft General Aviation	P ₁ ⁱ	N/A	≤ 3 x 10 ⁻⁵	N/A	N/A	N/A	N/A
Aircraft Launch essential	P ₁ ⁱ	N/A	≤ 10 x 10 ⁻⁶	N/A	N/A	N/A	N/A
Trains	P ₁ ⁱ	N/A	≤ 1 x 10 ⁻⁶	N/A	N/A	N/A	N/A

NOTES

- a Risk is a measure that accounts for both the probability of occurrence and the consequence of hazards to a population. Risk criteria applies from lift-off to orbital insertion for orbital missions (all hazards including debris, distant focusing overpressure, toxic dispersion, etc.) and from lift-off to final impact for suborbital missions (AFI 91-202). Risk criteria apply separately to the launch and reentry phases of flight for orbital missions IAW RCC 321, AFI 91-202, National Space Policy, and SSCMAN 91-710, Volume 2
- b When risks from toxic hazards exist, ensure the allowable risk does not exceed other required standards (national, federal, and state guidelines as well as agreements with local government authorities) for toxic exposure limits for the general public
- c Prior to requesting SSC/CC approval, SLD/CC approval must have occurred
- d Collective risk is the aggregated risk to all individuals from all hazards (debris, toxics, distant focus overpressure, etc.)
- e Expectation of casualty for personnel on waterborne vessels are included in the calculation of collective risk to the General Public or Launch Essential Personnel
- f Expectation of casualty. A casualty is a serious injury or worse to a human being
- g Risks greater than “Acceptable Limit” but less than or equal to one order of magnitude above “Acceptable Limit” require SLD/CC waiver and notification to SSC/CC
- h FAA-licensed launches shall meet both the FAA and DAF risk criteria
- i Predicted probability of impact

3.2.1. Prelaunch, Launch and Reentry Operations.

3.2.1.1. Range Safety shall review, approve and monitor (through Pad Safety) all prelaunch, launch and reentry operations conducted on SSC ranges and will impose safety

holds when necessary. These actions are required to ensure that hazards do not expose the public, launch base, launch area, launch complex, recovery area or recovery site personnel and range assets to risks greater than those considered acceptable by public law, state requirements and agreements or military regulations. These documents include, but are not limited to, 42 USC, Chapter 116; 29 CFR Part 1910.119, Process Safety Management of Highly Hazardous Chemicals; 40 CFR Part 355; 40 CFR 68, Subpart G, Risk Management Plan; and California Occupational Safety and Health Administration (CAL-OSHA) regulations.

3.2.1.2. Range Safety shall oversee launch vehicle, RV, payload, mission flight control and launch support operations to ensure that risks to the public, launch area, launch complex, recovery area and recovery site do not exceed acceptable limits consistent with mission and national needs.

3.2.1.3. The Range User shall provide each launch and reentry system with a capability that allows Range Safety to initiate a hold to prevent the launch or reentry in the event of the loss of range safety critical systems or the violation of mandatory range safety launch or reentry commit criteria (see SSCMAN 91-710 Volume 6).

3.2.1.3.1. Safety holds shall be initiated to prevent the start of a launch operation or to stop a launch operation that is committed if it violates public, launch area or launch complex safety or Launch Safety launch commit criteria.

3.2.1.3.2. Safety holds may be initiated by the MFCOs, Pad Safety Supervisor/Pad Safety Officer, Range Control Officers, Range Operations Commander (WR), Flight Safety Project Officer (FSPO) (WR), the Range User, FAA representative for licensed or permitted launches or any responsible supervisor in charge of a launch operation.

3.2.1.3.3. RVs that reenter from Earth orbit and will be landing/recovering at the ER or WR shall be operated such that only the vehicle operator is able to issue a command enabling reentry of the flight vehicle. Reentry flight shall not be initiated autonomously, under nominal circumstances, without prior enable. Reentry shall not be initiated until after an analysis of the vehicle health and safety and a Range Safety "GO" is obtained.

3.2.1.4. Explosives siting is required by the DoD and by Federal Law for any organization that stores, handles, operates, and/or assembles ordnance/propellant/explosive items on a DoD installation. Quantity distance explosives siting shall be accomplished for all explosives facilities in accordance with DESR 6055.09_AFMAN 91-201. Range Users shall submit their explosive requirements a minimum of one year prior to breaking ground for new construction or initiating facility modifications that require a new explosive site plan. Explosive requirements shall be submitted a minimum of 6 months prior to beginning a new use at an existing facility.

3.2.2. Range Safety Critical Systems. Range safety critical systems include all airborne and ground subsystems of the FSS. The FSS consists of airborne and ground FTSs, airborne and ground Range Tracking System (RTS) and the Telemetry Data Transmitting System (TDTS). The ground FSS also includes any hardware or software system, subsystem or elements thereof that could prevent the MFCO from stopping the launch of a vehicle, determining the performance of a nominal or non-nominal launch or reentry vehicle or commanding flight

termination action or could cause unauthorized issuance of FTS commands. Range safety criticality shall be determined during initial acquisition activities by the Range Safety organization at the launch range (see SSCMAN 91-710 Volume 4 and RCC 319 for further details). An autonomous flight safety system (AFSS) is a range safety critical system that is self-contained onboard the vehicle. There are no real-time ground systems (tracking, commanding or other) that are part of an AFSS. Command and tracking capability is necessary only from liftoff to over-the-horizon loss of signal, as viewed from the launch head, provided public risk criteria are not exceeded.

3.2.2.1. All range safety critical systems shall be designed to ensure that no single point of failure will deny the capability to monitor and terminate or result in the inadvertent termination of a launch vehicle, RV, or payload, as applicable. For software, this requirement may be satisfied by analysis and rigorous fault testing (IV&V) acceptable to Range Safety.

3.2.2.2. Range safety critical systems shall be designed to be dual fault tolerant against failure in hardware and software and still provide overall system redundancy.

3.2.2.3. The reliability requirements of the FSS are as follows:

3.2.2.3.1. The overall airborne and ground FTS reliability goal is 0.9981 at the 95 percent confidence level.

3.2.2.3.1.1. The airborne FTS reliability goal shall be a minimum of 0.999 at the 95 percent confidence level. This goal shall be met by combining the design approach and testing requirements of SSCMAN 91-710 Volume 4 and RCC 319.

3.2.2.3.1.2. The ground FTS shall have a reliability of 0.999 at the 95 percent confidence level for an 4-hour duration, as required.

3.2.2.3.2. The overall airborne and ground RTS reliability is a function of the following requirements:

3.2.2.3.2.1. The airborne RTS reliability shall be 0.995 at the 95 percent confidence level for transponder systems and 0.999 at the 95 percent confidence level for global positioning systems. Reliability requirements for other tracking systems, such as inertial measurement units, shall comply with the tracking system reliability requirements in RCC 324. These requirements shall be met by combining the design approach and testing requirements of SSCMAN 91-710 Volume 4.

3.2.2.3.2.2. The ground RTS reliability shall be 0.999 at the 95 percent confidence level for the duration of range safety responsibility.

3.2.2.3.3. The reliability requirement for the TDTS is the same as that for the airborne and ground RTS when the TDTS is used to provide tracking data. At a minimum, for vehicle health and FSS post-flight analysis, TDTS reliability shall be a minimum of 97% which includes ground and airborne systems.

3.2.2.4. Other systems determined to be range safety critical shall have a design reliability of 0.999 at the 95 percent confidence level.

3.2.2.5. The RTS shall include at least two adequate and independent instrumentation data sources. At least one of the instrumentation data sources shall be Global Positioning System (GPS) Metric Tracking (MT) as required by the Under Secretary of the Air Force memorandum (GPS Metric Tracking) dated Sep 20, 2006. This requirement applies to all launches (DoD, civil and commercial) from the Eastern and Western ranges. Waiver authority for this requirement is the SSC/CC. **Exception:** If an autonomous flight safety system is used, then a GPS tracking source is not mandated.

3.2.2.5.1. After T-0, based on Range Safety pre-launch analysis, two tracking sources are required for an adequate period of time before Minimum Time to Endanger to allow for MFCO actions to prevent violation of the destruct lines.

3.2.3. Control of Errant Vehicle Flight.

3.2.3.1. Range Safety shall verify that all launch or reentry vehicles launched from or onto SSC ranges or RVs or flyback stages originating from or recovering onto SSC ranges have a Range Safety-approved method of minimizing risks to the public, launch area, launch complex personnel and resources and recovery site personnel and resources. Normally, control systems on launch and reentry vehicles using the ranges shall consist of an airborne FSS that shall meet all the requirements of SSCMAN 91-710 Volumes 2 and 4 of this publication. A thrust termination system may be considered as an option for an FSS; however, quantification of risks shall be determined, and the requirements in SSCMAN 91-710 Volume 2 shall be met. The alternative thrust termination concept and design shall be approved by the SLD/CC.

3.2.3.2. Range Safety shall establish flight termination criteria and mission flight rules to ensure that operations do not exceed acceptable public safety limits.

3.2.3.3. Range Safety shall establish and control hazardous launch areas, recovery areas and procedures to protect the public on land, on the sea and in the air for each launch and launch vehicle or RV using the ranges and to ensure the following criteria are met:

3.2.3.3.1. No intact launch vehicle, RV, scheduled debris, payload, or launch vehicle and payload subsystems shall be allowed to intentionally impact on land except in the launch area or recovery area inside the impact limit lines. **Exception:** Air Force Global Strike Command (AFGSC) & MDA missions downrange. **Note:** There may be missions that require no intact impact on land areas (for example, a nuclear payload launch) that may drive additional mitigation techniques or augmentation to ensure vehicle or stage destruct capability inside the impact limit lines.

3.2.3.3.2. Flight paths and trajectories shall be designed so that normal impact dispersion areas do not encompass land.

3.2.3.3.3. Safety margins shall be used to avoid overly restrictive flight termination (destruct) limits.

3.2.3.4. Range Safety rules may allow errant launch vehicles and RVs to continue to fly to obtain maximum data until they would present an unacceptable risk to the public or until the launch vehicle or RV can no longer be controlled.

3.3. Launch Area Safety. The following requirements are in addition to those specifically identified for launch area safety in [paragraph 3.2](#). See [Attachment 5](#) and SSCMAN 91-710 Volume 7 for the definitions of terms related to risk.

3.3.1. The ranges shall ensure that all personnel and DAF or third-party resources located on any SSC range, including CCSFS or VSFB or on any supporting site within the ER or WR, are provided an acceptable degree of protection from the hazards associated with range operations.

3.3.2. Launch-Essential Personnel. Allowable collective aggregated risk for launch-essential launch area personnel is 300×10^{-6} . Allowable individual risk for launch-essential personnel is 10×10^{-6} .

3.3.2.1. Launch-essential personnel are those persons necessary to safely and successfully complete a specific/current hazardous operation or launch.

3.3.2.2. Launch-essential personnel include supporting personnel required to perform emergency actions according to authorized directives and persons in training to perform emergency actions.

3.3.2.3. Range Safety and the Range User jointly determine the number of launch-essential personnel allowed in safety clearance zones and hazardous launch areas with the concurrence of the SLD/CC.

3.3.3. For non-FAA-licensed or permitted launches, the SLD/CC can allow for neighboring operations personnel (NOP) to be assessed at the same risk level as launch-essential personnel (300×10^{-6} aggregated risk or 10×10^{-6} individual risk). For risk requirements for FAA-licensed or permitted launches, see 14 CFR Part 400 series.

3.3.4. Range Safety shall conduct risk studies and analyses to determine the risk levels, define acceptable risk levels and develop exposure criteria for launch area and launch complex safety.

3.3.5. Range Safety shall establish design criteria and controls, procedures, and processes to minimize personnel risks and ensure acceptable launch area and launch complex risk levels are not exceeded.

3.3.6. Range Safety shall evaluate all launch vehicle, payload, ground support and facility systems used on the ranges to test, checkout, assemble, handle, support or launch space launch vehicles or payloads with regard to their hazard potential and ensure they are designed to minimize risks to personnel and fall within acceptable exposure levels for launch area and launch complex safety.

3.3.7. Range Safety shall ensure that all hazardous operations affecting launch area and launch complex safety are identified and conducted using Range Safety or safety control authority (if procedure hazards are limited to launch complex safety) approved formal written procedures. Through Pad Safety, Range Safety shall ensure launch area and launch complex safety is provided IAW this publication and approved OSPs.

3.3.8. Range Safety shall define the threat envelope of all hazardous operations affecting launch area and launch complex safety and establish safety clearance zones to protect personnel and resources. A minimum number of personnel shall be exposed to the minimum hazard level consistent with efficient task accomplishment.

3.3.9. Range Users shall ensure all personnel performing hazardous operations that may impact launch area or launch complex safety are provided adequate training to ensure proper conduct of their jobs and tasks by reviewing Range User training plans. Range Safety may review the Range User training plans to ensure compliance.

3.3.10. Launch Area Resource Safety. Resource safety, formerly known as resource protection, is the protection of facilities, support equipment or other property from damage due to mishaps.

3.3.10.1. The SLD/CC shall ensure range-owned resources are protected. Where government property or facilities are leased to launch system operators, the SLD/CC shall ensure the government agency responsible for the resource identifies the requirements for resource safety in the appropriate lease agreements.

3.3.10.2. Procedures and rules that are applied for public and launch area safety shall be used to reduce risks to launch area DAF and third-party physical resources to acceptable levels.

3.3.10.3. Siting, design and use of DAF and third-party physical resources shall consider potential hazards and threat envelopes to ensure that damage exposure is limited to acceptable levels as defined by federal law and national consensus standards.

3.3.10.4. DAF squadron/detachment commanders shall be responsible for implementing resource safety requirements for all DAF flight hardware, ground support equipment and facilities within their assigned areas.

3.3.10.5. The US Navy, the National Aeronautics and Space Administration (NASA) and other government tenant organizations shall be responsible for all tenant-occupied facilities and tenant-owned equipment.

3.3.10.6. The SLD/CC is responsible for the implementation of resource safety requirements for any area on the installation that is not assigned to a specific DAF squadron/detachment commander or other Range User.

3.3.10.7. Commercial Range Users (contractors or licensed launch operators) shall be responsible for commercially owned, leased, or licensed physical resources, including facilities, equipment and flight hardware.

3.3.10.8. The SLD/CC shall inform owners of non-range resources of risk that may be incurred from operations of others when risk exceed normal limits.

3.4. Launch Complex Safety. The following requirements are in addition to those identified for launch complex safety in [paragraph 3.2](#) and [paragraph 3.3](#).

3.4.1. For commercially leased/licensed facilities and non-DAF government facilities with full-time safety staffs, the Space Launch Delta Chief of Safety shall review a list and summary of all hazardous procedures and shall identify any procedures that may pose or induce a potentially hazardous condition which may extend beyond the facility boundaries controlled by the operator. These procedures shall be classified as “launch area hazardous” and shall be reviewed and approved by the Space Launch Delta Chief of Safety or their designated representative. For launch complex facilities operated by the DAF or organizations without full-time safety staffs, the Space Launch Delta Chief of Safety or their designated

representative shall review and approve all procedures that may pose or induce a hazardous condition.

3.4.2. If the Range User is operating under a government contract, the government agency owning the contract shall ensure the launch provider is adequately protecting government interests within the terms and conditions of the contract.

3.4.3. When hazards extend to range assets or the general public, the SLD/CC has the ultimate responsibility to ensure proper safety through an appropriate level of oversight into Range User operations.

3.5. Recovery Area Safety. The following requirements are in addition to those specifically identified for reentry and recovery area safety (for reentry vehicles and flyback stages) in [paragraph 3.2](#) See [Attachment 5](#) and SSCMAN 91-710 Volume 7 for the definitions of terms related to risk.

3.5.1. Recovery-Essential Personnel. Allowable collective risk for recovery-essential personnel in the recovery area is 300×10^{-6} . Allowable individual risk for recovery-essential personnel in the recovery area is 10×10^{-6} .

3.5.1.1. Recovery-essential personnel are those persons necessary to safely and successfully complete a specific/current hazardous operation or support recovery of a RV.

3.5.1.2. Recovery-essential personnel include supporting personnel required to perform emergency actions according to authorized directives and persons in training to perform emergency actions.

3.5.1.3. Range Safety and the Range User jointly determine the number of recovery-essential personnel allowed in safety clearance zones and hazardous recovery areas with the concurrence of the SLD/CC.

3.5.2. For non-FAA-licensed or permitted reentry and recovery operations, the SLD/CC can allow for Neighboring Operations Personnel (NOP) to be assessed at the same risk level as launch and recovery essential personnel (300×10^{-6}). For risk requirements for FAA-licensed or permitted reentry and recovery operations, see 14 CFR Part 400 series.

3.5.3. Range Safety shall conduct risk studies and analyses to determine the risk levels, define acceptable risk levels and develop exposure criteria for recovery area and recovery site safety.

3.5.4. Range Safety shall establish design criteria and controls, procedures, and processes to minimize personnel risks and to ensure acceptable recovery area and recovery site risk levels are not exceeded.

3.5.5. Range Safety shall evaluate all RV, payload, ground support and facility systems used on the range to test, checkout, assemble, handle, support or recover RVs or payloads with regard to their hazard potential and to ensure they are designed to minimize risks to personnel and fall within acceptable exposure levels for recovery area and recovery site safety.

3.5.6. Range Safety shall ensure that all hazardous operations affecting recovery area and recovery site safety are identified and conducted using Range Safety approved formal written procedures. Through Pad Safety, Range Safety shall ensure recovery area and recovery site safety is provided IAW this publication and approved OSPs.

3.5.7. Range Safety shall define the threat envelope of all hazardous operations affecting recovery area and recovery site safety and establish safety clearance zones to protect personnel and resources. A minimum number of personnel shall be exposed to the minimum hazard level consistent with efficient task accomplishment.

3.5.8. Range Users shall ensure all personnel performing hazardous operations that may impact recovery area or recovery site safety are provided adequate training to ensure proper conduct of their jobs and tasks by reviewing Range User training plans. Range Safety may review the Range User training plans to ensure compliance.

3.5.9. Recovery Area Resource Safety. Resource safety, formerly known as resource protection, is the protection of facilities, support equipment or other property from damage due to mishaps.

3.5.9.1. The SLD/CC shall ensure range-owned resources are protected. Where government property or facilities are leased to RV operators, the SLD/CC shall ensure the government agency responsible for the resource identifies the requirements for resource safety in the appropriate lease agreements.

3.5.9.2. Procedures and rules that are applied for public and recovery area safety shall be used to reduce risks to the recovery area, DAF and third-party physical resources to acceptable levels.

3.5.9.3. Siting, design and use of DAF and third-party physical resources shall consider potential hazards and threat envelopes to ensure damage exposure is limited to acceptable levels as defined by federal law and national consensus standards.

3.5.9.4. DAF squadron/detachment commanders shall be responsible for implementing resource safety requirements for all DAF flight hardware, ground support equipment and facilities within their assigned areas.

3.5.9.5. The US Navy, NASA and other government tenant organizations shall be responsible for all tenant-occupied facilities and tenant-owned equipment.

3.5.9.6. The SLD/CC shall be responsible for implementation of resource safety requirements for an area on the installation not assigned to a specific DAF squadron/detachment commander or other Range User.

3.5.9.7. Commercial Range Users (contractors or licensed reentry operators) shall be responsible for commercially owned, leased, or licensed physical resources, including facilities, equipment and flight hardware.

3.6. Recovery Site Safety. The following requirements are in addition to those also specifically identified for recovery area safety in [paragraph 3.2](#) and [paragraph 3.5](#). The recovery area remains under the control of the SLD/CC. The recovery site must be a specifically defined geographic area or facility capable of being controlled by the Operator and not fouling or otherwise impeding the functionality of the recovery area.

3.6.1. The Chief of Safety shall review and approve all hazardous procedures and any procedures that may pose or induce a hazardous condition.

3.6.2. If the Range User is operating under a government contract, the government agency owning the contract shall ensure the reentry/flyback stage operator is adequately protecting government interests within the terms and conditions of the contract.

3.6.3. When hazards extend to range assets or the general public, the SLD/CC has the ultimate responsibility to ensure proper safety through an appropriate level of oversight into Range User operations.

3.7. Hazard Consequence, Probability and Risk Assessment Tables.

3.7.1. **Table 3.2**, **Table 3.3**, and **Table 3.4** show nominal launch area, launch complex, recovery area and recovery site hazard consequence, probability and risk assessment categories correlated to different levels of acceptability for hazards not associated with launch, recovery, launch safety launch commit criteria, or reentry commit criteria.

3.7.2. The numbers provided in these tables are guidance only and are not necessarily hard limits.

Table 3.2. Launch and Recovery Site Hazard Consequence Categories.

Category		Potential Consequences			
		Personnel Illness/Injury	Equipment Loss (\$)	Unit Downtime	Data Compromise
I	Catastrophic	Could result in one or more of the following: death, permanent total disability, irreversible significant environmental impact.	> 10,000,000	> 4 months	Data is never recoverable or primary program objectives are lost.
II	Critical	Could result in one or more of the following: permanent partial disability, injuries or occupational illness that may result in hospitalization of at least three personnel, reversible significant environmental impact.	1,000,000 to 10,000,000	2 weeks to 4 months	May cause repeat of test program.
III	Marginal	Could result in one or more of the following: injury or occupational illness resulting in one or more lost workday(s), reversible moderate environmental impact.	100,000 to 1,000,000	1 day to 2 weeks	May cause repeat of test period.
IV	Negligible	Could result in one or more of the following: injury or occupational illness not resulting in a lost workday, minimal environmental impact.	< 100,000	< 1 day	May cause repeat of data point, or data may require minor manipulation or computer rerun.

Table 3.3. Launch and Recovery Site Hazard Probability Categories.

Category		Range		Specific Individual Item	Fleet or Inventory
		Lower Limit	Upper Limit		
A	Frequent	3×10^{-2}	3×10^{-1}	Likely to occur repeatedly	Continuously experienced
B	Probable	3×10^{-3}	3×10^{-2}	Likely to occur several times	Will occur frequently
C	Occasional	3×10^{-4}	3×10^{-3}	Likely to occur sometime	Will occur several times
D	Remote	8×10^{-5}	3×10^{-4}	Unlikely to occur, but possible	Unlikely, but can reasonably be expected to occur
E	Improbable	1×10^{-6}	8×10^{-5}	Very unlikely to occur, but still possible.	Unlikely to occur, but possible
<p>Notes:</p> <p>Probability refers to the probability that the potential consequence will occur in the life cycle of the system (test/activity/operation).</p> <p>Definitions of descriptive words may need to be modified based on the quantity involved.</p> <p>The size of the fleet or inventory as well as the system life cycle shall be defined.</p>					

Table 3.4. Launch and Recovery Site Hazard Risk Matrix.

Severity Probability	Catastrophic (I)	Critical (II)	Marginal (III)	Negligible (IV)
A (Frequent)				
B (Probable)				
C (Occasional)				
D (Remote)				
E (Improbable)				
Notes:				
High – unacceptable		Serious – waiver required		
Medium – ELS required		Operation permitted		

Chapter 4

RANGE SAFETY PROCESSES

4.1. Range Safety and Range User Interface Process. Due to the complexity of launch vehicle and reentry programs, early Range Safety and Range User planning will lead to a cost-effective safety program and reduce potential schedule impacts. The goal of the interface process is to provide final approvals for launch and reentry as early as possible. Range Users will first be introduced to Range Safety through the SLD/XP office or, as applicable, through the sponsoring Range User. The PM will assist in establishing interfaces with other SLD offices for safety-related purposes. Range Users are strongly encouraged to solicit Range Safety participation in the development of programmatic documentation such as requests for proposals, source selection processes, concept developments, preliminary/subsequent design reviews, statements of work and contract data requirements lists. It is not the intent of this publication or the interface process to stifle ingenuity, new technology, state-of-the-art development or unique solutions to safety problems. Instead, the interface process ensures that Range Safety and Range Users understand the requirements of this publication and reach mutual agreement on compliance methods early in the program.

4.2. Range Safety Concept-to-Launch Process. The overall Range Safety process from “concept to launch” for new launch vehicles is shown in [Attachment 8, Figure A8.1](#). This process can be tailored to apply to RVs, payloads, ground support equipment, critical facilities and/or hazardous and safety critical operations. The details of this process can be found in SSCMAN 91-710 Volumes 2 through 6.

4.3. Initial Range Safety and Range User Technical Interchange Meeting.

4.3.1. During the concept phase of a program, Range Users shall contact Range Safety to arrange an initial technical interchange meeting (TIM) through the SLD/XP office. The purpose of this meeting is to present program concepts regarding flight plans; launch complex selection; recovery site selection, launch vehicle, RV, payload and ground support equipment; the FSS; and facility design, operations and launch complex safety and recovery site safety responsibility to determine if there are any major safety concerns that could impact the program.

4.3.2. This TIM may occur at any time but shall be no later than the formal PI via the SLD/XP office. The cost of the initial interface meetings will not be charged to the Range User as long as the workload associated with this activity is insignificant in scope.

4.4. Tailoring Process.

4.4.1. If desired by the Range User, Range Safety and the Range User shall jointly develop a tailored edition of this publication for their program. The purpose of tailoring the publication is to ensure that only applicable requirements are identified and to determine whether the requirement will be met as written or through an alternative means that will provide an ELS.

4.4.2. Requirements in this publication are subject to tailoring within limits, including detailed design, performance, operating and documentation requirements. Consideration is given to applicability, design pedigree and complexity, state of the art technology, cost and risk. Details of the tailoring process can be found in [Attachment 2](#).

4.4.3. Tailoring, if desired, should begin at the earliest opportunity and finish no later than 30 days after the critical design review. Tailored documents may be changed after initial approval, if necessary, but must go through the approval process again to accept changes.

4.4.4. The FAA shall be included in the tailoring process for FAA licensed or permitted programs at SSC ranges (see *Memorandum of Understanding Between Air Force Space Command and Federal Aviation Administration Office of Commercial Space Transportation for Resolving Requests for Relief from Common Launch Safety Requirements*). Although the tailoring may reference waivers, waivers shall be approved through a separate waiver process. ELS determinations are normally documented as part of the tailoring process.

4.5. Other Range Safety and Range User TIMs and Reviews. Range Safety and Range Users shall jointly agree to arrange for the following TIMs and reviews as necessary:

4.5.1. Flight Safety TIMs [Preliminary Flight Data Package (PFDP) and/or Final Flight Data Package (FFDP), SSCMAN 91-710 Volume 2].

4.5.2. Combined or independent safety reviews in association with the System Requirements Review (SRR), Preliminary Design Review (PDR), Critical Design Review (CDR), Pre-Ship Review (PSR) for the launch vehicle, RV, payload and associated ground support equipment design [Missile System Prelaunch Safety Package (MSPSP), SSCMAN 91-710 Volume 3], airborne FSS and associated ground support equipment design [Flight Termination System Report (FTSR), SSCMAN 91-710 Volume 4], critical facility design [Facility Safety Data Package (FSDP), SSCMAN 91-710 Volume 5] and Ground Operations Plans (GOPs), SSCMAN 91-710 Volume 6. For programs that do not use the above reviews, the Range User shall develop, in coordination with Range Safety, a review process that meets the intent of these requirements. This alternate process shall be included in the program's System Safety Program Plan.

4.5.2.1. SRRs or program equivalent activities shall provide design and operations detail to at least the system level.

4.5.2.2. PDRs or program equivalent activities shall provide design and operations detail to at least the subsystem and box level.

4.5.2.3. CDRs or program equivalent activities shall provide design and operating detail to the component and piece part level.

4.5.2.4. PSRs or program equivalent activities shall provide sufficient detail to ensure hazards are controlled to the maximum extent possible and to ensure Range Safety required documentation (e.g., MSPSP, Hazard Tracking System, FSDP, OSP, as a minimum) is ready for closure and Range Safety concurrence prior to the shipment of hardware to the range.

4.5.3. Hazardous and safety critical procedures TIMs (SSCMAN 91-710 Volume 6) and other TIMs, reviews, and meetings, as necessary.

4.6. Equivalent Level of Safety Determinations and Waivers.

4.6.1. General. Range Users shall identify the need for any potential ELS determinations and/or waivers regarding requirements in this publication to Range Safety for resolution. Waivers which could increase mishap risk related to DAF System Program/Project Office (SPO) acquired (or sustained) Systems/Services must be coordinated with the SPO Director or

designee for concurrence prior to exposure of the system to the risk. Potential ELS determinations or waivers shall be identified and presented to the Range Safety approval authority at the earliest possible time, preferably no later than the SRR. Details and requirements for submitting non-compliance requests can be found in [Attachment 4](#), “Submitting SSCMAN 91-710 Noncompliance Requests.”

4.6.2. ELS Determination. The term ELS means an approximately equal level of safety. An ELS may involve a change to the level of expected risk that is not statistically or mathematically significant as determined by qualitative or quantitative risk analysis. ELS determination made by SSC ranges have been referred to in the past as meets intent certifications. ELS determinations are normally incorporated during the tailoring process. A “life of the program” ELS should be addressed through updates to the program’s tailored IAW [Attachment 4](#).

4.6.3. Waivers

4.6.3.1. The term *waiver* refers to a decision that allows a Range User to continue with a launch or reentry, including the launch or reentry process, even though the Range User does not satisfy a specific safety requirement and is not able to demonstrate an ELS. A waiver applies where a failure to satisfy a safety requirement involves a statistically or mathematically significant increase in expected risk as determined through quantitative and/or qualitative risk analysis and the activity may or may not exceed the public risk criteria. The use of waivers will be minimized.

4.6.3.2. Waivers to the requirements shall be granted only in extremely unique or compelling circumstances and only when the mission objectives of the Range User cannot otherwise be achieved. Range Safety and the Range User shall jointly endeavor to ensure that all requirements of this publication are met as early in the design and operation process as possible to limit the number of required waivers to an absolute minimum.

4.6.3.3. Waivers shall always have the effectivity designated. All waivers are intended to have limited effectivities. “Life of the program” or lifetime waivers are highly discouraged and must be thoroughly justified. Range users shall provide a definitive “get-well” plan for all waiver requests.

4.6.3.4. The FAA shall be included in the waiver process for FAA licensed or permitted programs at SSC ranges (see *Memorandum of Understanding Between Air Force Space Command and Federal Aviation Administration Office of Commercial Space Transportation for Resolving Requests for Relief from Common Launch Safety Requirements*). For non-FAA licensed launches, the DAF shall notify the FAA and obtain FAA coordination regarding waivers involving ‘common’ launch vehicles or ‘common’ launch vehicle components.

4.6.3.5. The SLD/CC shall approve or disapprove all waivers affecting public safety.

4.6.3.6. The Chief of Safety or their designated representative shall approve or disapprove all waivers other than those affecting public safety.

4.6.4. Submittal. The Range User shall submit all waiver requests to Range Safety for review and approval. ELS determinations shall normally be documented as part of the tailoring

process. All approved waivers and ELS determinations shall be included in the appropriate safety data package as an appendix.

4.6.5. Every applicable waiver shall be reviewed for validity prior to each launch, reentry, and launch or reentry cycle. The Range User shall present a synopsis of each applicable waiver with the rationale concerning its viability for review and approval by Range Safety.

4.7. Changes to Approved Generic Systems.

4.7.1. Once baseline or generic launch or reentry systems, including launch or reentry vehicles, payloads, ground support equipment, FSSs and critical facilities have been approved, only those systems and subsystems that change shall be submitted to Range Safety for review and approval. The approval process remains the same as described in this publication and is subject to the requirements in [paragraph 1.2.3. Attachment 7](#) provides a tailored process for the approval of generic payloads.

4.7.2. Documentation shall be marked or labeled as “Mission Unique,” “Upgrade,” “Change” or “Other” to the previously approved system and shall be prepared in such a manner to allow easy reference to previously approved submittals.

Chapter 5

SAFETY AUTHORIZATIONS, APPROVALS AND DOCUMENTATION

5.1. General. Range Users are solely responsible for obtaining the identified mandatory authorizations and approvals necessary for operating on or launching from the ranges. Also, Range Users are responsible for providing the documentation necessary to show compliance or the rationale for obtaining ELS determinations or waivers to the requirements identified in this publication (See [paragraph 4.6](#)).

5.2. Safety Authorizations.

5.2.1. Programs launching from or reentering onto SSC ranges shall obtain authorizations from the appropriate authority.

5.2.2. Programs operating from an SCC range shall use an FSS that is jointly approved for flight at all SSC ranges. This includes government and FAA-licensed or permitted programs. Departures from this requirement shall be approved by all SSC ranges. Departures from this requirement shall not be approved unless Range Users sign a letter acknowledging that they will be solely responsible for any additional costs resulting from a decision to operate at another SSC range.

5.2.3. Programs launching from or reentering onto SSC ranges shall obtain authorizations for common requirements from the appropriate SLD authorities.

5.2.3.1. Unique requirements shall require authorizations from the appropriate SLD authority.

5.2.3.2. In general, if a program is approved at either of the current SSC ranges (ER or WR), it will be approved at the other range. However, for approval to occur, a streamlined review of the following items shall take place: all Range Safety required documentation, SSCMAN 91-710 tailoring non-compliances and agreements made between the Range User and the originating Range Safety office. The Range User shall also address applicable ER or WR unique requirements that are not subject to the original approval. Updates to existing range safety documentation, particularly the SAR, GOP and hazardous or safety critical procedures shall normally be required due to the change in the operating location.

5.3. Safety Approvals.

5.3.1. SLD Commander. The following safety approvals shall be authorized only by the SLD/CC or their designated representatives:

5.3.1.1. Tailored portions of SSCMAN 91-710 affecting public safety. (SLD 30/SE: Flight termination criteria for all launch vehicles)

5.3.1.2. Launch Safety launch commit criteria for all launch vehicles.

5.3.1.3. Range safety reentry commit criteria for all RVs that will recover to the Range.

5.3.1.4. The launch of launch vehicles containing explosive warheads.

5.3.1.5. The reentry of reentry vehicles containing explosive warheads.

5.3.1.6. The launch of nuclear payloads. In addition, nuclear payloads which meet criteria specified in DAFMAN 91-110 require Presidential approval IAW NSPM-20.

- 5.3.1.7. Waivers affecting public safety.
- 5.3.1.8. Alternative thrust termination concepts and design.
- 5.3.1.9. Range Safety Launch/Reentry Operations Approval Letter (SSCMAN 91-710 Vol. 1 and 6).
 - 5.3.1.9.1. WR. A Range Safety Launch Operations Approval Letter granting approval to launch from or onto the WR, signed by the Chief of Safety, shall be provided to the Range User no later than the scheduled LRR conducted before a planned launch operation. A Reentry Operations Approval Letter, signed by the SLD/CC, shall be provided to the Range User no later than Reentry Readiness Review (RRR) for reentry operations. Receipt of this letter depends on the Range User having obtained the previously required approvals described in this volume.
 - 5.3.1.9.2. ER. Launch/Reentry Operations Approval Letters are not normally issued by the ER. Range Safety's "GO" for launch at the LRR/RRR constitutes approval to launch/reentry operations and is contingent upon the Range User having obtained the required approvals identified in this volume. However, a Range Safety Launch/Reentry Operations Approval Letter can be provided, if requested.
 - 5.3.1.9.3. Lack of launch/reentry operations approval may result in the launch being withdrawn from the Range schedule.
- 5.3.1.10. Launch Safety Mission Rules, including termination criteria for expendable launch or reentry vehicles.
- 5.3.2. Chief of Safety. The following safety approvals shall be authorized by the Chief of Safety or a designated representative:
 - 5.3.2.1. Tailored versions of SSCMAN 91-710 (see [Attachment 2](#)).
 - 5.3.2.2. All ELSs
 - 5.3.2.3. All waivers that do not affect public safety.
 - 5.3.2.4. SSPP (see [Attachment 3](#)).
 - 5.3.2.5. Launch vehicle, RV and payload flight plans, PFDP and FFDP (see SSCMAN 91-710 Vol. 2).
 - 5.3.2.6. Aircraft and Ship Intended Support Plans (ISPs) (see SSCMAN 91-710 Vol. 2).
 - 5.3.2.7. Directed Energy Plans (DEPs) (see SSCMAN 91-710 Vol. 2).
 - 5.3.2.8. MSPSP (see SSCMAN 91-710 Vol. 3).
 - 5.3.2.9. Airborne FTSR (see SSCMAN 91-710 Vol. 4).
 - 5.3.2.10. FSDP (see SSCMAN 91-710 Vol. 5).
 - 5.3.2.11. Hazardous and Safety Critical Procedures (see SSCMAN 91-710 Vol. 1 and SSCMAN 91-710 Vol. 6).
 - 5.3.2.12. Final Range Safety Approval for Launch/Reentry (see SSCMAN 91-710 Vol. 1 and 6).

- 5.3.2.12.1. Holdfire checks, FSS checks, and other safety critical checks shall be performed satisfactorily; environmental conditions shall be met; and all Launch Safety launch or reentry commit criteria shall be “green” before final approval to launch or reenter (see SSCMAN 91-710 Vol. 6).
- 5.3.2.12.2. Given that holdfire checks, FSS checks, other safety critical checks and environmental conditions are satisfactory, and all Launch/Range Safety launch/reentry commit criteria are “GREEN,” Range Safety shall provide a final approval to launch/reenter as follows: At the ER, the Chief of Safety reports “GO” status to the launch decision authority during the final “CLEAR TO LAUNCH” poll. At the WR, the MFCO issues a “GREEN TO GO” electronically and a verbal call “Safety is sending a GREEN.”
- 5.3.2.13. Range safety instrumentation, tracking, data and display requirements for all launch or reentry vehicles.
- 5.3.2.14. Safety Assessment Report (SAR).
- 5.3.2.15. RSORs.

5.4. Other Required Approvals.

- 5.4.1. Explosives Site Plans. Explosives site plans require the signature of a member of the Department of Defense Explosives Safety Board (DDESB).
- 5.4.2. Use of Radioactive Sources for Space Operations. The use of radioactive sources for space operations requires approval IAW procedures in SSCMAN 91-710 Vol. 3.
- 5.4.3. For commercial launches from an SSC range, or from a neighboring location that presents a risk to SSC people, facilities, or resources, SSC will require hazard analysis that provides an assessment of risk from the launch/reentry activity. Range Safety will review this hazard analysis for consideration against established risk criteria to determine if the activity presents acceptable risk to resources. If risk exceeds criteria, the SLD/CC can mitigate, accept, or reject the activity based on unacceptable impact to national security interests. If the SLD/CC rejects the risk and halts the activity, SLD/CC shall be notified.

5.5. Documentation and Data Requirements. Volumes 2 through 6 of this publication have “Documentation Requirements” or “Data Requirements” that describe the information that shall be submitted and the processes that shall be used to obtain the necessary approvals to operate at SSC ranges. In addition, attachments in all volumes provide detailed document content requirements that shall be met. All other documentation noted in the specific volumes shall also be approved as indicated in the respective SSCMAN 91-710 volumes. While developing the required documentation, Range Users are encouraged to work closely with Range Safety to facilitate the approval process. The Range User is responsible for providing the following documents (not all inclusive):

- 5.5.1. Tailored version of SSCMAN 91-710, if desired (see [Attachment 2](#)).
- 5.5.2. Tailored version of an SSPP (see [Attachment 3](#)).
- 5.5.3. Flight Plans, PFDPs, FFDPs, ISPs and DEPs (see SSCMAN 91-710 Vol. 2).
- 5.5.4. MSPSP, associated test plans and reports (see SSCMAN 91-710 Vol. 3).

5.5.5. Airborne FTSR (see SSCMAN 91-710 Vol. 4).

5.5.6. FSDP for all critical facilities and launch complexes and recovery sites, including applicable test plans, test reports, demolition plans and explosive quantity distance site plans (see SSCMAN 91-710 Vol. 5).

5.5.7. GOPs, hazardous and safety critical procedures, recycle procedures, FEOPs, Emergency Evacuation Plans (EEPs) and, as applicable, Emergency Response Plan (ERP) for graphite/epoxy composite over-wrapped and Kevlar-wrapped pressure vessels (see SSCMAN 91-710 Vol. 6).

5.5.8. Data for mission rules, launch commit criteria, reentry commit criteria and flight control operations, telemetry measurement lists and electronic media, the Range User Countdown Checklist and any special requirements.

5.5.9. ELS or waiver request justification (see [Attachment 4](#)).

5.5.10. Safety Assessment Report (SAR).

Chapter 6

INVESTIGATING AND REPORTING MISHAPS AND INCIDENTS

6.1. Mishaps and Incidents Involving Department of the Air Force Personnel and Resources. Following any vehicle or FSS failure, a Range Safety return to flight certification shall be required. Vehicle-related failure resolution shall address risk model reliability and ensure corrective action was initiated. For an FSS in-flight failure, root cause and corrective action shall be completed and approved by Range Safety. The appropriate DAF organization shall investigate and report all mishaps and incidents involving DAF personnel and resources IAW DAFI 91-204, *Safety Investigations and Reports*; AFMAN 91-221, *Weapons Safety Investigations and Reports*; AFMAN 91-222, *Space Safety Investigations and Reports*; and DAFMAN 91-224, *Ground Safety Investigations and Reports*.

6.2. Non-Department of the Air Force Personnel and Resources.

6.2.1. The SSC ranges shall not report or investigate non-Department of the Air Force mishaps under DAFI 91-204 auspices. However, Range Safety shall assist and participate in mishap investigations that affect or could affect public safety, launch area safety, recovery area safety or Department of the Air Force resources and may assist in non-Department of the Air Force mishap investigations that affect or could affect launch complex safety, recovery site safety or non-Department of the Air Force third party resources.

6.2.2. Range Safety shall be provided with the investigation results of any mishaps or incidents occurring on the ranges that were destined for one of the ranges, or at any off-range recovery areas for missions that originated on the range.

6.2.3. Regardless of the Range User, the SLD/CC may conduct formal investigations into any mishap and incident that affects or could affect public safety, launch area safety, recovery area safety, launch complex safety or recovery site safety. However, the scope of such an investigation into contractor mishaps is limited to the protection of the public, other Range Users and Department of the Air Force personnel and resources.

6.2.4. Investigation of FAA-licensed and/or permitted activities shall be IAW with applicable FAA, National Transportation and Safety Board (NTSB) and DAF regulations and MOUs regarding space launch accidents.

6.2.5. Investigation of other U.S. government agency launches (non-DoD, non-FAA-licensed) will be conducted under the regulations of that agency, unless one of the conditions cited in [paragraph 6.2.3](#) occurs (e.g., range safety system failure suspected or confirmed.)

6.3. Reporting Space Launch System Anomalies. Any anomaly with potential safety implications occurring with a launch or reentry vehicle or system during prelaunch processing (including range safety system ground systems), launch, flight, deorbit/deorbit preparations, reentry or post-launch processing or post-recovery processing shall be promptly reported to Range Safety for review. Range Users shall notify Range Safety of all anomaly reviews/meetings prior to the review/meeting and shall provide copies of the briefings, reports, meeting minutes and actions identified and taken to address the anomalies.

Chapter 7

CHANGES TO THIS PUBLICATION

7.1. Change Review Cycle. This publication shall be reviewed and updated every four years; however, it may be updated more frequently, if required. Each volume of SSCMAN 91-710 is considered a separate publication and can be updated individually.

7.2. Change Process. Permanent changes shall be performed IAW the requirements in [Attachment 6](#). Changes requiring immediate attention, such as previously unknown risk, safety compromise, or implementation of new technology, shall be made as necessary and distributed as Guidance Memorandums IAW DAFMAN 90-161.

7.3. Change Notifications. All changes to this publication shall be coordinated among the SSC ranges before being submitted to HQ SSC/SE for incorporation. Range Safety shall inform all their Range Users when changes are issued to any volume of SSCMAN 91-710.

Chapter 8

RANGE USER INFORMATION SOURCES

8.1. Organization of SSCMAN 91-710 Volumes.

8.1.1. Main Chapters. The main chapters of this publication include common requirements for all vehicle classes. Attachments include additional requirements to supplement the main chapters.

8.1.2. Open Text. The open text contains the actual mandatory performance-based requirements. Tailoring expected for these requirements includes the deletion of non-applicable requirements, changes to an existing requirement due to a different design or process with rationale acceptable to Range Safety, or addition to a requirement when there are no existing requirements addressing a new technology, when unforeseen hazards are discovered, when federal or industry standards change and for similar reasons. For example, solid rocket motor performance requirements would be deleted for launch systems that do not use solid rocket motors.

8.1.3. Bordered Paragraphs.

8.1.3.1. Bordered paragraphs, or text boxes, identified as tables and notes in this publication, are non-mandatory and are used to identify some of the potential detailed technical solutions that meet the performance requirements. **Figure 8.1** is an example of a bordered paragraph. In addition, they may be used to provide lessons learned from previous applications of the performance requirement, where a certain design may have been found successful or have been tried and failed to meet the requirement. These bordered paragraphs are provided for the following reasons:

8.1.3.1.1. To aid the tailoring process between Range Safety and Range Users in evaluating a potential system against all the performance requirements.

8.1.3.1.2. To aid Range Safety and Range Users in implementing lessons learned.

8.1.3.1.3. To provide benchmarks that demonstrate what Range Safety considers an acceptable technical solution/implementation of the performance requirement and to help convey the level of safety the performance requirement is intended to achieve.

Figure 8.1. Bordered paragraph example.

Some Range Users employ software packages (e.g., Dynamic Object-Oriented Requirements System (DOORS)) to track and verify completion of their tailored safety requirements.

8.1.3.2. The technical solutions in the bordered paragraphs may be adopted into the tailored version of the requirements for a specific program when the Range User intends to use that solution to meet the performance requirement. At this point, they become mandatory requirements to obtain Range Safety approval. This process is done to:

8.1.3.2.1. Provide an appropriate level of detail necessary for contractual efforts and to promote efficiency in the design process.

8.1.3.2.2. Avoid contractual misunderstandings that experience has shown often occur if an appropriate level of detail is not agreed to. The level of detail in the bordered paragraphs is necessary to avoid costly out-of-scope contractual changes and to prevent inadvertently overlooking a critical technical requirement. A requirement must be included for each applicable bordered paragraph that accepts, replaces, or tailors the existing wording. A requirement must reside in the bordered paragraph that provides an equivalent level of detail. The bordered paragraphs are not to be tailored as “information only” (see [paragraph A2.1.5.4](#))

8.1.3.3. The Range User always has the option to propose alternatives to the bordered paragraph solutions. Range User proposed alternative solutions shall achieve an equivalent level of safety and be approved by Range Safety. After meeting these two requirements, the Range User proposed solutions become part of the tailored SSCMAN 91-710 for that specific program.

8.1.3.4. Range Safety has final decision authority in determining whether Range User proposed detailed technical solutions meet SSCMAN 91-710 performance requirements.

8.2. SSCMAN 91-710 Access. The official version of each volume of SSCMAN 91-710 (as well as other SSC 91-7XX series publications) is located on the Department of the Air Force publications web site (<http://www.e-publishing.af.mil/>).

PAUL J. MEJASICH, NH-04, DAFC
Director of Safety

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

See SSCMAN 91-710 Volume 7, *Range Safety User Requirements Manual - Glossary of References and Supporting Information*, which contains the references, forms, abbreviations, acronyms, office symbols, and terms used within all volumes of the 91-710 publication.

Attachment 2

SSCMAN 91-710 TAILORING PROCESS

A2.1. Introduction.

A2.1.1. Purpose. Tailoring refers to the process used at SSC ranges beginning at PI where SSC (Range Safety) organizations and a Range User review each safety requirement in SSCMAN 91-710 and jointly document whether the requirement is applicable to the Range User; and if applicable, whether or not the Range User will meet the requirement as written or achieve an ELS via a Range Safety acceptable alternative. If developed, the tailored edition shall be placed on the Range User's contract or applied through a Commercial Space Operations Support Agreement. A tailored version of the publication is denoted as SSCMAN 91-710 Tailored [T]. Programs that launch from only one of the SSC ranges shall be tailored by the appropriate SLD safety office. A combined SLD 30/SE and SLD 45/SE team shall tailor programs that intend to launch from or return (including fly-back boosters) onto more than one of the SSC ranges. The FAA shall be invited to participate in the tailoring process for all programs utilizing common launch vehicles at SSC ranges. SSC (SLD 30/SE and SLD 45/SE) and the FAA will coordinate on the review of any request for an ELS for a common launch safety requirement that is part of the tailoring IAW the MOU between AFSPC and FAA/AST for Resolving Requests for Relief from Common Launch Safety Requirements. Programs launching from or reentering onto SSC ranges (that require an FSS) shall have an FSS that is jointly approved for flight at all ranges for all launching and reentering vehicles (government or FAA-licensed). Departures from this requirement shall be approved by all affected ranges.

A2.1.2. Content. This attachment describes the rationale for tailoring, the tailoring process and the requirements for documenting tailored editions of the publication.

A2.1.3. Applicability. The tailoring process is applicable to all programs (boosters, solid rocket motors, upper stages, payloads, RVs, associated ground support equipment and facilities). The tailoring process is optional for new programs and existing programs where Range Safety and the Range User agree this process would be effective.

A2.1.4. Formation of a High-Performance Work Team. A high-performance work team (HPWT) shall be formed to perform tailoring during TIMs. HPWT membership shall include the Range User, Range Safety and FAA (if applicable) personnel who have specific tailoring authority.

A2.1.5. Tailoring Rationale. Tailoring shall be accomplished based on the rationale described below. Alternative means of identifying deletions, changes, additions, and Range User information are allowable provided that they are distinguishable from the original text and each other and are mutually agreed to by the Range User and Range Safety.

A2.1.5.1. Deletion of a Requirement.

A2.1.5.1.1. When a requirement is not applicable to a Range User program, the requirement shall be deleted.

A2.1.5.1.2. The original paragraph number and headings shall remain, but the non-applicable text shall be removed and replaced with the abbreviation "N/A".

A2.1.5.2. Change to a Requirement.

A2.1.5.2.1. ELS determinations for tailoring may be provided and approved by the HPWT through the change process; however, the HPWT cannot provide or approve waivers.

A2.1.5.2.2. A particular system requirement may be tailored as long as the intent of the requirement is met and the ELS is maintained.

A2.1.5.2.3. The change shall be written in the place of the original requirement.

A2.1.5.2.4. The existing numbering system shall remain the same to the maximum extent possible.

A2.1.5.2.5. Additional paragraphs may be added; however, using the remaining unaffected paragraph numbers is not allowed.

A2.1.5.2.6. All changes shall be highlighted in bold. Deletions of text, including partial deletions, shall be shown with the original text marked with strikethrough. Insertions of text, including partial insertions, shall be shown with the new text marked with underline.

A2.1.5.3. Addition to a Requirement.

A2.1.5.3.1. An addition to a requirement is allowed when there are no existing requirements addressing a new technology, when unforeseen hazards are discovered, when federal or industry standards change and for similar reasons.

A2.1.5.3.2. An addition shall be added with new paragraph numbers in the paragraph for which it is appropriate or in a new paragraph if no other paragraph applies.

A2.1.5.3.3. All additions shall be highlighted in bold. Insertions/additions of text, including partial insertions, shall be shown with the new text marked with underline.

A2.1.5.4. Range User Information Only.

A2.1.5.4.1. Requirements having only an indirect effect on the Range User but which are still required of the program as a whole shall remain in the tailored publication as information only. Examples of such requirements include Pad Safety responsibilities, other range contractor responsibilities and Range User facilities manager responsibilities.

A2.1.5.4.2. All "Range User Information Only" requirements shall be highlighted with an asterisk before the affected paragraph.

A2.1.5.5. Waivers. Waivers are not rationale for the deletion of requirements. The requirements shall remain in the SSCMAN 91-710[T] and the waiver process shall be used for the disposition of the requirement.

A2.1.5.6. Risk-Cost Benefit Analysis.

A2.1.5.6.1. Technical issues regarding such items as applicable requirements, policy, criteria or data may be evaluated on a risk-cost benefit basis to determine if the risk is acceptable to waive the requirements.

A2.1.5.6.2. A risk-cost benefit analysis, based on the criteria defined in [Table 3.1](#), [Table 3.2](#), [Table 3.3](#), and [Table 3.4](#) shall be submitted to Range Safety.

A2.1.5.6.3. Based on risk-cost benefit analysis data, Range Safety and the Range User shall reach agreement on the disposition of the requirement in question.

A2.1.5.6.4. If the application of an SSCMAN 91-710 requirement results in significant reduction in risk at a significant cost benefit, it may be determined by Range Safety to be sufficient to impose the requirement; however, if the benefit is insignificant and/or the cost is high, the requirement may be waived or determined to provide an ELS, all with consideration for public safety.

A2.1.6. Scheduling Technical Interchange Meetings.

A2.1.6.1. TIMs are required for Range Users to present their systems to Range Safety and to TIM participants in the active tailoring of the publication.

A2.1.6.2. TIMs shall be scheduled as early in the program as possible when program definition is sufficient to make the meetings worthwhile and structured so that technical tailoring is completed before contractual tailoring is started.

A2.1.6.3. SSCMAN 91-710[T] TIM data shall be provided to Range Safety at least 30 days before scheduled TIMs.

A2.2. Tailoring Process.

A2.2.1. Typically, all programs operating at the SSC ranges request a tailored version of SSCMAN 91-710 for their program. Therefore, all range users should request a Range introduction meeting at the earliest opportunity following the Range User's request for program support through the SLD/XP.

A2.2.1.1. During the Range introduction meeting, the Range User provides their "program concept" to Range Safety and Range Safety provides the Range User with SSCMAN 91-710 requirements, a guidebook containing the rationale for the safety requirements, lessons learned from similar programs, the range history, known differences between the SSC ranges, etc.

A2.2.1.2. Based on the information provided by Range Safety, the Range User shall develop a draft tailored version of SSCMAN 91-710 (SSCMAN 91-710[T]) and submit it to Range Safety. SSCMAN 91-710 [T] Tailoring Requests can be used to document proposed SSCMAN 91-710 [T] deletions, changes, and additions to aid in the draft SSCMAN 91-710[T] development. The forms for submitting Tailoring Requests are available from the Range Safety offices. Range Users shall submit Tailoring Requests in writing using any format containing the same information as the Tailoring Request form, if mutually agreed to by the Range User and Range Safety. Working group meetings (including technical interchanges) to ask questions, resolve issues, work non-compliance concerns, provide analyses, test data, solution justifications, etc. between the Range User and Range Safety during the development of the draft SSCMAN 91-710[T] will save time and resources for both the Range User and Range Safety. Range Users shall submit their draft SSCMAN 91-710 [T] to Range Safety 30 days prior to the PDR or equivalent program safety review activity if the program does not hold a PDR.

A2.2.1.2.1. Completing Tailoring Requests.

A2.2.1.2.1.1. The original SSCMAN 91-710 paragraph number, original (or summarized, if sufficiently detailed) text, tailored paragraph number, proposed text and the rationale for the change shall be included.

A2.2.1.2.1.2. Deletions of requirements that are non-applicable and need no formal explanation may all be listed on one or more Tailoring Request forms.

A2.2.1.2.1.3. Tailoring Requests dealing with similar or related requirements and rationale may all be combined on the same Tailoring Request form.

A2.2.1.2.2. Disposition of Tailoring Requests.

A2.2.1.2.2.1. If necessary, Range Safety shall comment on the proposed change and dispose of it as “approved,” “approved with comments” or “disapproved.”

A2.2.1.2.2.2. When agreement is reached and a Tailoring Request is approved, Range Safety and Range User representatives shall sign and date the form.

A2.2.1.3. Range Safety will review the draft SSCMAN 91-710[T] and provide comments and changes to the Range User. After the Range User and Range Safety resolve all issues, Range Safety will approve the program-specific SSCMAN 91-710[T].

A2.2.2. Publication of SSCMAN 91-710 [T].

A2.2.2.1. Final Publication.

A2.2.2.1.1. Range Users should initiate the development of SSCMAN 91-710[T] as soon as possible to minimize impacts to program schedules. Range Users should initiate tailoring discussions with Range Safety in time to submit a draft of their SSCMAN 91-710[T] NLT 30 days prior to the PDR. The final SSCMAN 91-710[T] should be submitted to Range Safety no later than 30 days after CDR. Tailoring is a continuous process even after the SSCMAN 91-710[T] is published. Thus, tailored documents should be considered living documents that may be modified throughout the life of the program.

A2.2.2.1.2. In some cases, it may be necessary to complete the SSCMAN 91-710 [T] as part of the contracting process or at some other point before the PDR. In these cases, Range Safety will work with the Range User to establish and meet a completion date for SSCMAN 91-710 [T] publication.

A2.2.2.2. The tailored edition shall look like SSCMAN91-710 with the following exceptions:

A2.2.2.2.1. The document title/heading shall read, "SSCMAN91-710VX TAILORED FOR Program Name". This title shall be centered at the top of each page.

A2.2.2.2.2. The date of the applicable contract/CSOSA/agreement/etc. shall be listed under the title and centered at the top of each page.

A2.2.2.2.3. The date of the tailored edition shall be on the cover page of the document.

A2.2.2.2.4. If requested by the Range User, the term "PROPRIETARY" shall be placed at the top and bottom of each page, centered directly over the title/heading.

A2.2.2.2.5. The following items from the front page (title page) of SSCMAN91-710 shall be removed:

A2.2.2.2.5.1. "Docid" information (i.e. SSCMAN91-710VX)

A2.2.2.2.5.2. "BY ORDER OF THE COMMANDER SPACE SYSTEMS COMMAND"

A2.2.2.2.5.3. Space Systems Command Shield

A2.2.2.2.5.4. OPR and certifier information

A2.2.2.2.5.5. Number of pages and distribution information

A2.2.2.2.6. The remaining heading information shall be left justified

A2.2.2.2.7. Change " **SPACE SYSTEMS COMMAND MANUAL 91-710 VOLUME X**" to "**Extracted from SPACE SYSTEMS COMMAND MANUAL 91-710 VOLUME DATED DD/MMM/YYYY**".

A2.2.2.2.8. Change "**COMPLIANCE WITH THIS PUBLICATION IS MANDATORY**" to "**COMPLIANCE WITH THIS TAILORED EXTRACT OF SSCMAN91-710 IS MANDATORY**".

A2.2.2.2.9. In the introduction, the paragraph identified as "*NOTES:*" shall read as follows:

NOTES:

1. Special publication formatting features are described in paragraph 8.1 of Volume 1. SSCMAN 91-710 Volume 7 contains a glossary of references, acronyms, abbreviations, and terms for use with all SSCMAN 91-710 volumes.
2. Bordered paragraphs are non-mandatory and are used to identify some of the potential detailed technical solutions that meet the performance requirements of this document as well as applicable lessons learned."

A2.2.2.2.10. All deleted information shall be removed from the tailored edition.

A2.2.2.2.11. All added information shall be inserted in the tailored edition as a separate paragraph immediately following the most applicable paragraph in SSCMAN91-710. The added paragraph shall not be numbered. The add-in paragraphs shall be clearly labeled as, "(Program Name - Added)....."

A2.2.2.2.12. The signature block that appears on the last page of the official version of SSCMAN91-710, prior to the attachments, shall be removed from the tailored version.

A2.2.2.3. Effectivity of SSCMAN 91-710 [T].

A2.2.2.3.1. Each SSCMAN 91-710 [T] shall contain a preface paragraph detailing its effectivity.

A2.2.2.3.2. At a minimum, the types of vehicles, the time period and the number of vehicles to which the SSCMAN 91-710 [T] applies shall be addressed.

A2.2.2.4. Assumptions.

A2.2.2.4.1. Each SSCMAN 91-710 [T] shall contain a preface paragraph detailing the critical assumptions that were made in writing the tailored edition.

A2.2.2.4.2. The nature of the assumptions shall be such that a change may invalidate the SSCMAN 91-710 [T] or require a change or update. An example of such a critical assumption is that the design of any hazardous system does not change from that presented before publication of the SSCMAN 91-710 [T].

A2.2.2.4.3. The assumption(s) described in the Tailoring Request form shall include sufficient detail to categorize the scope of the tailored requirement to the specific systems or subsystems affected by the proposed change. If two or more systems/subsystems are affected by the tailored paragraph, then the assumption(s) shall state which of those systems/subsystems is intended to be included in the scope of the tailoring. If there is a difference in the tailoring for the two or more systems/subsystems, then the tailored paragraph shall be repeated with appropriate tailoring unique to each individual system/subsystem.

A2.2.2.5. Management Summaries.

A2.2.2.5.1. Management summaries shall be prepared to specifically identify SSCMAN 91-710 [T] deletions, changes, and additions. Management summaries shall be used to assist management in their review of editions of SSCMAN 91-710 [T].

A2.2.2.5.2. The management summary shall consist of all signed SSCMAN 91-710 [T] Tailoring Requests and a list of all HPWT members.

A2.2.2.5.3. A copy of the management summary and the final SSCMAN 91-710 [T] ready for signature shall be provided to the SLD/CC or their designated representatives for signature.

A2.2.3. Approvals.

A2.2.3.1. Each significant addition, change or deletion shall be signed off by the Range Safety Program Manager and the appropriate Range User representative on the Tailoring Request form.

A2.2.3.2. Tailored SSCMAN 91-710 volumes affecting public safety (normally Volumes 1, 2 and 4) shall be approved and signed on the front page of the SSCMAN 91-710 [T] by the Chief of Safety or a designated representative and the Range User authorized representative.

A2.2.3.3. Tailored SSCMAN 91-710 volumes not affecting public safety (normally Volumes 3, 5 and 6) shall be approved and signed by the appropriate Range Safety division chief or a designated representative and the appropriate Range User representative.

A2.2.3.4. Tailored paragraphs of SSCMAN 91-710 affecting public safety shall be approved by the SLD/CC or their designated representatives. Public safety ELSs in the SSCMAN 91-710[T] shall be approved by the Chief of Safety or may be elevated by SLD/CC.

A2.2.4. Revisions to SSCMAN 91-710 [T].

A2.2.4.1. Any revision to this publication shall be evaluated against each program SSCMAN 91-710 [T] to determine applicability.

A2.2.4.2. Any revisions to SSCMAN 91-710 [T] shall be made IAW the SSCMAN 91-710 change process (see [Attachment 6](#)).

Attachment 3

SYSTEM SAFETY PROGRAM REQUIREMENTS

A3.1. Introduction.

A3.1.1. Purpose. This attachment establishes the minimum requirements for a Range User's System Safety Program for launch safety purposes. Such a program is consistent with MIL-STD-882, *Department of Defense Standard Practice for System Safety*, for DoD programs and the requirements of AFI 91-202 for Department of the Air Force programs. The program includes the corresponding requirements for a Range User SSPP and identifies hazard analysis and risk assessment requirements.

A3.1.2. Tailoring. Tailoring of this attachment and the requisite SSPP is highly recommended. The tailoring process is defined in [Attachment 2](#). When conflicting requirements or deficiencies are identified in launch safety program requirements or with other program requirements, the Range User shall submit notification, with proposed solutions or alternatives and supporting rationale, to Range Safety for resolution.

A3.1.3. Special Provisions. Many programs may already have a system safety program due to contract or internal company directives. In these cases, many of the following tasks may already be covered and need only be provided to the ranges in the form of the larger system safety program. This attachment is not intended to cause duplicate work. Additionally, the analyses and other requirements specified in SSCMAN 91-710 Volume 2, Flight Analyses and SSCMAN 91-710 Volume 4, Airborne Flight Safety Systems are adequate for Range Safety purposes and no additional system safety analyses in these areas are required from the Range User by the ranges. However, the Range User system safety management and organization in the SSPP shall note that these analyses and other applicable requirements are performed by the SSC ranges.

A3.1.4. Demonstration of an Acceptable Level of Mishap Risk. Range Users shall demonstrate an acceptable level of mishap risk to Range Safety through the completion of the system safety hazard analyses and risk assessments described in this attachment.

A3.2. System Safety Program Tasks. To achieve the system safety objectives and obtain Range Safety approval, the following tasks shall be completed by the Range User in the approximate order that they are listed and in conjunction with the milestones that are identified.

A3.2.1. Task 1: Establish a Range User Safety Program. By the time of the Range User's PI, the Range User shall have established a Safety Program that meets the tailored requirements of this publication which includes the following:

A3.2.1.1. Establishing a safety management system. A Range User program manager shall be responsible for the following:

A3.2.1.1.1. Establishing, controlling, incorporating, directing, and implementing the system safety program policies.

A3.2.1.1.2. Ensuring that mishap risk is identified and eliminated or controlled within established program risk acceptability parameters. Decisions regarding resolution of identified hazards shall be based on assessment of the risk involved. To aid the achievement of the objectives of system safety, hazards shall be characterized as to

hazard severity categories and hazard probability levels, when possible. Since the priority for system safety is eliminating hazards by design, a risk assessment procedure, considering only hazard severity, will generally suffice during the early design phase to minimize risk. When hazards are not eliminated during the early design phase, a risk assessment procedure based upon the hazard probability, hazard severity, as well as risk impact, shall be used to establish priorities for corrective action and resolution of identified hazards.

A3.2.1.1.3. Establishing internal reporting systems and procedures for investigation and disposition of system related mishaps and safety incidents, including potentially hazardous conditions not yet involved in a mishap or incident and reporting such matters to Range Safety.

A3.2.1.1.4. Reviewing and approving the safety analyses, reports and documentation required by this publication and submitted to Range Safety to establish knowledge and acceptance of residual risks to the public and launch area personnel and resources.

A3.2.1.2. Establishing a key system safety position for each program. The individual in this position shall be directly responsible to the Range User program manager for safety matters. At a minimum, Range User key safety personnel shall be responsible for the following:

A3.2.1.2.1. Reviewing and approving all safety analyses, reports and documentation required by this publication and submitted to Range Safety for approval.

A3.2.1.2.2. Reviewing and approving all hazardous and safety critical test plans and procedures conducted at the SSC ranges and verifying that all safety requirements are incorporated.

A3.2.1.3. Developing a planned approach for safety task accomplishment, providing qualified people to accomplish the tasks, establishing the authority for implementing the safety tasks through all levels of management and allocating appropriate resources, both manning and funding, to ensure the safety tasks are completed.

A3.2.1.4. Establishing a system safety organization or function and lines of communication within the program organization and with associated organizations (government and contractor).

A3.2.1.5. Establishing interfaces between system safety and other functional elements of the program, as well as between other safety disciplines such as nuclear, range, explosive, chemical and biological.

A3.2.1.6. Designating the organizational unit responsible for executing each safety task.

A3.2.1.7. Establishing the authority for resolution of identified hazards.

A3.2.1.8. Establishing a single closed-loop hazard tracking system by development of a method or procedure to document and track hazards and their controls and providing an audit trail of hazard mitigation.

A3.2.1.8.1. Maintaining and making available to Range Safety upon request a centralized file, computer database or document called a Hazard Log. At a minimum, the Hazard Log shall contain the following information:

A3.2.1.8.1.1. Title and description of each hazard, including an associated hazard including hazard cause and associated risk index.

A3.2.1.8.1.2. Status of each hazard and the status of the associated controls for each hazard.

A3.2.1.8.1.3. Traceability of resolution on each Hazard Log item from the time the hazard was identified to the time the risk associated with the hazard was reduced to a level acceptable to Range Safety.

A3.2.1.8.1.4. Identification of residual risk.

A3.2.1.8.1.5. Action persons and organizational element.

A3.2.1.8.1.6. The recommended design features, procedure controls, cautions & warnings, and training to reduce the hazard to a level of risk acceptable to Range Safety.

A3.2.1.8.1.7. The signature of Range Safety accepting the risk effecting closure of the Hazard Log item.

A3.2.1.9. Establishing the order of precedence for satisfying system safety requirements and resolving identified hazards as follows:

A3.2.1.9.1. Designing for Minimum Risk. From program inception, a program should design their system to eliminate hazards. If an identified hazard cannot be eliminated, reduce the associated risk to an acceptable level, as defined by Range Safety, through design selection.

A3.2.1.9.2. Incorporating Safety Devices. If identified hazards cannot be eliminated or their associated risk adequately reduced through design selection, that risk shall be reduced to a level acceptable to Range Safety through the use of fixed, automatic or other protective safety design features or devices. Provisions shall be made for periodic functional checks of safety devices when applicable.

A3.2.1.9.3. Providing Warning Devices. When neither design nor safety devices can effectively eliminate identified hazards or adequately reduce associated risk, devices shall be used to detect the condition and to produce an adequate warning signal to alert personnel of the hazard. Warning signals and their application shall be designed to minimize the probability of incorrect personnel reaction to the signals and shall be standardized within like types of systems.

A3.2.1.9.4. Developing Procedures and Training. Where it is impractical to eliminate hazards through design selection or adequately reduce the associated risk with safety and warning devices, procedures and training shall be used. However, without a specific waiver from Range Safety, no warning, caution, or other form of written advisory shall be used as the only risk reduction method for Category I or II hazards (see [Table 3.2](#), [Table 3.3](#), and [Table 3.4](#)). Procedures may include the use of personal protective equipment. Precautionary notations shall be standardized as specified by Range Safety. Range User personnel performing safety critical tasks and activities (as defined in SSCMAN 91-710, Volume 7) require certification of personnel proficiency.

A3.2.1.10. Defining system safety program milestones and relating these to major program milestones, program element responsibility and required inputs and outputs. When major program milestones are not used, an equivalent process that meets the intent of this document shall be developed by the Range User in coordination with Range Safety. The final resulting process shall be included in the program's SSPP.

A3.2.1.11. Establishing System Safety Program reviews and audits.

A3.2.1.11.1. Conducting, documenting, and making the following documentation available to Range Safety upon request:

A3.2.1.11.1.1. The Range User launch safety program plan and supporting risk assessment data.

A3.2.1.11.1.2. Associate contractor SSPP and supporting risk assessment data.

A3.2.1.11.1.3. Support contractor SSPP and supporting risk assessment data.

A3.2.1.11.1.4. Subcontractor SSPP and supporting risk assessment data.

A3.2.1.11.2. Providing support for the following:

A3.2.1.11.2.1. Safety reviews and audits performed by representatives of Range Safety.

A3.2.1.11.2.2. Presentations to government certifying activities such as phase safety reviews, munitions safety boards, nuclear safety boards or flight safety review boards to the extent specified by this publication. These may also include special reviews such as flight and article readiness reviews or pre-construction briefings.

A3.2.1.11.2.3. Safety reviews shall be held in association with the program SSR, PDR, CDR and PSR. When the design review process is not used, the Range User shall develop, in coordination with Range Safety, a review process that meets the intent of the SSCMAN 91-710 identified safety reviews. This review process shall be included in the program's SSPP. As a minimum, all safety reviews shall address the following:

A3.2.1.11.2.3.1. Program systems and operations overview.

A3.2.1.11.2.3.2. Presentation of Range Safety required documentation and hazard analyses.

A3.2.1.11.2.3.3. SSCMAN 91-710 non-compliances.

A3.2.1.11.2.3.4. Open safety issues.

A3.2.1.12. Establishing an incident alert and notification, investigation, and reporting process, to include notification of Range Safety.

A3.2.1.13. Establishing a process to evaluate engineering change proposals (ECPs), specification change notices (SCNs), software problem reports (SPRs), program or software trouble reports (PTRs, STRs) for their safety impact on the system and notify Range Safety if the level of risk of the system changes.

A3.2.1.14. Establish a positive method that verifies the program's final system configuration meets all the requirements in the program's tailored version of SSCMAN 91-710. **Note:** A number of Range Users employ specific software packages, such as DOORS (Dynamic Object-Oriented Requirements System) for tracking tailored safety requirements from identification to final verification.

A3.2.2. Task 2: Develop a SSPP. The Range User shall develop and implement a Range Safety approved SSPP to prevent mishaps once the system enters a DAF Range and ending at safety control authority transfer or previously approved by other documentation. The SSPP shall describe, in detail, tasks and activities of system safety management and system safety engineering required to identify, evaluate, and eliminate or control hazards, to reduce the associated risk to a level acceptable to Range Safety. The approved plan provides a formal basis of understanding between the Range User and Range Safety on how the Safety Program will be conducted to meet the requirements of SSCMAN 91-710. The approved plan shall account for all required tasks and responsibilities on an item-by-item basis. The Range User shall submit a draft SSPP to Range Safety for review and approval within 45 days of the PI and a final at least 45 days before any program SRR, or program equivalent milestone. The SSPP shall include the following information:

A3.2.2.1. System Safety Organization. The System Safety Organization narrative shall describe the following:

A3.2.2.1.1. The location of the system safety and flight safety analysis organizations or functions within the overall program organization, using charts to show the organizational and functional relationships and lines of communication.

A3.2.2.1.2. The organizational relationship between other program functional elements having responsibility for tasks with launch safety impacts and the system safety management and engineering organization.

A3.2.2.1.3. Review and approval authority of applicable tasks by key system safety personnel.

A3.2.2.1.4. The responsibility and authority of key system safety personnel, other Range User organizational elements involved in the launch/reentry/flyback safety effort, contractors, and system safety groups.

A3.2.2.1.5. A description of the methods by which safety personnel may raise issues of concern directly to the program manager or the program manager's supervisor within the corporate organization.

A3.2.2.1.6. Identification of the organizational unit responsible for executing each task.

A3.2.2.1.7. Identification of the authority in regard to resolution of all identified hazards.

A3.2.2.1.8. The staffing of the system safety organization for the duration of the program to include personnel loading and a summary of the qualifications of key system safety personnel assigned to the effort, including those personnel identified with approval authority for Range User prepared Range Safety documentation.

A3.2.2.1.9. The process by which Range User management decisions will be made, including such decisions as timely notification of unacceptable risks, necessary action, incidents or malfunctions or request for non-compliances to safety requirements or program waivers.

A3.2.2.1.10. Details of how resolution and action relative to system safety will be accomplished at the program management level possessing resolution authority.

A3.2.2.2. System Safety Program Milestones. The SSPP shall:

A3.2.2.2.1. Define system safety program milestones and relate these to the major program milestones, program element responsibility and required inputs and outputs.

A3.2.2.2.2. Provide and maintain a program schedule of safety tasks, including start and completion dates, reports, and reviews.

A3.2.2.2.3. Identify subsystem, component, or software safety activities as well as integrated system level activities such as design analyses, tests and demonstrations applicable to the system safety program but specified in other engineering studies and development efforts to preclude duplication.

A3.2.2.2.4. Combined or independent safety reviews in association with the following programs: System Requirements Review (SRR), Preliminary Design Review (PDR), Critical Design Review (CDR), Pre-Ship Review (PSR) for the launch vehicle, RV, payload and associated ground support equipment design [Missile System Prelaunch Safety Package (MSPSP), SSCMAN 91-710 Volume 3], airborne FSS and associated ground support equipment design [Flight Termination System Report (FTSR), SSCMAN 91-710 Volume 4], critical facility design [Facility Safety Data Package (FSDP), SSCMAN 91-710 Volume 5] and Ground Operations Plans (GOPs), SSCMAN 91-710 Volume 6. For programs that do not use the above reviews, the Range User shall develop, in coordination with Range Safety, a review process that meets the intent of these requirements. This alternate process shall be included in the program's System Safety Program Plan.

A3.2.2.2.4.1. SRRs or program equivalent activities shall provide design and operations detail to at least the system level.

A3.2.2.2.4.2. PDRs or program equivalent activities shall provide design and operations detail to at least the subsystem and box level.

A3.2.2.2.4.3. CDRs or program equivalent activities shall provide design and operating detail to the component and piece part level.

A3.2.2.2.4.4. PSRs or program equivalent activities shall provide sufficient detail to ensure hazards are controlled to the maximum extent possible and to ensure Range Safety required documentation (e.g., MSPSP, Hazard Tracking System, FSDP, OSP, as a minimum) is ready for closure and Range Safety concurrence prior to the shipment of hardware to the range.

A3.2.2.3. System Safety Data. The SSPP shall:

A3.2.2.3.1. Identify the method(s) by which deliverables will be delivered to Range Safety. If delivery is through a web site or company portal, the Range User shall

provide Range Safety the ability to access these sites. Identify deliverable data by title, number and means of delivery such as hard copy or electronic submission.

A3.2.2.3.2. Identify non-deliverable system safety data and describe the procedures for accessibility by Range Safety and retention of data of historical value. The SSPP shall identify how data will be stored and retained when delivery of the data to Range Safety is on an “upon request” basis.

A3.2.2.4. System Safety Interfaces. The SSPP shall identify, in detail:

A3.2.2.4.1. The interface between system safety and all other applicable safety disciplines such as nuclear safety, launch safety, explosive and ordnance safety, chemical and biological safety, laser safety and any others.

A3.2.2.4.2. The interface between system safety, design and/or systems engineering, and all other support disciplines such as maintainability, quality control, reliability, software development, human factors engineering, medical support (health hazard assessments) and any others.

A3.2.2.4.3. The interface between system safety and all system integration and test disciplines.

A3.2.3. Task 3: Perform and Document a Preliminary Hazard Analysis. The Range User shall perform and document a Preliminary Hazard Analysis (PHA) to identify safety critical areas, to provide an initial assessment of hazards and to identify requisite hazard controls and follow-on actions. The results of the PHA shall be submitted to Range Safety at least 45 days prior to the SRR or equivalent program design activity. The results of the PHA shall be used as a guide for tailoring SSCMAN 91-710 for the program. Based on the best available data, including mishap data from similar systems and other lessons learned, hazards associated with the proposed design or function shall be evaluated for hazard severity, hazard probability and operational constraints. Safety studies identifying provisions and alternatives needed to eliminate hazards or reduce their associated risk to a level acceptable to Range Safety shall be included. At a minimum, the PHA shall consider the following for identification and evaluation of hazards:

A3.2.3.1. Hazardous components such as fuels, propellants, lasers, explosives, toxic substances, hazardous construction materials, pressure systems and other energy sources.

A3.2.3.2. Safety related interface considerations among various elements of the system such as material compatibility, electromagnetic interference, inadvertent activation, fire and explosive initiation and propagation and hardware and software controls. This shall include consideration of the potential contribution by software, including software developed by other contractors and sources, to subsystem and system mishaps.

A3.2.3.3. Safety design criteria to control safety-critical software commands and responses such as inadvertent command, failure to command, untimely command or responses, inappropriate magnitude or designated undesired events shall be identified and appropriate action taken to incorporate them in the software and related hardware specifications.

A3.2.3.4. Environmental constraints including the operating environments such as drop, shock, vibration, extreme temperatures, humidity, noise, thermal range, rate of heating,

space-based radiation, corona effects, acoustics, exposure to toxic substances, health hazards, fire, electrostatic discharge, lightning, electromagnetic environmental effects, ionizing and non-ionizing radiation including laser radiation.

A3.2.3.5. Operating, test, maintenance, built-in-tests, diagnostics and emergency procedures (human factors engineering, human error analysis of operator functions, tasks and requirements; effect of factors such as equipment layout, lighting requirements, potential exposures to toxic materials, effects of noise or radiation on human performance; explosive ordnance render safe and emergency disposal procedures; life support requirements and their safety implications in manned systems, crash safety, egress, rescue, survival and salvage).

A3.2.3.6. Those test unique hazards that will be a direct result of the test and evaluation of the article or vehicle.

A3.2.3.7. Facilities, real property installed equipment, support equipment such as provisions for storage, assembly, checkout, proof testing of hazardous systems and assemblies that may involve toxic, flammable, explosive, corrosive or cryogenic materials and wastes; radiation or noise emitters; electrical power sources.

A3.2.3.8. Training and certification pertaining to hazardous and safety critical operations and maintenance of hazardous and safety critical systems.

A3.2.3.9. Safety related equipment, safeguards and possible alternate approaches such as interlocks; system redundancy; fail-safe design considerations using hardware or software controls; subsystem protection; fire detection and suppression systems; personal protective equipment; heating, ventilation, and air-conditioning; and noise or radiation barriers.

A3.2.3.10. Malfunctions to the system, subsystems, or software. Each malfunction shall be specified, the cause and resulting sequence of events determined, the degree of hazard determined and appropriate specification and/or design changes developed.

A3.2.4. Task 4: Perform and Document Subsystem, System, Facility and Operating and Support Hazard Analyses:

A3.2.4.1. Subsystem Hazard Analysis. The Range User shall perform and document a subsystem hazard analysis (SSHA) to identify all components and equipment that could result in a hazard or whose design does not satisfy range safety requirements. The purpose of the SSHA is to verify subsystem compliance with safety requirements contained in subsystem specifications and other applicable documents; identify previously unidentified hazards associated with the design of subsystems including component failure modes, critical human error inputs and hazards resulting from functional relationships between components and equipment comprising each subsystem; and recommend actions necessary to eliminate identified hazards or control their associated risk to acceptable levels. The SSHA shall include government furnished equipment, non-developmental items, and software. Areas to consider are performance, performance degradation, functional failures, timing errors, design errors, defects, or inadvertent functioning. The human shall be considered a component within a subsystem, receiving both inputs, and initiating outputs, during the conduct of this analysis. The SSHA may indicate the need for revised tailoring of some requirements of this publication depending on the level of risk

identified or the discovery of any previously unidentified hazards. The analysis shall include a determination of the following:

A3.2.4.1.1. The modes of failure including reasonable human errors as well as single point and common mode failures and the effects on safety when failures occur in subsystem components.

A3.2.4.1.2. The potential contribution of hardware and software, including that which is developed by other contractors and sources, events, faults, and occurrences such as improper timing on the safety of the subsystem.

A3.2.4.1.3. That the safety design criteria in the hardware, software and facilities specifications have been satisfied.

A3.2.4.1.4. That the method of implementation of hardware, software and facilities design requirements and corrective actions has not impaired or decreased the safety of the subsystem nor has it introduced any new hazards or risks.

A3.2.4.1.5. The implementation of safety design requirements from top level specifications to detailed design specifications for the subsystem. The implementation of safety design requirements developed as part of the PHA shall be analyzed to ensure that it satisfies the intent of the requirements.

A3.2.4.1.6. Test plan and procedure recommendations to integrate safety testing into the hardware and software test programs.

A3.2.4.1.7. That system level hazards attributed to the subsystem are analyzed and that adequate control of the potential hazard is implemented in the design.

A3.2.4.1.8. SSHA Analysis Techniques. If no specific analysis techniques are directed or if the Range User recommends that a different technique other than that specified by Range Safety should be used, the Range User shall obtain approval of techniques to be used before performing the analysis.

A3.2.4.1.9. SSHA Software.

A3.2.4.1.9.1. Software used to control safety critical computer system functions shall be developed IAW SSCMAN 91-710 Volume 3.

A3.2.4.1.9.2. Range Users shall identify all safety critical computer system functions IAW SSCMAN 91-710 Volume 3 and develop a SSHA for each.

A3.2.4.1.9.3. Software shall be put under formal configuration control of a Software Configuration Control Board (SCCB) IAW SSCMAN 91-710 Volume 3 as soon as a baseline is established. This will ensure that hardware/software changes do not conflict with or introduce potential safety hazards due to hardware/software incompatibilities.

A3.2.4.1.9.4. Problems identified that require the reaction of the software developer shall be reported to Range Safety in time to support the ongoing phase of the software development process.

A3.2.4.1.10. Updating the SSHA. The Range User shall update the SSHA as a result of any system design changes, including software design changes that affect system safety.

A3.2.4.1.11. SSHA Submittal. The Range User shall submit their plan for developing their SSHA at the PDR or equivalent program activity. The Range User shall submit a draft of their SSHA 45 days prior to the CDR or equivalent program activity. The Range User shall provide the final SSHA with their final MSPSP (see SSCMAN 91-710 Volume 3).

A3.2.4.2. System Hazard Analysis. The Range User shall perform and document a system hazard analysis (SHA) to identify hazards and assess the risk of the total system design, including software, and specifically of the subsystem interfaces. The purpose of the SHA is to verify system compliance with safety requirements contained in system specifications and other applicable documents; identify previously unidentified hazards associated with the subsystem interfaces and system functional faults; assess the risk associated with the total system design, including software, and specifically of the subsystem interfaces; and recommend actions necessary to eliminate identified hazards and/or control their associated risk to acceptable levels. The SHA may indicate the need for revised tailoring of some requirements of this publication depending on the level of risk identified or the discovery of any previously unidentified hazards. This analysis shall include a review of subsystem interrelationships to determine the following:

A3.2.4.2.1. Compliance with specified safety design criteria.

A3.2.4.2.2. Possible independent, dependent, and simultaneous hazardous events including system failures; failures of safety devices; common cause failures and events; and system interactions that could create a hazard or result in an increase in mishap risk.

A3.2.4.2.3. Degradation in the safety of a subsystem or the total system from normal operation of another subsystem.

A3.2.4.2.4. Design changes that affect subsystems.

A3.2.4.2.5. Effects of reasonable human errors.

A3.2.4.2.6. Potential contribution of hardware and software, including that which is developed by other Range Users and other sources or commercial off-the-shelf hardware or software, events, faults, and occurrences such as improper timing on the safety of the system.

A3.2.4.2.7. That the safety design criteria in the hardware, software and facilities specifications have been satisfied.

A3.2.4.2.8. That the method of implementation of the hardware, software and facilities design requirements and corrective actions has not impaired or degraded the safety of the system nor has introduced any new hazards.

A3.2.4.2.9. SHA Analysis Techniques. If no specific analysis techniques are directed or if the Range User recommends that a different technique than that specified by Range Safety should be used, the Range User shall obtain approval of techniques to be

used before performing the analysis. The SHA may be combined with and/or performed using similar techniques to those used for the SSHA.

A3.2.4.2.10. SHA Software.

A3.2.4.2.10.1. Software used to control safety critical computer system functions shall be developed IAW SSCMAN 91-710 Volume 3.

A3.2.4.2.10.2. Range Users shall identify all safety critical computer system functions IAW SSCMAN 91-710 Volume 3 and develop an SHA for each.

A3.2.4.2.10.3. Software shall be put under formal configuration control of a Software Configuration Control Board (SCCB) IAW SSCMAN 91-710 Volume 3 as soon as a baseline is established. This will ensure that hardware/software changes do not conflict with or introduce potential safety hazards due to hardware/software incompatibilities.

A3.2.4.2.10.4. Problems identified that require the reaction of the software developer shall be reported to Range Safety in time to support the ongoing phase of the software development process.

A3.2.4.2.11. Updating the SHA. The Range User shall update the SHA as a result of any system design changes, including software design changes that affect system safety.

A3.2.4.2.12. SHA Submittal. The Range User shall submit their plan for developing the SHA at the PDR or equivalent program activity if a PDR is not held. A draft SHA shall be submitted 45 days prior to the CDR or equivalent program activity if a CDR is not held. The final SHA shall be provided with the final MSPSP (see SSCMAN 91-710, Volume 3).

A3.2.4.3. Operating and Support Hazard Analyses. The Range User shall perform and document an operating and support hazard analysis (O&SHA) to examine procedurally controlled activities. The purpose of the O&SHA is to evaluate activities for hazards or risks introduced into the system by operational and support procedures and to evaluate adequacy of operational and support procedures used to eliminate, control, or abate identified hazards or risks. The O&SHA identifies and evaluates hazards resulting from the implementation of operations or tasks performed by persons, considering the following criteria: the planned system configuration and/or state at each phase of activity; the facility interfaces; the planned environments or the ranges thereof; the supporting tools or other equipment, including software controlled automatic test equipment, specified for use; operational and/or task sequence, concurrent task effects and limitations; biotechnological factors, regulatory or contractually specified personnel safety and health requirements; and the potential for unplanned events including hazards introduced by human errors. The human shall be considered an element of the total system, receiving both inputs and initiating outputs during the conduct of this analysis. The O&SHA shall identify the safety requirements or alternatives needed to eliminate or control identified hazards or to reduce the associated risk to a level that is acceptable under either regulatory or Range Safety specified criteria. The O&SHA may indicate the need for revised tailoring of some requirements of this publication depending on the level of risk identified or the discovery of any previously unidentified hazards. The analysis shall identify the following:

A3.2.4.3.1. Activities that occur under hazardous conditions, their time periods and the actions required to minimize risk during these activities and time periods

A3.2.4.3.2. Changes needed in functional or design requirements for system hardware and software, facilities, tooling or support and test equipment to eliminate or control hazards or reduce associated risks

A3.2.4.3.3. Requirements for safety devices and equipment, including personnel safety and life support equipment.

A3.2.4.3.4. Warnings, cautions and special emergency procedures such as egress, rescue, escape, render safe, explosive ordnance disposal and back out, including those necessitated by failure of a computer software-controlled operation to produce the expected and required safe result or indication.

A3.2.4.3.5. Requirements for packaging, handling, storage, transportation, maintenance, and disposal of hazardous materials.

A3.2.4.3.6. Requirements for safety training and personnel certification.

A3.2.4.3.7. Effects of non-developmental hardware and software across the interface with other system components or subsystems.

A3.2.4.3.8. Potentially hazardous system states under operator control.

A3.2.4.3.9. Assessment of Procedures. The O&SHA shall document system safety assessment of procedures involved in system production, deployment, installation, assembly, test, operation, maintenance, servicing, transportation, storage, modification, demilitarization, and disposal. Human factors shall be analyzed during the development of all O&SHAs.

A3.2.4.3.10. O&SHA Analysis Techniques. If no specific analysis techniques are directed or if the Range User recommends that a different technique other than that specified by Range Safety should be used, the Range User shall obtain approval of techniques to be used before performing the analysis.

A3.2.4.3.11. Updating the O&SHA. The Range User shall update the O&SHA as a result of any system design or operational changes.

A3.2.4.3.12. O&SHA Submittal. The Range User shall submit their plan for developing their O&SHA submittal at the PDR or equivalent program activity if a PDR will not be held. A draft O&SHA shall be submitted 45 days prior to the CDR or equivalent program activity if a CDR will not be held. The final O&SHA shall be provided to Range Safety with the final GOP (see SSCMAN 91-710 Volume 6).

A3.2.4.4. Facility Safety Analyses. The PHA, SSHA, SHA and O&SHA shall address hazards associated with the facilities used to support the Range User program. The facility portions of these analyses shall be provided with the Facility Safety Data Package specified in SSCMAN 91-710 Volume 5.

A3.2.5. Task 5: Perform and Document a Safety Assessment Report (SAR). The Range User shall perform and document a SAR. The purpose of this task is to perform and document a comprehensive evaluation of the mishap risk being assumed before test or operation of the Range User's system. The SAR shall be developed using data from the hazard analyses

required in Task 4 (A2.2.4) and data packages required in SSCMAN 91-710 Volumes 1 through 6 and shall summarize the following information:

A3.2.5.1. The safety criteria and methodology used to classify and rank hazards, plus any assumptions on which the criteria or methodologies were based or derived including the definition of acceptable risk as specified by Range Safety (see [Table 3.1](#), [Table 3.2](#), [Table 3.3](#), and [Table 3.4](#)).

A3.2.5.2. The results of analyses performed to identify hazards inherent in the system, including those hazards that still have a residual risk and the actions that have been taken to reduce the associated risk to a level specified as acceptable by Range Safety (see [Table 3.1](#), [Table 3.2](#), [Table 3.3](#), and [Table 3.4](#)).

A3.2.5.3. The results of the safety program efforts, including a list of all significant hazards along with specific safety recommendations or precautions required to ensure safety of personnel, property, or the environment. The list shall be categorized as to whether or not the risks may be expected under normal or abnormal operating conditions.

A3.2.5.4. Conclusion with the Range User program safety manager and the Range User program manager signed statement that all identified hazards have been eliminated or their associated risks controlled to levels specified in [Table 3.1](#), [Table 3.2](#), [Table 3.3](#), and [Table 3.4](#), and that the system is ready to test or operate or proceed to the next acquisition phase.

A3.2.5.5. Recommendations applicable to hazards at the interface of Range User systems with other systems, as required.

A3.2.5.6. A formal request for Range Safety approval to conduct operations at the ranges.

A3.2.5.7. SAR Submittal. The Range User shall submit their plan for developing their SAR at the PDR or equivalent program activity if a PDR is not held. The Range User shall submit their final SAR at the Pre-Ship Review (PSR) or equivalent program activity if no PSR is held.

A3.2.5.8. SAR Approval. The SAR shall be approved by Range Safety prior to the start of operations on the range.

Attachment 4

SUBMITTING SSCMAN 91-710 NONCOMPLIANCE REQUESTS

A4.1. Introduction.

A4.1.1. Purpose. ELSs and waivers are used when Range Users cannot meet the requirements of this publication.

A4.1.2. Content. This attachment describes the noncompliance categories and the process for submitting ELSs and waivers.

A4.1.3. Applicability.

A4.1.3.1. The noncompliance process is applicable to all programs including boosters, solid rocket motors, upper stages, payloads, RVs, ground support equipment, facilities and others that operate at SSC ranges or elsewhere if governed under Range Safety unless grandfathered IAW the criteria stated below.

A4.1.3.2. The noncompliance process is also applicable to all programs regardless of which version of range safety requirements documents (such as Air Force Eastern Test Range (AFETR) 127-1, Eastern Space and Missile Center Regulation (ESMCR) 127-1, Eastern Range Regulation (ERR) 127-1, Western Range and Missile Center Regulation (WSMCR) 127-1, Western Range Regulation (WRR) 127-1, Eastern and Western Range (EWR) 127-1, AFSPCMAN 91-710, United States Space Force Manual (SPFCMAN) 91-710) is under contract.

A4.1.3.3. The flight plan approval process does not fall within the intent of this attachment except when it involves launch vehicle, RV and/or payload hardware.

A4.1.4. Grandfathering Criteria. Previously approved systems with or without granted ELSs and waivers will be grandfathered and maintain approval and need not be resubmitted unless it is determined by the Chief of Safety and/or the Range User that one of the situations described below exists. Range Safety shall coordinate all grandfathering determinations with the affected Range User.

A4.1.4.1. Existing programs make major modifications that affect the launch vehicle's or RV's operation or safety characteristics or include the use of currently approved components, systems or subsystems in a new application (through tailoring if desired). **Exception:** Previously approved existing components, systems or subsystems that do not increase the risks, do not degrade safety, or can survive new environments equivalent to or lower than the originally approved qualification levels shall be honored and do not have to meet new requirements as long as data and analyses show that the criteria have been met.

A4.1.4.2. The Range User has determined that it is economically and technically feasible to incorporate new requirements into the system.

A4.1.4.3. The system has been or will be modified to the extent that it is considered a new program or that existing safety approvals no longer apply. Risk and hazard analyses developed jointly by Range Safety and the Range User shall be used to determine applicability of the safety approvals.

A4.1.4.4. A previously unforeseen or newly discovered safety hazard exists that is deemed by either Range Safety or the Range User to be significant enough to warrant the change. This category includes systems that were previously approved, but when obtaining the approval, the non-compliances to the original requirement were not identified.

A4.1.4.5. A system or procedure is modified, and a new requirement reveals that a significant risk exists.

A4.1.4.6. Accident, incident investigations and reports may render specific compliance mandatory within this publication.

A4.1.5. Noncompliance Categories.

A4.1.5.1. Public Safety. Public safety noncompliance deals with safety requirements involving risks to the public, including foreign countries, their personnel and/or their resources.

A4.1.5.2. Launch Area Safety. Launch area safety non-compliances deal with safety requirements involving risks that are limited to personnel and/or resources on SSC ranges, including CCSFS and VSFB and may be extended to KSC. Launch area safety involves multiple licensed users, government tenants or DAF squadrons.

A4.1.5.3. Launch Complex Safety. Launch complex safety non-compliances deal with safety requirements involving risk that is limited to the personnel and/or resources under the control of a single licensed user, full time government tenant organization or DAF squadron/detachment (control authority). Launch complex safety is limited to risks confined to a physical space for which the single control authority is responsible.

A4.1.5.4. Recovery Area Safety. Recovery area safety non-compliance deals with safety requirements involving risks that are limited to personnel and/or resources on SSC ranges, including CCSFS and VSFB, and may be extended to KSC. Recovery area safety involves multiple licensed users, government tenants and/or DAF units.

A4.1.5.5. Recovery Site Safety. Recovery site safety non-compliance deals with safety requirements involving risks that are limited to the personnel and/or resources under the control of a single licensed user, full time government tenant organization or DAF units (control authority). Recovery site safety is limited to risks confined to a physical space for which the single control authority is responsible.

A4.1.6. Effectivity of Non-compliances.

A4.1.6.1. Lifetime.

A4.1.6.1.1. All waivers are intended to have limited effectivities. Lifetime waivers shall be limited to those situations where it is virtually impossible to meet the requirement or meet the intent of the requirement.

A4.1.6.1.2. Lifetime ELSs are allowed provided equivalent safety is maintained. A life of the program ELS should be addressed through updates to the tailored SSCMAN 91-710.

A4.1.6.2. Time Limited.

A4.1.6.2.1. Time limited waivers are set for a limited period of time or a limited number of launches. The time constraint is normally determined as a function of cost, schedule and the minimum time needed to satisfactorily modify or replace the noncompliant system or to modify the noncompliant operation.

A4.1.6.2.2. ELSs may be time limited depending on the method by which equivalent safety is accomplished. If excessive procedural controls, personnel, material or costs are required to maintain equivalent safety, the ELS should be time limited.

A4.1.7. Conditions for Issuance of ELSs and Waivers.

A4.1.7.1. Hazard Mitigation. All reasonable steps shall be taken to meet the intent of the publication requirements and mitigate associated hazards to acceptable levels, including design and operational methods.

A4.1.7.2. Get Well Plans. Range Users who have ELSs and waivers that are not granted for the life of a program shall provide a plan to meet the requirements in question by the time the approved effectivity expires. Range Users who have ELSs and waivers that are granted for the life of the program shall provide Range Safety a definition of “program life” intended for the scope of the ELSs and waivers.

A4.1.8. Risk-Cost Benefit Analysis.

A4.1.8.1. Technical disagreements regarding such items as applicable requirements, policy, criteria, or data may be evaluated on a risk-cost benefit basis to determine if the risk is acceptable to issue an ELS determination or waive the requirement.

A4.1.8.2. Risk-cost benefit analyses based on the criteria defined in [Table 3.2](#), [Table 3.3](#), and [Table 3.4](#) shall be submitted to Range Safety.

A4.1.8.3. Based on data from the risk-cost benefit analysis, Range Safety and the Range User shall reach agreement on the disposition of the requirements involving the launch area, launch complex personnel, recovery area, recovery area personnel, and DAF resources. However, Range Safety shall be the sole authority for the determination and disposition of requirements that affect public safety.

A4.1.8.4. If the application of an SSCMAN 91-710 requirement results in a significant reduction of risk at a significant cost benefit, it may be judged by Range Safety to be sufficient to impose the requirement; however, if the benefit is insignificant and/or the cost is high, the requirement may be waived or determined to be an ELS, after considering the effect on public safety.

A4.2. Submitting Non-compliances.

A4.2.1. Format. Range Users shall submit non-compliances in writing using the format provided in the MOA Between AFSPC and FAA for Resolving Requests for Relief from Common Launch Safety Requirements. This format and the associated instructions are available by request from Range Safety. Note that this form was developed for use by all range users, not just range users associated with FAA licensing.

A4.2.2. Process.

A4.2.2.1. Requests for ELSs and waivers shall be submitted to the office of the Chief of Safety as early as they are known to be necessary.

A4.2.2.2. Public safety ELSs and waivers such as flight plan approval, FSS design and toxic propellant storage normally require extensive risk analyses that can take one to two years to perform; therefore, these ELSs and waivers shall be initiated during the planning phase and be closed out by Range Safety (ELs) or the Space Launch Delta Commander (waivers) approval or design change before manufacture of the booster, spacecraft, FSS or other system in question.

A4.2.2.3. Launch area safety, launch complex safety, recovery area and recovery site safety ELSs and waivers normally require two weeks to two months to process depending on the nature of the noncompliance and the requested effectivity.

A4.2.2.4. Range Safety shall coordinate all noncompliance requests with affected agencies, as appropriate. A coordinated review and resolution of requests for relief from common DAF-FAA launch safety requirements shall be per procedures developed between SSC and the FAA. Range Safety shall also coordinate all noncompliance requests with the affected Range User.

A4.2.3. Approvals.

A4.2.3.1. Programs launching from and reentering onto only one SSC range require only the appropriate SLD 30/SE or SLD 45/SE approvals.

A4.2.3.2. Programs launching from one range and reentering onto another range require approvals from both the launching range for the launch and orbital phases of flight and from the reentry range for the reentry phase of flight prior to the initiation of operations/test. If the risk associated with the mission cannot be separated by phases according to the guidelines and requirements defined in SSCMAN 91-710 Volume 2 governing separate risk budgets, then launch range approval will be conditional on the reentry range's approval. If a launch occurs from an SSC range and the associated reentry occurs on another range/location, the launching range shall ensure all approvals required by the reentry range/location are obtained prior to the initiation of operations.

A4.2.3.3. Waivers dealing with public safety shall be approved by the SLD/CC.

A4.2.3.4. Waivers other than public safety shall be approved by the Chief of Safety or his/her designated representatives.

A4.2.3.5. ELSs shall be approved by the appropriate SLD 45/SE or SLD 30/SE or their designated representatives.

Attachment 5

ACCEPTABLE RISK CRITERIA

A5.1. Introduction. The risk criteria defined in this attachment apply to all programs and missions operating at SSC ranges. FAA-licensed/permitted launches shall comply with FAA risk requirements in 14 CFR Part 400 series (Commercial Space Transportation). The standard acceptable risk criteria apply separately to the launch and reentry phases of flight (including RLVs) provided the guidelines of RCC 321 (if used) and requirements of SSCMAN 91-710 Volume 2 (Chapter 2) are met. Therefore, the standard acceptable risk criteria apply separately to the launch vehicle, upper stage reentry (for upper stages that achieve orbit), and payload reentry provided RCC 321 and SSCMAN 91-710 Volume 2 requirements are satisfied. The risk posed by a flyback vehicle component/flyback booster is part of the launch risk budget provided the flyback vehicle component/flyback booster does not achieve orbit.

A5.2. Definition of Terms and Guidance Information.

A5.2.1. Casualty.

A5.2.1.1. Definition. A casualty is a serious injury or worse, including death, to a human.

A5.2.1.2. Guidance Information. Casualty modeling is a critical part of any risk analysis performed before flight to establish launch or reentry commit criteria that protect against casualties. The Abbreviated Injury Scale (AIS) is an anatomical scoring system first introduced in 1969. AIS provides a reasonably accurate way of ranking the severity of an injury. A scaling committee of the Association for the Advancement of Automotive Medicine monitors the AIS. In the AIS system, injuries are ranked on a scale of 1 to 6, with 1 being a minor injury; 2, moderate; 3, serious; 4, severe; 5, critical; and 6, a non-survivable injury. AIS Level 3 and greater is appropriate for describing a medical condition sufficiently to allow modeling of casualties for purposes of determining whether a launch or reentry satisfies the risk criteria for launch-essential personnel, recovery essential personnel and the public.

A5.2.2. Risk.

A5.2.2.1. Definition. Risk is a measure that accounts for both the probability of occurrence and the consequence of a hazard to a population or installation. Unless otherwise noted, risk is measured in expectation of casualties and expressed as individual risk or collective risk.

A5.2.2.2. Individual Risk.

A5.2.2.2.1. Definition. Individual risk is the risk that any single person will suffer a consequence. Unless otherwise noted, individual risk is expressed as the probability that any individual will become a casualty from a given hazard (P_c) at a specific location and event.

A5.2.2.2.2. Guidance Information. If each person in a group is subject to the same individual risk, then the collective risk may be computed as the individual risk multiplied by the number of people in the group.

A5.2.2.3. Collective Risk.

A5.2.2.3.1. Definition. Collective risk is the total risk to all individuals exposed to any and all hazards during a specific period of time or event such as a specific phase of flight, launch area, downrange (overflight), and recovery area or reentry overflight. The collective risk includes aggregated and accumulated risk. Unless otherwise noted, collective risk is the mean expectation of casualty predicted (E_c) to result from all hazards associated with an operation.

A5.2.2.3.2. Guidance Information. For launch and reentry, the collective risk per hazard may be determined for each of the different phases of flight, such as the launch area, recovery area, downrange/overflight, reentry overflight, or accumulated through all phases of the vehicle's flight.

A5.2.2.4. Accumulated Risk.

A5.2.2.4.1. Definition. Accumulated risk is the combined collective risk to all individuals exposed to a particular hazard through all phases of an operation.

A5.2.2.4.2. Guidance Information. For the flight of an orbital launch vehicle, risk is accumulated from liftoff through orbital insertion. For the flight of a suborbital launch vehicle, risk is accumulated from liftoff through the impact of all pieces of the launch vehicle, including the payload.

A5.2.2.5. Aggregated Risk.

A5.2.2.5.1. Definition. Aggregated risk is the accumulated risk due to all hazards associated with a flight.

A5.2.2.5.2. Guidance Information. For a specified launch, aggregated risk includes, but is not limited to, the risk due to debris impact, toxic release and distant focusing of blast overpressure.

A5.2.3. Populations at Risk.

A5.2.3.1. Launch-Essential Personnel.

A5.2.3.1.1. Definition. Launch-essential personnel are those persons necessary to safely and successfully complete a specific hazardous operation or launch (see SSCMAN 91-710 Volume 7 for the complete definition).

A5.2.3.1.2. Guidance Information. Launch-essential personnel include supporting personnel required to perform emergency actions according to authorized directives and persons in training. Range Safety and the Range User jointly determine the number of launch-essential personnel allowed within safety clearance zones or hazardous launch areas, with concurrence of the SLD/CC.

A5.2.3.2. Recovery-Essential Personnel.

A5.2.3.2.1. Definition. Recovery-essential personnel are those persons necessary to safely and successfully complete a specific hazardous operation, recovery of a RV, or flyback vehicle component (see SSCMAN 91-710 Volume 7 for the complete definition).

A5.2.3.2.2. Guidance Information. Recovery-essential personnel include supporting personnel required to perform emergency actions according to authorized directives

and persons in training. Range Safety and the Range User jointly determine the number of recovery-essential personnel allowed within safety clearance zones or hazardous recovery areas, with concurrence of the SLD/CC.

A5.2.3.3. Public.

A5.2.3.3.1. Definition. Public refers to all persons not in the launch-essential or recovery-essential categories. There are two sub-categories of public: neighboring operations personnel and the general public.

A5.2.3.3.2. Neighboring Operations Personnel (NOP).

A5.2.3.3.2.1. Definition. Neighboring operations personnel are individuals, not associated with the specific operation or launch or recovery currently being conducted, required to perform safety, security or critical tasks and who are notified of a neighboring hazardous operation and are either trained in mitigation techniques or accompanied by a properly trained escort.

A5.2.3.3.2.2. Guidance Information. For a commercially licensed launch, the FAA, as well as the range, shall approve the number and location of all neighboring operations personnel. Neighboring operations may include individuals performing launch processing tasks for another launch, recovery tasks for another reentry vehicle or flyback vehicle component, or neighboring military aircraft operations in adjacent airspace, but do not include individuals in training for any job or individuals performing routine activities such as administrative, maintenance, support, or janitorial. Neighboring operations activities may be allowed within safety clearance zones and hazardous launch or recovery areas and would not be evacuated with the general public. Neighboring operations activities shall be included in the same risk category as launch-essential personnel. Range Safety and the Range User jointly determine the number and location of NOP, with the concurrence of the SLD/CC. For a commercially licensed launch, the FAA as well as the range must approve the numbers and locations of NOP.

A5.2.3.3.3. General Public.

A5.2.3.3.3.1. Definition. The general public consists of all individuals that are not in the launch-essential personnel, recovery-essential or NOP categories and includes the people onboard ships and aircraft.

A5.2.3.3.3.2. Guidance Information. For a specific launch or reentry, the general public includes all visitors, media and other non-essential personnel at the launch base or recovery site, as well as persons located outside the boundaries of the launch or recovery sites.

A5.2.4. Modeling.

A5.2.4.1. Probabilistic Modeling.

A5.2.4.1.1. Definition. Probabilistic modeling is a process of employing statistical principles and the laws of probability to quantify the variability and the uncertainty in a physical quantity. The results of probabilistic modeling typically express the ratio of the outcomes that would produce a given event to the total number of possible outcomes.

A5.2.4.1.2. Guidance Information. Two common forms of probabilistic modeling are pure statistical modeling and probabilistic modeling with reference to a deterministic model. Statistical modeling refers to the process of using statistical analysis of data to characterize an outcome. Probabilistic modeling with reference to a deterministic model begins with an appropriate deterministic model describing the underlying physical process. Probabilistic models (probability distributions of input parameters and characterization of model uncertainty) are superimposed on the deterministic model to develop a characterization of the likelihood of different outcomes from the process being studied. Probabilistic modeling is used for many purposes including: (1) characterizing performance envelopes of a booster, (2) characterizing the ability of a tracker to detect and track a booster, (3) characterizing the region hazarded by a particular peril; for example, impact probability contours; and (4) computing the risk from a hazardous operation; for example, casualty expectation from a mission.

A5.2.4.2. Deterministic Modeling.

A5.2.4.2.1. Definition. A deterministic model is a mathematical model used to evaluate the extent of a hazard. Deterministic models are the mathematical basis used to establish boundaries that define where a specific hazard exists.

A5.2.4.2.2. Guidance Information. Deterministic models are commonly employed for the following purposes: (1) to establish a reference model about which to build a probabilistic model; (2) when a Range Safety analyst believes that variability and uncertainty are not important in the context of the analysis; and (3) as the basis for conservative screening of models to assess whether one or more hazardous conditions poses a sufficient threat to warrant operational restrictions or more complete analyses.

A5.3. Description of Risk Criteria.

A5.3.1. As shown in [Table A5.1](#), comparing normally accepted public, day-to-day accident risk exposure to normal launch (expendable and reusable), payload launch, and recovery operating risk exposure indicates that, under any circumstances, the annual collective risk for launch and reentry operations is small.

A5.3.2. Individual hazardous activities may exceed guidance levels based on national need or mission requirements. ELSs or waiver requests are required.

A5.3.3. All programs and missions are subject to GO/NO-GO decisions based on risk acceptance. The overall risk levels resulting from debris, toxic, and blast overpressure shall be accumulated and aggregated. Risk guidance levels in [paragraph 3.2](#) and [paragraph 3.3](#) are derived from the criteria shown in [Table A5.1](#).

Table A5.1. Normally Accepted Public Collective Accident Risks.

US Hazardous Events	Average Individual Casualty Risk	Collective Casualty Risk per Year for Population in ER and WR Launch Area ^a	Equivalent Launch Collective Casualty Risk per Year	Launch Guidance Limits: Collective Risks per Launch
All accidents	7.2×10^{-2b}	1.8×10^4		
Motor vehicle accidents	8.0×10^{-3b}	2.0×10^3		
Air travel accidents	6.4×10^{-4c}	1.6×10^2		
Natural hazards ^d	2.6×10^{-4e}	6.5×10^1		
Hypothetical nuclear plant accident	4.0×10^{-6e}	1.0		
Aviation overflight accidents		1.8×10^{-2f}		
Max risk acceptable ^g for accident in national need launch			1×10^{-2}	300×10^{-6h}
Max risk acceptable ^g for accidents in launches unless high management review			1×10^{-3}	100×10^{-6i}

Notes:

- a Total population of 2.5×10^5 assumed exposed to ER or WR launch area accidents
- b From total numbers of casualties (at least one-day disability) in *Accident Facts*, 1994, a publication of the National Safety Council, divided by US population of 2.5×10^8
- c From number of fatalities in *Accident Facts*, 1994, multiplied by 200, approximately the average number of casualties (at least one-day disability) experienced in the US for each accident fatality experienced
- d Lightning, tornadoes, hurricane (earthquake negligible)
- e From *Reactor Safety Study*, WASH-1400/NUREG-75/014, 1975

- f From Philipson, Lloyd L., *Refined Estimate of the Risk from Aviation Accidents to the Population in the CCAS Area of Concern*, ACTA Inc., Report No. 94-297/46-01, September 1994 (estimates derived for the ER; assumed to be applicable to the WR as well)
- g If the risk is $> 100 \times 10^{-6}$ but $< 300 \times 10^{-6}$, a SLD/CC waiver is required. If the risk is $> 300 \times 10^{-6}$ but $< 3,000 \times 10^{-6}$, in addition to the SLD/CC waiver, the SSC/CC shall be notified of the risk. If the risk is $> 3,000 \times 10^{-6}$, in addition to the SLD/CC waiver, approval shall be obtained from the SSC/CC
- h At most one such launch per year assumed for calculation purposes only. In practice, there is no such limit
- i Per RCC 321: A casualty is a serious injury or worse, including death to a human

A5.3.4. The following risk acceptability criteria are provided as guidance for the SLD/CC and as planning information for Range Users.

A5.3.5. The aggregated risk to all members of the general, public, including personnel on identified ships, shall be $E_c \leq 100 \times 10^{-6}$. The risk to personnel on other ships and aircraft beyond the Range's surveillance area shall be mitigated through the development of hazard zones and implementation of area clearance measures. FAA-licensed/permitted launches shall meet FAA and SSC risk criteria. The standard acceptable risk criteria apply separately to the launch and reentry phases of flight IAW RCC 321.

A5.3.6. The acceptable risk criteria in this manual are for the aggregated risk from all hazards associated with an operation. The range may require a lower launch risk criteria for toxic release to ensure that acceptable exposure concentrations for the general public are not exceeded. Since the results are dependent on many factors, such as the location, size, and other characteristics of the surrounding population centers, a similar analysis may not yield the same result at other ranges. Therefore, each range should determine the applicable allowable toxic exposure limits that are acceptable to the Range Commander, federal, state, and local governments.

A5.3.7. Acceptable risk to an individual member of the general public is $\leq 1 \times 10^{-6}$ expected casualties.

A5.3.8. Acceptable risk to an individual launch-essential person is $\leq 10 \times 10^{-6}$ expected casualties.

A5.3.9. Ship Protection.

A5.3.9.1. General Public Ship Criteria. The term "ship" includes boats and watercraft of all sizes. A contour shall be developed based on the probability of impact of debris capable of causing a casualty exceeding 1×10^{-5} for general public ships of various sizes. If the probability of impact contour does not define a finite area, then the hazard area shall be based on the three-sigma dispersion area that provides 99 percent confidence of containment of the planned debris impacts. Risk to personnel on identified ships shall be calculated and summed with the general public aggregated risk for all other hazards from liftoff through orbital insertion.

A5.3.9.2. Launch Essential Ship Criteria. A contour shall be developed based on the probability of impact of debris capable of causing a casualty exceeding 10×10^{-5} for launch essential ships of various sizes. If the probability of impact contour does not define a finite area, then the hazard area shall be based on the three-sigma dispersion area that provides about 99 percent confidence of containment of the planned debris impacts. Risk to personnel on identified ships shall be calculated and summed with the launch essential aggregated risk for all other hazards from lift off until orbital insertion. For non-FAA-licensed or permitted launches, the SLD/CC can allow for neighboring sea-based operations (not associated with the specific operation or launch or recovery currently being conducted, required to perform safety, security, or critical tasks) to be assessed at the same risk level as launch essential ships.

A5.3.10. Aircraft Protection.

A5.3.10.1. General Public Aircraft Criteria. General public aircraft will be restricted from hazard volumes of airspace where the probability of debris capable of causing one or more casualties for a representative aircraft exceeds 1×10^{-6} . For non-FAA-licensed or permitted launches, general aviation aircraft (e.g., that portion of civil aviation other than scheduled air services and nonscheduled air transport operations for remuneration or hire) will be restricted when the hit probability exceeds 3×10^{-5} .

A5.3.10.2. Launch Essential Aircraft Criteria. Launch essential aircraft will be restricted from hazard volumes of airspace where the probability of debris capable of causing one or more casualties for an aircraft exceeds 10×10^{-6} . For non-FAA-licensed or permitted launches, the SLD/CC can allow for neighboring aircraft operations (not associated with the specific operation or launch or recovery currently being conducted, required to perform safety, security or critical tasks) to be assessed at the same risk level as launch essential aircraft.

A5.4. Risk Assessment Approach.

A5.4.1. The overall risk assessment approach at SSC ranges is to accumulate the risks (both in the launch area and down range/overflight) due to the various hazards (debris, blast and toxics) and then aggregate the risks for all hazards. The standard acceptable risk criteria apply separately to the launch and reentry phases of flight IAW RCC 321 and SSCMAN 91-710, Volume 2. Refer to the definitions of terms for an explanation of accumulated and aggregated risks. Each hazard risk is treated separately and then aggregated to assess the overall risk to each population category.

A5.4.2. Aggregated Hazard Risks when E_c is $>100 \times 10^{-6}$ through $10,000 \times 10^{-6}$. This level of risk may require the Range User to take additional measures to protect personnel and resources. Examples include fix/correct/improve existing non-compliances, improve risk analyses to reduce the level of uncertainty, require a day-of-launch risk analysis, establish disaster aversion criteria. SLD/CCs, based on their assessment of national need, may approve launches/grant a waiver when $E_c >100 \times 10^{-6}$ through $10,000 \times 10^{-6}$. However, the SLD/CC shall notify the SSC/CC before allowing launches that exceed an E_c of $1,000 \times 10^{-6}$. FAA-licensed/permitted launches must comply with FAA (14 CFR Part 400 series, Commercial Space Transportation) and SSC risk criteria.

A5.4.3. Aggregated Hazard Risks when $E_c > 10,000 \times 10^{-6}$. This level of risk may require the Range User to take additional measures to protect personnel and resources. Examples include fix/correct/improve existing non-compliances, improve risk analyses to reduce the level of uncertainty, require a day-of-launch risk analysis, establish disaster aversion criteria. SSC/CC must approve any launch when the E_c exceeds $10,000 \times 10^{-6}$. FAA-licensed/permitted launches must comply with FAA (14 CFR Part 400 series, Commercial Space Transportation) and SSC for FAA risk criteria requirements.

A5.4.4. Acceptable Aggregated Risk Level Criteria for All Hazards.

A5.4.4.1. Aggregate Risk to the General Public. Aggregate risk refers to the risk to the general public from all hazards. The risk criteria apply separately to the launch and reentry phases of flight IAW RCC 321. The acceptable risk criteria for the launch or reentry shall be $E_c \leq 100 \times 10^{-6}$.

A5.4.4.2. Aggregate Risk to Essential Personnel. Acceptable aggregate risk to launch-essential and NOP from all hazards is $E_c \leq 300 \times 10^{-6}$. The risk criteria apply separately to the launch and reentry phases of flight IAW RCC 321.

A5.4.5. Accumulated Risk Criteria. Accumulated risk is the combined collective risk to all individuals exposed to a particular hazard through all phases of an operation/flight. For the flight of an orbital launch vehicle, risk is accumulated from liftoff through orbital insertion. For the flight of a suborbital launch vehicle, risk is accumulated from liftoff through the impact of all pieces of the launch vehicle, including any payload. The various levels of hazard risks are described below.

A5.4.5.1. Accumulated Hazard Risks. Acceptable accumulated hazard risks (risk to all individuals from a single hazard) is $E_c < 1/3$ of criteria. This level of risk is acceptable if supported by established standardized risk analyses approved by Range Safety. Established standardized risk analysis refers to analysis that meets the requirements outlined in this publication. A standardized risk analysis allows for a side-by-side comparison of programs.

A5.4.5.2. Accumulated Hazard Risks (risk to all individuals from a single hazard) when E_c exceeds $1/3$ of criteria. This level of risk may require the Range User to take additional measures to protect personnel and resources. Examples include fix/correct/improve existing non-compliances, improve risk analyses to reduce the level of uncertainty, require a day-of-launch risk analysis, establish disaster aversion criteria. Range Safety is the approval authority for accumulated hazard risks when E_c exceeds $1/3$ of criteria but is less than 100×10^{-6} . Although the acceptable limit for all accumulated hazard risks is 100×10^{-6} with Range Safety approval, an individual hazard could potentially be close to that value if all other hazards are only marginal contributors to the aggregate risk.

A5.5. Risk Analysis.

A5.5.1. AIS level 3 shall be used to quantify casualties in risk analysis models.

A5.5.2. Risk analysis can be conducted using a two-tiered approach. The tiering approach allows Range Users to initially employ relatively simple metrics to establish a casualty from each hazard (debris, blast overpressure and toxics). If the range determines that the result of the first tier (relatively simplistic and moderately conservative) risk analysis demonstrates

adequate safety, no further analysis is required. However, if the tier 1 analysis is determined by Range Safety to be too risky, Range Safety shall perform a tier 2 (sophisticated) risk analysis. The tier 1 thresholds reflect 1 percent probability of exposure of personnel to values exceeding deterministic threshold values for each of the hazards.

A5.5.2.1. Hazard Parameters.

A5.5.2.1.1. Debris.

A5.5.2.1.1.1. Two screens shall be used for a tier 1 debris risk analysis. The first screen is 11 foot-pounds for a casualty due to blunt trauma for the general public (in the open) due to a typical launch vehicle debris impact for both the launch area and downrange/overflight. The second screen shall account for a casualty due to a penetrating injury for the general public (in the open) due to a typical launch vehicle debris impact for both the launch area and down range/overflight. The second screen shall be based on a penetration injury threshold level of 8 foot-pounds per inch squared that will be defined by Range Safety during tailoring discussions.

A5.5.2.1.2. Blast Overpressure.

A5.5.2.1.2.1. Two criteria shall be used for a tier 1 blast overpressure risk analysis. The first criterion is 1 psi for a casualty due to a blast load following a launch vehicle accident for both the launch area and down range/overflight. The second criterion is fragment throw distance for ships and boats. Range Users shall calculate a fragment throw distance for ships and boats using 1.0 psi for ships and 1/2 psi for boats.

Attachment 6

MAKING CHANGES TO SSCMAN 91-710

A6.1. Introduction.

A6.1.1. Purpose. Changing the publication provides a means for keeping the publication current as new technology and processes develop while allowing for internal and external technical reviews.

A6.1.2. Content. This attachment describes the process for submitting changes to this publication. These changes shall be global in nature and are not intended to address technical changes that are related to specific and unique program issues. For specific and unique program issues changes refer to [Attachment 2](#).

A6.1.3. Applicability. The publication change process is applicable to all Range Users and range organizations that are responsible for establishing and enforcing Range User requirements.

A6.2. Change Process. Changes to SSCMAN 91-710 shall be submitted using the Range Safety provided Change Request Form. Only one change is allowed per Change Request Form and that change is required to stand alone regarding specific subject matter and paragraph number. While the Change Request Form is preferred, alternative formats may be accepted so long as all the following required information is included. In such cases, Range Safety will normally initiate a single form as a cover sheet for the received change request. Changes made by “revision-in-text” mode are strongly discouraged.

A6.2.1. Completing Change Requests. Change Requests shall include the following information:

A6.2.1.1. Date of request.

A6.2.1.2. Name of originator.

A6.2.1.3. Name of company or agency.

A6.2.1.4. Address of company or agency.

A6.2.1.5. E-mail address, telephone number and fax number, as applicable.

A6.2.1.6. The numeric designation of the affected paragraph.

A6.2.1.7. The text for the suggested change.

A6.2.1.8. The rationale for the suggested change.

A6.2.2. Submitting Changes to SSCMAN 91-710. Organizations desiring to submit proposed changes to SSCMAN 91-710 (any volume) shall complete a Change Request Form (CRF), available from the Range Safety offices. Submit a single Change Request Form for each proposed change to either SLD 45/SE, Systems Engineering Support (1201 Edward H. White Street, Patrick Space Force Base, Florida 32925-3238) or SLD 30/SE, Launch Vehicle Safety (806 13th Street, Suite 3, Vandenberg Space Force Base, California 93437-5230). CRFs may also be submitted electronically via the following Range Safety e-mail address: 45safety@us.af.mil. SLD 30/SEAL shall forward copies of all CRFs to SLD 45/SE.

A6.2.3. Disposition of Change Requests.

A6.2.3.1. SLD 45/SE is designated as the lead range for administratively processing changes to all volumes of SSCMAN 91-710. CRFs shall be submitted IAW [paragraph A6.2.2](#) above. SLD 45/SE shall assign each CRF with a unique identifiable tracking number. After receipt, SLD 45/SE, in conjunction with SLD 30/SE, shall develop a joint SLD/SE recommended disposition, record this disposition on the CRF and forward the CRF to HQ SSC/SE. If SLD 30/SE and SLD 45/SE cannot reach agreement on a joint recommended disposition, SLD 45/SE shall forward the CRF containing the recommended dispositions of both SLD 30/SE and SLD 45/SE to HQ SSC/SE for resolution. After consulting with both SLDs, HQ SSC/SE shall issue the final CRF disposition.

A6.2.3.2. The disposition of Change Requests falls into the following three categories:

A6.2.3.2.1. Approved. The reviewer approves the proposed change as suggested by the submitter.

A6.2.3.2.2. Approved with Comments. The reviewer submits proposed revised wording of the proposed change as well as rationale for the revision.

A6.2.3.2.3. Disapproved. Rationale for not accepting the proposed change will be provided.

Attachment 7

GENERIC PAYLOAD REQUIREMENTS AND APPROVAL PROCESSES

A7.1. Generic Payloads. Many payload systems are generic, meaning they are built on identical bus structures, they launch on a standard launch vehicle and use standard range processing prelaunch and launch procedures. If requested by a Range User and upon completion of the initial payload bus/launch vehicle processing/launch cycle, a Range Safety approved baseline shall be established identifying the program as a generic payload program. These generic payload systems result in few changes to the baseline system and the payload/launch vehicle or payload/RV ground processing safety data remains basically the same from one mission to the next. The interactive process between Range Safety, payload (bus) manufacturers and launch vehicle companies or government agencies (Range Users) described in this attachment has been developed to reduce the cost and time required for the approval process while satisfying the required launch safety requirements.

A7.1.1. To take advantage of previously approved generic payload/launch systems and their associated ground processing safety data, the requirements described below shall be followed; however, they may be modified to meet individual program requirements:

A7.1.1.1. Range Safety and the Range User shall conduct initial planning meetings to establish a generic payload/launch system approval process.

A7.1.1.2. Once a baseline payload/launch system has been approved, Range Safety efforts will focus on specific changes for each new program or mission. Existing and ongoing previously approved components, systems and subsystems need not be resubmitted as part of data packages for review and approval.

A7.1.1.3. Range Safety and the Range User shall conduct a safety assessment of each new program or mission to define changes and/or additions that create new uncontrolled hazards or that increase risks significantly.

A7.1.1.3.1. Based on the joint safety assessment, the parties shall agree on the minimum required changes and/or documentation to be submitted to Range Safety for review and approval.

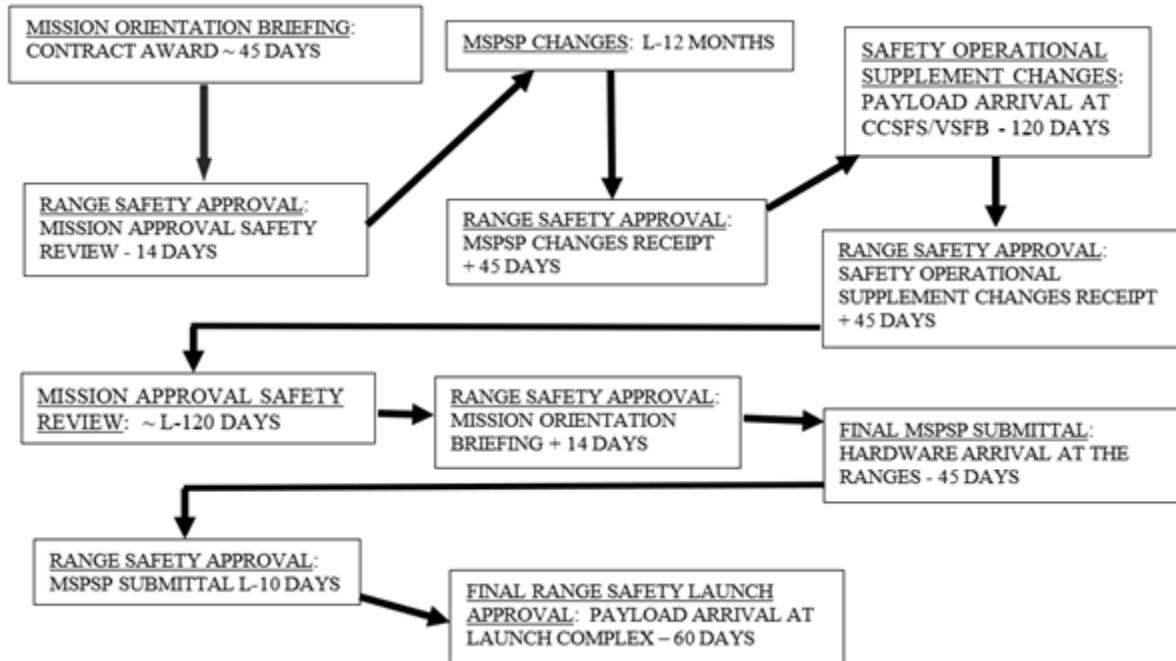
A7.1.1.3.2. Data submittal and Range Safety response times shall be established based on the joint safety assessment and modified only upon agreement of all parties.

A7.1.1.4. The goal of the generic payload approval process is to achieve final Range Safety approval at least 60 calendar days before payload arrival on the launch complex.

A7.2. Approval Process for Existing Payload Buses. For existing payload buses with approved baseline MSPSPs, Accident Risk Assessment Reports (ARARs), SARs, GOPs and hazardous and safety critical procedures, the goal is to grant baseline approvals for generic buses during the first mission, after a request for generic status by a Range User and upon implementation of this approach. Subsequent flights would use the joint assessment process to review and approve changes to the generic bus and/or payload additions for specific missions. Key to the approach is the safety assessment that is used to determine whether changes or additions have created any new uncontrolled hazards or increased the risks significantly. The assessment results will be used to

determine changes (if any), data required and review and approval requirements. The approval process for existing payload buses is shown in [Figure A7.1](#) and described below:

Figure A7.1. Approval Process for Existing Payload Buses.



A7.2.1. Launch Services and Mission Orientation Briefing.

A7.2.1.1. A launch services and mission orientation safety briefing shall be presented to Range Safety approximately 45 days after contract award for the mission. The briefing shall cover the following topics:

- A7.2.1.1.1. Changes to the launch vehicle or RV.
- A7.2.1.1.2. Changes to the payload bus.
- A7.2.1.1.3. Planned payload additions for the mission.
- A7.2.1.1.4. Changes to hazardous systems and operations (the focus of this review).

A7.2.1.2. Range Safety concurrence for both the mission concept and schedule for the remaining Range Safety milestones shall be provided during the mission orientation safety briefing or within 14 calendar days after the briefing.

A7.2.2. Data Review and Approval.

A7.2.2.1. Mission Unique Missile System Prelaunch Safety Package.

A7.2.2.1.1. An MSPSP, ARAR or SAR shall be delivered approximately 12 months before launch and contain the data requirements identified during the mission orientation safety briefing on the changes to the launch vehicle and payload unique for the mission and identified in the initial operation's concept review.

A7.2.2.1.2. Range Safety shall provide responses within 45 calendar days after receipt of the data package.

A7.2.2.2. GOP and Hazardous and Safety Critical Procedures.

A7.2.2.2.1. A GOP supplement describing changes to approved operations and/or new or modified safety critical or hazardous procedures shall be delivered to Range Safety approximately 120 days before payload arrival on the range. This supplement is required only if changes have been made to operations and procedures that affect hazardous levels or risks.

A7.2.2.2.2. Range Safety shall provide responses within 45 calendar days after receipt of the data.

A7.2.3. Mission Approval Safety Review.

A7.2.3.1. A mission approval safety review shall be conducted at approximately L-120 days to obtain Range Safety approval for launch vehicle and payload processing, transport of the payload to the launch pad, payload mate to the launch vehicle and launch pad payload processing. For RVs and payloads returning from space, this chapter also applies and, if required, appropriate approval shall be obtained.

A7.2.3.2. Unless there are significant issues, Range Safety shall provide mission safety approval 14 calendar days after the safety review.

A7.2.4. Final Launch Approval. Final approval to proceed with launch vehicle and payload processing up to beginning the final countdown shall be provided by Range Safety at least 60 days before payload arrival at the launch complex. Flight plan approval for a mission that involves public safety may not be granted until just before the LRR depending on the complexity of the public safety issue encountered. For example, typically, at the ER, easterly launch azimuths can be approved at least 120 days before launch; on the other hand, high inclination launches may require extensive risk analyses that can delay final flight plan approval until just before the LRR.

A7.3. Approval Process for New Payload Buses. For new payload buses, the Range User shall submit a request for generic status at PI. The Range User shall then comply with the tailored requirements of this publication for the program. Range Safety shall evaluate the initial mission processing and associated data and grant baseline approval as a generic bus. Subsequent flights would follow the requirements set out in [paragraph A7.2](#) for existing payloads.

A7.4. Incidental Launch Safety Issues. Incidental launch safety issues such as component failures, test failures and the discovery of unforeseen hazards occurring after baseline approvals shall be worked in real time as part of the final approval process for individual launch requirements. ELS or waiver requests are required.

Attachment 8

LAUNCH SAFETY CONCEPT-TO-LAUNCH PROCESS KEY DESCRIPTIONS

A8.1. Range Safety Milestones. Represents distinct activities or groupings of activities in the launch safety approval process.

A8.2. SSCMAN 91-710 Milestone Volume Office of Primary Responsibility (OPR). Refers to the primary SSCMAN 91-710 volume in which the Launch Safety Milestone is addressed and identifies the Range Safety Office with primary responsibility for the Launch Safety Milestone.

A8.3. Required TIM or Activity. Refers to the TIMs or activities required to achieve the Launch Safety Milestone.

A8.4. Primary Document. Refers to the primary documents or data the Range User must submit to Range Safety for review and approval to achieve the Launch Safety Milestone.

A8.5. Approval Required Prior To. Refers to the activity that cannot be accomplished without accomplishment of the Launch Safety Milestone.

A8.6. Typical Timeframes. Refers to typical timeframes in which the Launch Safety Milestone must be initiated for new, major launch vehicle programs. These timeframes vary depending on the complexity of the program. For smaller vehicles and payloads, the timeframes can be compressed to a year or less. Timeframe requirements for Range Safety and the Range Users throughout the publication are baselines for all programs; however, they may be altered during the tailoring process.

Figure A8.1. Launch Safety Concept to Launch Process.

