

**BY ORDER OF THE COMMANDER  
AIR FORCE SPACE COMMAND**

**AIR FORCE SPACE COMMAND  
MANUAL 91-710 VOLUME 1**

**1 JULY 2004**



**Safety**

**RANGE SAFETY USER REQUIREMENTS  
MANUAL VOLUME 1 - AIR FORCE SPACE  
COMMAND RANGE SAFETY POLICIES  
AND PROCEDURES**

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This manual implements Department of Defense Directive (DoDD) 3100.10, *Space Policy*; DoDD 3200.11, *Major Range and Test Facility Base*; DoDD 3230.3, *DoD Support for Commercial Space Activities*; Air Force Policy Directive (AFPD) 91-1, *Nuclear Weapons and Systems Surety*; AFPD 91-2, *Safety Programs*; AFPD 63-12, *Assurance of Occupational Safety, Suitability, and Effectiveness*; Air Force Instruction (AFI) 91-202, *The US Air Force Mishap Prevention Program*, (AFSPC Sup 1); and the *Memorandum of Agreement between the Department of the Air Force and the Federal Aviation Administration on Safety for Space Transportation and Range Activities*.

This volume incorporates information previously found in Eastern and Western Range 127-1, Chapter 1, *Eastern and Western Range Policies and Procedures*. It describes the Range Safety Program; defines responsibilities and authorities; and delineates policies, processes, and approvals, and approval levels for all activities from or onto Air Force Space Command (AFSPC) ranges. These activities include the life cycle of launch vehicles and payloads from design concept, test, checkout, assembly, and launch to orbital insertion or impact. The volume also defines Range User responsibilities and describes Range Safety and Range User interfaces for all AFSPC ranges, including the 30th Space Wing, [Western Range (WR)] at Vandenberg Air Force Base (VAFB), California and the 45th Space Wing [Eastern Range (ER)] at Patrick Air Force Base (PAFB), Florida. Range Users may familiarize themselves with AFSPCI91-701, *Range Safety Program Policy and Requirements*, to fully understand the overall Range Safety Program, the capabilities of the ranges, and range management activities.

This volume applies to all Range Users conducting or supporting operations on the AFSPC ranges. Range Users include any individual or organization that conducts or supports any activity on resources (land, sea, or air) owned or controlled by AFSPC ranges. This includes such organizations as the Department of Defense (DoD), United States (US) government agencies, civilian launch operators, and foreign government agencies and other foreign entities that use AFSPC range facilities and test equipment; conduct pre-launch and launch operations, including payloads to orbital insertion or impact; and/or require on-orbit or other related support. Commercial users intending to provide launch services from one of the ranges shall have a license or license application in process from the Department of Transportation's Federal Aviation Administration (FAA) or have a DoD sponsorship and be accepted by the DoD to use the ER or WR. For-

oreign government organizations or other foreign entities shall be sponsored by an appropriate US government organization or be a customer of a Range User. This volume applies to the Air National Guard. It does not apply to the Air Force Reserve Command.

**NOTE:** Volume 1 includes a complete table of contents for all the volumes of AFSPCMAN 91-710. In addition, each individual volume contains its own table of contents. Volume 7 contains a glossary of references, acronyms, abbreviations, and terms for use with all the volumes. Special publication formatting features are described in 8.2 of this volume.

### **COMPLETE TABLE OF CONTENTS FOR AFSPCMAN 91-710 VOLUMES 1 THROUGH 7**

<b>TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 1</b>	<b>3</b>
<b>TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 2</b>	<b>6</b>
<b>TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 3</b>	<b>9</b>
<b>TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 4</b>	<b>19</b>
<b>TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 5</b>	<b>37</b>
<b>TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 6</b>	<b>40</b>
<b>TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 7</b>	<b>48</b>

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**TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 1**

<b>Chapter 1— INTRODUCTION</b>	<b>49</b>
1.1. Objective. ....	49
1.2. Applicability: ....	49
1.2.1. Range Users. ....	49
1.2.2. Tailoring: ....	49
1.2.3. New Programs. ....	50
1.2.4. Previously Approved Programs. ....	50
1.3. Basis for the Requirements. ....	50
 <b>Chapter 2— RESPONSIBILITIES AND AUTHORITIES</b>	 <b>52</b>
2.1. General. ....	52
2.2. Headquarters Air Force Space Command Responsibilities. ....	52
2.3. Space Wing Responsibilities: ....	52
2.3.1. Commanders, 30th Space Wing and 45th Space Wing: ....	52
Figure 2.1. 30th SW and 45th SW Safety Organizations. ....	52
2.3.2. Relationship with Range Users. ....	53
2.3.3. General Description of the Eastern and Western Ranges: ....	53
Figure 2.2. Typical Launch Sector for Launches from the ER.. ....	55
Figure 2.3. Owned or Leased Facilities on Sites Downrange from the ER. ....	56
Figure 2.4. Typical Launch Sector for Launches from the WR. ....	57
Figure 2.5. Owned or Leased Facilities on Sites Uprange and Downrange from the WR. ....	58
2.3.4. Chiefs of Safety, 30th and 45th Space Wings. ....	58
2.3.5. Range Safety Offices. ....	59
2.3.6. Other Space Wing Organizations With Safety Program Responsibilities: ....	60
2.4. Federal Aviation Administration Responsibilities. ....	61
2.5. Range User Responsibilities. ....	62
2.5.1. Range Safety Funding. ....	62
2.5.2. System Safety Program. ....	62
2.5.3. Design, Test, and Inspection Requirements. ....	62
2.5.4. Radioactive Material Launches. ....	63
2.5.5. Conduct of Operations. ....	63

2.5.6. Control Authority Responsibilities. ....	64
2.5.7. Occupational Safety and Health: ....	64
2.5.8. Resource Safety. ....	65
<b>Chapter 3— RANGE SAFETY POLICY</b>	<b>66</b>
3.1. General: ....	66
3.2. Public Safety. ....	66
Figure 3.1. Acceptable Public Exposure Launch Operation Risk Guidance. ....	67
3.2.1. Prelaunch and Launch Operations: ....	67
3.2.2. Range Safety Critical Systems. ....	68
3.2.3. Control of Errant Vehicle Flight: ....	69
3.3. Launch Area Safety. ....	69
Figure 3.2. Acceptability Guidelines for Prelaunch Launch Area/Launch Complex Hazard Consequences and Probability Categories. ....	71
3.4. Launch Complex Safety. ....	73
<b>Chapter 4— RANGE SAFETY PROCESSES</b>	<b>74</b>
4.1. Range Safety and Range User Interface Process. ....	74
4.2. Range Safety Concept-to-Launch Process. ....	74
4.3. Initial Range Safety and Range User Technical Interchange Meeting: ....	74
4.4. Tailoring Process: ....	74
4.5. Other Range Safety and Range User TIMs and Reviews. ....	75
4.6. ELS Determinations and Waivers: ....	75
4.6.1. General. ....	75
4.6.2. ELS Determination. ....	75
4.6.3. Waivers: ....	75
4.6.4. Submittal. ....	76
4.7. Changes to Approved Generic Systems: ....	76
<b>Chapter 5— SAFETY AUTHORIZATIONS, SAFETY APPROVALS, AND DOCUMENTATION</b>	<b>77</b>
5.1. General. ....	77
5.2. Safety Authorizations: ....	77
5.3. Safety Approvals: ....	77
5.3.1. SW Commanders. ....	77

<b>AFSPCMAN 91-710 V1 1 JULY 2004</b>	<b>5</b>
5.3.2. Chiefs of Safety. ....	78
5.4. Other Required Approvals: .....	79
5.4.1. Explosives Site Plans. ....	79
5.4.2. Use of Radioactive Sources for Space Operations. ....	79
5.5. Documentation and Data Requirements. ....	79
<b>Chapter 6— INVESTIGATING AND REPORTING MISHAPS AND INCIDENTS</b>	<b>80</b>
6.1. Mishaps and Incidents Involving Air Force Personnel and Resources. ....	80
6.2. Non-Air Force Personnel and Resources: .....	80
6.3. Reporting Space Launch System Anomalies. ....	80
<b>Chapter 7— CHANGES TO THIS PUBLICATION</b>	<b>81</b>
<b>Chapter 8— RANGE USER INFORMATION SOURCES</b>	<b>82</b>
8.1. Range User Handbook. ....	82
8.2. Organization of the Volumes: .....	82
8.2.1. Main Chapters. ....	82
8.2.2. Open Text. ....	82
8.2.3. Bordered Paragraphs: .....	82
8.3. AFSPC Range Safety Web Site Access. ....	83
<b>Attachment 1— THE AFSPCMAN 91-710 TAILORING PROCESS</b>	<b>84</b>
<b>Attachment 2— SYSTEM SAFETY PROGRAM REQUIREMENTS</b>	<b>90</b>
<b>Attachment 3— SUBMITTING AFSPCMAN 91-710 NONCOMPLIANCE REQUESTS</b>	<b>101</b>
<b>Attachment 4— ACCEPTABLE RISK CRITERIA</b>	<b>105</b>
aTable A4.1. Normally Accepted Public Ambient Collective Accident Risks. ....	109
<b>Attachment 5— MAKING CHANGES TO AFSPCMAN 91-710</b>	<b>113</b>
<b>Attachment 6— GENERIC PAYLOAD POLICY AND APPROVAL REQUIREMENTS</b>	<b>115</b>
Figure A6.1. Approval Process for Existing Payload buses. ....	116
<b>Attachment 7— LAUNCH COMPLEX SAFETY TRAINING AND CERTIFICATION</b>	<b>118</b>
<b>Attachment 8— RANGE SAFETY CONCEPT-TO-LAUNCH PROCESS</b>	<b>127</b>
<u>Figure A8.1. Range Safety Concept to Launch Process. ....</u>	<u>128</u>

**TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 2**

<b>Chapter 1— GROUND RULES</b>	<b>6</b>
1.1. Organization of the Volume. ....	6
1.1.1. Main Chapters. ....	6
1.1.2. Open Text. ....	6
1.1.3. Bordered Paragraphs: ....	6
1.2. Impact Restrictions: ....	6
1.5. Data Submission: ....	7
1.5.1. General. ....	7
1.5.2. Statement of Program Justification. ....	7
1.6. Range User Responsibilities. ....	8
1.6.9. Range User Range Tracking System Performance Requirements. ....	8
<b>Chapter 2— FLIGHT ANALYSIS APPROVAL AND DATA REQUIREMENTS</b>	<b>11</b>
2.1. Introduction. ....	11
2.1.1. Security and Data Delivery Lead Times: ....	11
Table 2.1. Data Requirements Documentation Lead Times. ....	11
2.2. Flight Plan Approval and Data Requirements Overview. ....	12
2.2.1. Approval Phases. ....	12
2.2.2. Data Requirements. ....	13
2.2.3. Preliminary Flight Plan Approval and Data Package Requirements: ....	13
2.2.4. Final Flight Plan Approval and Data Package Requirements: ....	18
2.3. Aircraft/Ship Intended Support Plans and Data Package Requirements: ....	20
2.3.1. Purpose. ....	20
2.3.2. ISP Development and Submittal. ....	20
2.3.3. ISP Data Package Requirements. ....	20
2.4. Directed Energy Plan Approval and Data Requirements. ....	21
2.4.1. Purpose. ....	21
2.4.2. DEP Submittal: ....	21
2.4.3. Laser Operational Procedures: ....	22
2.4.4. DEP Data Package Requirements: ....	22

2.4.5. Coordination with the Strategic Command Control Center. ....	26
2.5. Large Nuclear Systems Approval and Data Requirements. ....	26
2.5.1. Environment Impact Statement: L-3 years. ....	26
2.5.2. Final Safety Analysis Report: L-1 year. ....	26
<b>Chapter 3— PROGRAM-SPECIFIC FLIGHT ANALYSES</b>	<b>27</b>
3.1. Trajectory Analysis: ....	27
3.1.1. General. ....	27
3.1.2. Trajectory Analysis Products: ....	27
3.2. Malfunction Turn Analysis. ....	37
3.2.1. General. ....	37
3.2.2. Malfunction Turn Analysis Products: ....	37
3.3. Debris Analysis. ....	37
3.3.1. General. ....	37
3.3.2. Debris Analysis Products: ....	37
3.4. Debris Risk Analysis ....	38
3.4.1. General: ....	38
3.4.2. Debris Risk Analysis Products: ....	38
3.5. Acoustic Analysis. ....	39
3.5.1. Acoustic Analysis Products: ....	39
3.6. Sonic Boom Analysis. ....	39
3.6.1. Sonic Boom Analysis Products: ....	40
3.7. FTS Determination Analysis. ....	40
3.7.1. General. ....	41
3.7.2. FTS Determination Analysis Products: ....	41
3.8. Post-Flight Vehicle Performance Analysis. ....	41
<b>Attachment 1— TRAJECTORY DATA</b>	<b>44</b>
A1.2.1.XYZ Coordinates. ....	44
A1.2.2.Trajectory Data Item Requirements. ....	44
A1.2.3.Nominal (Reference) Trajectory. ....	45
A1.2.4.Three-Sigma Dispersed Trajectories. ....	45
Table A1.1. Trajectory Types for Single Flight Azimuths. ....	46

Table A1.2. Trajectory Types for Variable Flight Azimuths. ....	47
Table A1.3. Trajectory Types for Multiple Liquid Propellant Engines Thrusting at Liftoff. ....	47
Table A1.4. Trajectory Data Items. ....	47
<b>Attachment 2— MALFUNCTION TURN DATA</b>	<b>53</b>
<b>Attachment 3— FRAGMENT DATA</b>	<b>58</b>
<b>Attachment 4— JETTISONED BODY DATA</b>	<b>61</b>

---



**TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 3**

<b>Chapter 1— INTRODUCTION</b>	<b>12</b>
1.1. General: .....	12
1.2. Organization of the Volume: .....	12
1.2.1. Main Chapters. ....	12
1.2.2. Open Text. ....	12
1.2.3. Bordered Paragraphs: .....	12
<b>Chapter 2— RESPONSIBILITIES AND AUTHORITIES</b>	<b>14</b>
2.1. Range Safety, 30th and 45th Space Wings: .....	14
2.2. Range User Responsibilities. ....	14
<b>Chapter 3— GENERAL DESIGN POLICY</b>	<b>15</b>
3.1. General: .....	15
3.2. Systems Without Specific Design Criteria. ....	15
<b>Chapter 4— DOCUMENTATION REQUIREMENTS</b>	<b>16</b>
4.1. System Safety Program Plan and Hazard Analyses: .....	16
4.2. Missile System Prelaunch Safety Package: .....	16
4.2.1. MSPSP Submittal, Review, and Approval Process: .....	16
4.2.2. MSPSP Preparation. ....	16
4.3. MSPSP Associated Test Plans and Test Results: .....	17
4.4. Nondestructive Examination Plans: .....	17
<b>Chapter 5— OPERATIONS SAFETY CONSOLE</b>	<b>18</b>
5.1. Operations Safety Console General Design Requirements: .....	18
5.2. ER OSC Controls, Monitors, and Communication Lines: .....	18
5.3. WR OSC Controls, Monitors, and Communication Lines: .....	19
5.4. OSC Color Television System: .....	20
5.5. OSC Communication and Video Recording: .....	20
5.6. OSC Validation and Test Requirements: .....	20
5.7. OSC Data Requirements. ....	20

<b>Chapter 6— MATERIAL HANDLING EQUIPMENT, CRANES AND HOISTS, AND PERSONNEL WORK PLATFORMS</b>	<b>21</b>
6.1. Material Handling Equipment: .....	21
6.1.1. MHE General Requirements: .....	21
6.1.2. Slings: .....	23
6.1.3. Below-the-Hook Lifting Devices: .....	24
6.1.4. Handling Structures: .....	25
6.1.5. Support Structures: .....	26
6.1.6. Hydrasets and Load .....	27
6.1.7. MHE Data Requirements. ....	28
6.2. Cranes and Hoists. ....	28
6.2.1. Crane and Hoist Design Standards and Requirements: .....	28
6.2.2. Crane and Hoist Inspection and Test Requirements: .....	31
6.2.3. Crane and Hoist Data Requirements. ....	32
6.2.4. Unique WR Crane Design Standards and Requirements: .....	33
6.2.5. Additional Requirements for Cranes and Hoists Used To Handle Crit Hdwr .....	33
6.2.6. Reserved: .....	40
6.3. Removable, Extendible, and Hinged Personnel Work Platforms. ....	40
6.3.1. Removable, Extendible, and Hinged Personnel Work Platform Design Requirements: .....	40
6.3.2. Removable, Extendible, and Hinged Personnel Work Platform Marking Requirements: .....	40
6.3.3. Removable, Extendible, and Hinged Personnel Work Platform Inspection..Test Req. ....	40
6.3.4. Removable, Extendible, and Hinged Personnel Work Platform Data Requirements. ....	41
6.4. Man-Rated Baskets. ....	41
<b>Chapter 7— ACOUSTIC HAZARDS</b>	<b>42</b>
7.1. Acoustic Design Standards: .....	42
7.2. Acoustic Data Requirements. ....	42
<b>Chapter 8— NON-IONIZING RADIATION SOURCES</b>	<b>43</b>
8.1. Radio Frequency Emitters. ....	43
8.1.1. RF Emitter Design Standards: .....	43
8.1.2. RF Emitter Design: .....	43
8.1.3. RF Emitter Initial Test Requirements: .....	44
8.1.4. RF Emitter Data Requirements: .....	44

<b>AFSPCMAN 91-710 V1 1 JULY 2004</b>	<b>11</b>
8.2. Laser Systems: .....	44
8.2.1. Laser System Design Standards: .....	44
8.2.2. Laser System General Design Requirements. ....	44
8.2.3. Laser System Test Requirements: .....	45
8.2.4. Laser System Data Requirements: .....	45
<b>Chapter 9— RADIOACTIVE (IONIZING) RADIATION SOURCES</b>	<b>47</b>
9.1. Radioactive Source Design Standards and Controls: .....	47
9.1.1. Radioactive Source Design Standards .....	47
9.1.2. Additional ER and WR Design Controls: .....	47
9.2. Radioactive Sources Carried on Launch Vehicles and Payloads. ....	48
9.2.1. Radioactive Sources Carried on Launch Vehicles and Payloads General Design Requirements: .....	48
9.2.2. Radioactive Sources Carried on Launch Vehicles and Payloads Test Requirements:	48
9.2.3. Radioactive Sources Carried on Launch Vehicles and Payloads Launch Approval Requirements: .....	49
9.2.4. Radioactive Sources Launch Approval Data Requirements. ....	49
9.2.5. Radiation Producing Equipment and Devices Data Requirements. ....	49
<b>Chapter 10— HAZARDOUS MATERIALS</b>	<b>50</b>
10.1. Hazardous Materials Selection Criteria: .....	50
10.1.1. Hazardous Materials Flammability and Combustibility: .....	50
10.1.2. Hazardous Materials Toxicity: .....	50
10.1.3. Hazardous Materials Compatibility: .....	50
10.1.4. Hazardous Materials Electrostatic Buildup. ....	50
10.2. Hazardous Materials Test Requirements: .....	50
10.2.1. Plastic Materials Test Requirements: .....	50
10.2.2. Other Hazardous Material Test Requirements: .....	51
10.3. Hazardous Materials Environmental Requirements: .....	51
10.4. Hazardous Material Data Requirements. ....	51
10.5. Process Safety Management and Risk Management Plan: .....	51
<b>Chapter 11— GROUND SUPPORT PRESSURE, VACUUM, AND HAZARDOUS STORAGE SYSTEMS</b>	<b>52</b>
11.1. Ground Support Pressure Vacuum and Storage Systems Requirements: .....	52

11.2. Ground Support Pressure Systems Requirements: .....	52
11.2.1.Generic Ground Support Pressure System Requirements: .....	52
Table 11.1. Sheet/Plate Material Stainless Steel Properties. ....	55
11.2.2.Ground Support Pressure System Hardware Design Requirements: .....	61
Table 11.2. Open Line Force Calculation Factor. ....	71
Table 11.3. Spacing for Tubing Supports Within Consoles or Modules. ....	75
Table 11.4. Spacing for Tubing Supports Between Consoles or Modules. ....	76
11.2.3.Ground Support Pressure System Testing: .....	83
11.2.4.Ground Support Pressure System Analysis and Documentation Requirements: .....	86
11.3. Ground Support Pressure Systems Certification and Recertification: .....	89
11.3.1.Ground Support Pressure Systems Recertification Test Requirements. ....	89
11.3.2.Ground Support Pressure Systems General Recertification Requirements: .....	90
11.3.3.Ground Support Pressure Systems Certification: .....	91
11.3.4.Ground Support Pressure System Analyses. ....	92
 <b>Chapter 12— FLIGHT HARDWARE PRESSURE SYSTEMS AND PRESSURIZED STRUCTURES</b>	 <b>94</b>
12.1. Flight Hardware Pressure System and Pressurized Structure General Requirements.	94
12.1.1.Flight Hardware Presssure System and Pressurized Structure General Design Rqmnts:	94
12.1.2.Flight Hardware Pressure System and Pressurized Structure Fault Tolerance: .....	94
12.1.3.Flight Hardware Pressure System Offloading: .....	94
12.1.4.Flight Hardware Pressure System Operations. ....	95
12.1.5.Flight Hardware Pressure System and Pressurized Structure Analyses: .....	95
12.1.6.Flight Hardware Pressure Vessel and Pressurized Structure Loads, Pressures/Envr .	98
12.1.7.Flight Haardware Pressure Vessel and Pressurized Structure Strength Requirements:	98
12.1.8.Flight Hardware Pressure Vessel and Pressurized Structure Stiffness Requirements:	99
12.1.9.Flight Hardware Pressure Vessel and Pressurized Structure Thermal Requirements:	99
12.1.10.Physical Arrangement of Flight Hardware Pressure Systems and System Compnts:	99
Table 12.1. Open Line Force Calculation Factor. ....	102
12.1.11.Flight Hardware Pressure System and Pressurized Structure Supports and Clamps:	104
12.1.12.Flight Hardware pressure System Bonding and Grounding: .....	104
12.1.13.Flight Hardware Pressure System and Pressurized Structure Material Compa/Select:	105
12.1.14.Flight Hardware Pressure System Contamination and Cleanliness Requirements:	106

12.1.15.Flight Hardware Pressure System Components Service Life and Safe-Life: .....	106
12.1.16.Flight Hardware Metallic Materials: .....	107
12.1.17.Flight Hardware Pressure Vessel and Pressurized Structure QA Program Rqmts: .....	109
12.1.18.Flight Hardware Pressure System and Pressurized Structure Ops and Maintenance: .....	111
12.1.19.Flight Hardware Pressure System and Pressurized Structure Documentation Reqmts: .....	113
12.2. Flight Hardware pressure Vessel Design, Analysis, and Test Requirements: .....	113
12.2.1.Flt Hardware Metallic Pressure Vessel Gen Design, Analysis/Verification Reqmts. ....	113
Figure 12.1. Pressure Vessel Design Verification Approach. ....	115
12.2.2.Flight Hardware Metallic Pressure Vessels with Non-Hazardous LBB Failure Mode: .....	116
Table 12.2. Qualification Pressure Test Requirements. ....	117
12.2.3.Flt Hdwr Metallic Press Vessels with Brittle Fracture/Hazardous LBB Failure Mode: .....	118
12.2.4.Flt Hdwr Metallic Press Vessels Designed Using ASME Boiler/ Press Vessel Code. ....	120
12.2.5.Flight Hardware Composite Overwrapped Pressure Vessels. ....	120
12.2.6.COPVs with Non-Hazardous LBB Failure Mode: .....	121
12.2.7.Flight Hardware COPVs with Brittle Fracture or Hazardous LBB Failure Mode. ....	122
12.2.8.COPV Data Requirements. ....	124
12.3. Flight Hardware Metallic Pressurized Structure Analysis and Test Requirements: ..	125
12.3.1.Flight Hardware Metallic Pressurized Structure General Requirements. ....	125
12.3.2.Flt Hdwr Metallic Pressurized Structures with Non-Hazardous LBB Failure Mode: .....	125
12.3.3.Flt Hdwr Metallic Pressurized Structures with Hazardous LBB/Brittle Failure Mode: .....	127
12.4. Flight Hardware Special Pressurized Equipment Design, Analysis, and Test Reqmts. ....	128
12.4.1.Flight Hardware Batteries with LBB Failure Mode. ....	128
12.4.2.Flight Hardware Batteries with Brittle Fracture Failure Mode: .....	130
12.4.3.Flight Hardware Cryostats or Dewars with LBB Failure Mode: .....	130
12.4.4.Flight Hardware Cryostats or Dewars with Brittle Fracture Failure Mode: .....	131
12.4.5.Flight Hardware Heat pipe Requirements: .....	133
12.4.6.Flight Hardware Sealed Containers: .....	134
12.5. Flight Hardware Pressure System Component Design and Test Requirements. ....	134
12.5.1.Flight Hardware Pneumatic and Hydraulic Pressure System Components: .....	135
Table 12.3. Pressure Components Safety Factors. ....	135
Table 12.4. Limit Torque Requirements. ....	141
12.5.2.Flt Hdwr Haz Fluid Syst Components, Incl Hypergolic, Cryogenic, and Hydr Syst. ....	144

12.6. Flight Hardware Pneumatic System Design Requirements. ....	146
12.6.1.Flight Hardware Pneumatic System Piping: .....	146
12.6.2.Flight Hardware Pneumatic System Tubing. ....	146
12.6.3.Flight Hardware Pneumatic System Regulators: .....	146
12.6.4.Flight Hardware Pneumatic System Valves: .....	146
12.6.5.Flight Hardware Pneumatic System Pressure Indicating Devices: .....	147
12.6.6.Flight Hardware Pneumatic System Flexible Hoses. ....	147
12.6.7.Flight Hardware Pneumatic System Pressure Relief Devices: .....	147
12.6.8.Flight Hardware Pneumatic System Vents: .....	148
12.7. Flight Hardware Hydraulic System Design and Test Requirements. ....	148
12.7.1.Flight Hardware Hydraulic System General Design Requirements: .....	148
12.7.2.Flight Hardware Hydraulic System Accumulators and Reservoirs. ....	149
12.7.3.Flight Hardware Hydraulic System Pressure Indicating Devices: .....	149
12.7.4.Flight Hardware Hydraulic System Pressure Relief Devices: .....	149
12.7.5.Flight Hardware Hydraulic System Vent and Drain Systems. ....	149
12.7.6.Testing Flight Hardware Hydraulic System Components Before Assembly. ....	150
12.7.7.Testing Flight Hardware Hydraulic Systems After Assembly: .....	150
12.8. Flight Hardware Hypergolic Propellant System Design and Test Requirements: ....	150
12.8.1.Flight Hardware Hypergolic Propellant System General Design Requirements: ....	150
12.8.2.Flight Hardware Hypergolic Propellant System Piping and Tubing: .....	150
12.8.3.Flight Hardware Hypergolic Propellant System Valves: .....	151
12.8.4.Flight Hardware Hypergolic Propellant System Pressure Indicating Devices: .....	151
12.8.5.Flight Hardware Hypergolic Propellant System Flexible Hoses. ....	151
12.8.6.Flight Hardware Hypergolic Propellant System Pressure Relief Devices: .....	152
12.8.7.Flight Hardware Hypergolic Propellant Vent Systems: .....	153
12.8.8.Testing Flt Hardware Hypergolic Propellant System Components Before Assembly: 153	
12.8.9.Testing Flight Hardware Hypergolic Propellant Systems After Assembly. ....	154
12.8.10.Testing Modified and Repaired Flight Hardware Hypergolic Propellant Systems. 154	
12.9. Flight Hardware Cryogenic Systems Design and Test Requirements: .....	154
12.9.1.Flight Hardware Cryogenic System General Design Requirements: .....	154
12.9.2.Flight Hardware Cryogenic System Vessels and Tanks: .....	155
12.9.3.Flight Hardware Cryogenic System Piping and Tubing: .....	155

12.9.4.Flight Hardware Cryogenic System Valves: .....	155
12.9.5.Flight Hardware Cryogenic System Pressure Indicating Devices: .....	156
12.9.6.Flight Hardware Cryogenic System Flexible Hoses. ....	156
12.9.7.Flight Hardware Cryogenic System Pressure Relief Devices: .....	156
12.9.8.Flight Hardware Cryogenic System Vents: .....	157
12.9.9.Testing Flight Hardware Cryogenic System Components Before Assembly: .....	158
12.9.10.Testing Flight Hardware Cryogenic Systems After Assembly: .....	158
12.9.11.Testing Modified and Repaired Flight Hardware Cryogenic Systems: .....	158
12.10.Flight Hardware Pressure Systems Data Requirements: .....	159
12.10.1.General. ....	159
12.10.2.Flight Hardware Pressure Systems General Data Requirements. ....	159
12.10.3.Flight Hardware Pressure System Design Data Requirements. ....	159
12.10.4.Flight Hardware Pressure System Component Design Data: .....	159
12.10.5.Flight Hardware Pressure System Test Procedures and Reports: .....	159
12.10.6.Flight Hardware Pressure System Certification Files: .....	160
<b>Chapter 13— ORDNANCE SYSTEMS</b>	<b>161</b>
13.1. Ordnance Hazard Classification: .....	161
13.1.1.Ordnance General Classification: .....	161
13.1.2.Range Safety Ordnance Device and System Categorization: .....	161
13.2. Ordnance System General Requirements. ....	162
13.2.1.Ordnance Subsystem Identification. ....	162
13.2.2.Preclusion of Inadvertent Firing. ....	162
13.2.3.Failure Mode Effects and Criticality Analysis. ....	162
13.3. Ordnance Electrical and Optical Circuits: .....	162
13.3.1.Ordnance Electrical and Optical Circuit General Design Requirements: .....	162
13.3.2.Ordnance Electrical and Optical Circuit Shielding: .....	163
13.3.3.Ordnance Electrical and Optical Circuits Wiring: .....	164
13.3.4.Ordnance Electrical and Optical Connectors: .....	164
13.3.5.Ordnance Electrical and Optical Circuit Switches and Relays: .....	165
13.3.6.Ordnance Electrical and Optical Monitoring, Checkout, and Control Circuits: .....	165
13.4. Initiator Electrical and Optical Circuits: .....	166
13.4.1.Electrical and Optical Low Voltage Electromechanical Circuits Design Reqmnts: .	166

13.4.2.High Voltage Exploding Bridgewire Circuits: .....	167
13.4.3.Laser Initiated Ordnance Circuits: .....	167
13.5. Ordnance Safety Devices: .....	168
13.5.1.Ordnance Safety Device General Design Requirements. ....	168
13.5.2.Ordnance Arming and Safing Plugs: .....	169
13.5.3.Low Voltage EED Electromechanical S&As: .....	170
13.5.4.Mechanical S&As: .....	172
13.5.5.EBW Firing Units: .....	172
13.5.6.Laser Firing Units, Optical Barriers, Optical S&As, and Ordnance S&As: .....	172
13.6. Ordnance Initiating Devices: .....	178
13.6.1.Ordnance Initiating Device General Design Requirements: .....	178
13.6.2.Low Voltage EEDs: .....	178
13.6.3.High Voltage Exploding Bridgewires: .....	179
Table 13.1. RF Sensitivity. ....	180
13.6.4.Laser Initiated Devices: .....	180
13.6.5.Percussion Activated Devices: .....	182
13.6.6.Non-Explosive Initiators. ....	182
13.7. Explosive Transfer Systems and Receptor Ordnance. ....	182
13.8. Ordnance Test Equipment: .....	183
13.8.1.Ordnance Test Equipment General Design Requirements: .....	183
13.8.2.Stray Current Monitors: .....	184
13.8.3.Ground Support Test Equipment. ....	184
13.8.4.Laser Test Equipment: .....	184
13.9. Ordnance Data Requirements. ....	185
<b>Chapter 14— ELECTRICAL AND ELECTRONIC EQUIPMENT</b>	<b>186</b>
14.1. Elect and Electronic Grnd Support Eqmnt/Flt Hdwr Gen Design Reqmnts and Stnds:	186
14.2. EGSE Design Requirements: .....	189
14.2.1.EGSE Design Standards. ....	189
14.2.2.EGSE Switches and Controls: .....	189
14.2.3.EGSE Circuit Protection: .....	189
14.2.4.EGSE Cables. ....	190
14.2.5.EGSE Batteries: .....	190



14.2.6. EGSE Battery Charging Equipment: .....	190
14.2.7. Fixed and Portable EGSE in Hazardous Locations: .....	190
14.3. Electrical and Electronic Flight Hardware: .....	193
14.3.1. Electrical and Electronic Flight Hardware Design Standards. ....	193
14.3.2. Flight Hardware Electromechanical Initiating Devices and Systems: .....	193
14.3.3. Flight Hardware Batteries: .....	193
14.3.4. Test Requirements for Lithium Batteries. ....	194
14.3.5. Electrical and Electronic Equipment Data Requirements. ....	195
<b>Chapter 15— MOTOR VEHICLES</b>	<b>196</b>
15.1. General: .....	196
15.2. Motor Vehicles Other Than Lift Trucks: .....	196
15.2.1. General Design Standards: .....	196
15.2.2. Special-Purpose Trailers Used to Transport Critical or Haz Loads Design Reqments: .....	196
15.2.3. Special-Purpose Trailers Used to Transport Critical or Hazardous Loads Tests: ....	197
15.2.4. Motor Vehicles Used to Transport Critical or Hazardous Loads Data Requirements. ....	197
15.3. Lift Trucks: .....	197
15.3.1. Lift Truck Standards: .....	197
15.3.2. Lift Truck General Design Requirements: .....	197
15.3.3. Lift Truck Tests. ....	197
15.3.4. Lift Truck Data Requirements. ....	198
<b>Chapter 16— COMPUTER SYSTEMS AND SOFTWARE</b>	<b>199</b>
16.1. General: .....	199
16.2. Determination of Safety Critical Computer System Functions. ....	199
16.3. Hardware and Software Safety Design Requirements. ....	200
16.3.1. Computer Systems: .....	200
16.3.2. Computer System Power: .....	201
16.3.3. Computer System Anomaly and Failure Detection: .....	201
16.3.4. Computer System Anomaly and Failure Response: .....	202
16.3.5. Computer System Testing and Maintenance: .....	203
16.4. Software Requirements: .....	203
16.4.1. Software Design, Development, and Test Requirements. ....	203
16.4.2. Software Coding Practices. ....	203

16.4.3.Human-Computer Interface: .....	204
16.4.4.Software Data Standards: .....	204
16.4.5.Configuration Control: .....	205
16.5. Computer System and Software Data Requirements. ....	205
<b>Chapter 17— WR SEISMIC DESIGN</b>	<b>206</b>
17.1. Applicability of Design and/or Anchorage or Restraint Requirements: .....	206
17.2. Basis for Design: .....	206
17.3. WR Seismic Data Requirements. ....	207
<b>Chapter 18— SOLID ROCKET MOTORS AND ROCKET MOTOR SEGMENTS</b>	<b>208</b>
18.1. General.....	208
18.2. FMECA and OHA. FMECA and operational hazard analysis (OHA) .....	208
18.3. Lightning Effects Hazard Analysis. ....	208
18.4. Solid Rocket Motor and Motor Segment Data Requirements. ....	208
<b>Attachment 1— MISSILE SYSTEM PRELAUNCH SAFETY PACKAGE</b>	<b>209</b>
<b>Attachment 2— HANDLING STRUCTURES INITIAL AND PERIODIC TEST REQUIREMENT FLOWPATH</b>	<b>234</b>
Figure A2.1. Flowpath. ....	234
<b>Attachment 3— HAZARDOUS AREA CLASSIFICATION</b>	<b>237</b>
Figure A3.1. Flowpath. ....	237

**TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 4**

<b>Chapter 1— INTRO, RESPONSIBILITIES/ FLT SFTY SYS CATS, PROCEDURES/PLANS</b>	<b>20</b>
1.1. Introduction: .....	20
1.2. Organization of the Volume, Tailoring, Waivers, and Equivalent Level of Safety Certs:	20
1.2.1. Main Chapters. ....	20
1.2.2. Open Text. ....	20
1.2.3. Bordered Paragraphs: .....	20
1.2.4. Tailoring. ....	21
1.2.5. Waivers and Equivalent Level of Safety Certifications: .....	21
1.3. Responsibilities And Authorities: .....	22
1.3.1. Space Wing Commanders: .....	22
1.3.2. Range Users. ....	22
1.3.3. Range Safety Office Responsibilities. ....	22
1.4. Flight Safety System: .....	23
1.4.1. Typical FSS. ....	23
Figure 1.1. Typical FSS with FTS for Missiles, Sounding Rockets, and ELVs. ....	23
Figure 1.2. Typical FSS with FTS for RPVs, Sub- and Full-Scale Aerial Targets, and RLVs. ..	24
1.4.2. Tracking and Telemetry. ....	24
1.4.3. FSS Operational Constraints. ....	24
1.5. FTS Procedures and Plans: .....	25
1.5.2. FTS Installation and Checkout Procedures. ....	26
1.5.3. FTS Prelaunch Test Results. ....	27
1.5.4. Countdown Plan. ....	27
1.5.5. Launch Abort or Delay Recovery and Recycle Plan. ....	28
1.5.6. Communications Plan. ....	28
1.6. Categories of Flight Vehicles and Assignment of Categories: .....	28
1.6.1. Categories of Flight Vehicles. ....	28
1.6.2. Assignment of Category. ....	29
<b>Chapter 2— RESERVED</b>	<b>30</b>
<b>Chapter 3— COMMON FTS SYSTEM AND COMPONENT PERFORMANCE REQ</b>	<b>31</b>
3.1. FTS Functional Requirements. ....	31

3.2. FTS Design: .....	32
3.2.1. Reliability Prediction. ....	32
3.2.2. Single Fault Tolerance. ....	32
3.2.3. Redundancy. ....	33
3.2.4. System Independence. ....	35
3.2.5. Performance Specifications for Components and Parts. ....	36
3.2.6. Ability To Test. ....	36
3.2.7. Software Safety Critical Functions. ....	37
3.2.8. Component Storage, Operating, and Service Life. ....	37
3.2.9. Consistency of Components. ....	37
3.3. Environmental Design: .....	38
3.3.1. General. ....	38
3.3.2. Maximum Predicted Environments: .....	38
3.3.3. Thermal Environment. ....	40
3.3.4. Random Vibration. ....	42
3.3.5. Sinusoidal Vibration. ....	43
3.3.6. Transportation Vibration. ....	43
3.3.7. Operational Shock: .....	43
3.3.8. Transportation Shock. ....	44
3.3.9. Bench Handling Shock. ....	44
3.3.10. Acceleration Environment. ....	44
3.3.11. Acoustic Environment. ....	44
3.3.12. Other Environments. ....	44
3.4. Command Terminate System: .....	44
3.5. Automatic, Fail-Safe, or Inadvertent Separation FTS: .....	45
3.5.1. Automatic or Inadvertent Separation FTS: .....	45
3.5.2. Fail-Safe System: .....	46
3.6. FTS Safing and Arming: .....	46
3.6.1. General. ....	46
3.6.2. FTS Arming. ....	47
3.6.3. Preflight Safing. ....	47
3.6.4. In-Flight Safing. ....	47

3.7. Reserved:	48
3.8. FTS Monitoring:	48
3.9. FTS Electrical Components and Electronic Circuitry:	49
3.9.1. General.	49
3.9.2. Electronic Piece-Parts.	49
3.9.3. Over, Under, And Transient Input Voltage Protection.	49
3.9.4. Series-Redundant Circuit.	50
3.9.5. Power Circuit.	50
3.9.6. Circuit Isolation, Shielding, And Grounding.	50
3.9.7. Circuit Protection.	51
3.9.8. Repetitive Functioning.	52
3.9.9. Watchdog Circuits.	53
3.9.10. Self-Test.	53
3.9.11. Electromagnetic Interference Protection.	53
3.9.12. Ordnance Initiator Circuits.	53
3.9.13. Response Time.	54
3.9.14. Memory Data Retention.	54
3.9.15. Adjustment.	54
3.9.16. Component Protection.	54
3.10. FTS Monitor, Checkout, and Control Circuits:	54
3.11. FTS Ordnance Train:	55
3.12. RF Receiving System:	56
3.12.1. General.	56
3.12.2. Sensitivity.	56
3.12.3. Antennas.	57
3.12.4. RF Coupler.	57
3.13. Reserved:	58
3.14. Flight Termination Receiver:	58
3.14.1. General.	58
3.14.2. Tone-Based RF Processing.	58
3.14.3. Inadvertent Command Output.	61
3.15. Wiring and Connectors:	62

3.16. Batteries: .....	65
3.16.1.Capacity. ....	65
3.16.2.Electrical Characteristics. ....	66
3.16.3.Service and Storage Life. ....	67
3.16.4.Monitoring Capability. ....	68
3.16.5.Battery Identification. ....	68
3.16.6.Battery Temperature Control. ....	68
3.16.7.Battery Cases and Cells. ....	68
3.16.8.Silver-Zinc Batteries. ....	69
3.16.9.Rechargeable Cells and Batteries: ....	69
3.16.10.Reserved: .....	70
3.16.11.Remotely Activated Battery Requirements. ....	70
3.16.12.Generator-Powered Missiles. ....	70
3.17. Electromechanical S&A Devices With a Low Voltage Initiator: .....	71
3.18. High Energy Electronic Initiator Firing Unit: .....	75
3.18.1.General. ....	75
3.18.2.Charging and Discharging. ....	75
3.18.3.Input Command Processing. ....	76
3.18.4.High Voltage Output. ....	76
3.18.5.Output Monitors. ....	77
3.19. Ordnance Interrupter: .....	78
3.20. Ordnance Initiators: .....	82
3.20.1.General: .....	82
3.20.2.Low Voltage EEDs: .....	84
3.20.3.Exploding Bridgewire: .....	84
3.20.4.Exploding Foil Initiators. ....	85
3.20.5.Laser Initiated Detonator: .....	86
3.21. Low Voltage Laser Diode Firing Unit: .....	87
3.21.1.General. ....	87
3.21.2.Input Command Processing. ....	87
3.21.3.Output Firing Circuit. ....	87
3.21.4.Optical Degradation. ....	88

3.21.5.Inhibit/Safing Circuitry. ....	88
3.21.6.Output Monitors. ....	88
3.21.7.Built-In-Test. ....	89
3.22. Laser Initiated Ordnance Fiber Optic Cable Assembly: ....	89
3.22.1.General. ....	89
3.22.2.Continuity. ....	89
3.22.3.Testing. ....	89
3.22.4.Repetitive Functioning. ....	89
3.22.5.Power Transmission. ....	90
3.22.6.Shielding. ....	90
3.22.7.Handling. ....	90
3.22.8.Connector Verification. ....	90
3.22.9.Connector Locking. ....	90
3.22.10.Connector Mate/Demate. ....	90
3.22.11.Contamination Sensitivity. ....	90
3.22.12.Optical Transmission. ....	90
3.22.13.BIT Performance. ....	90
3.23. Percussion-Activated Devices: ....	90
3.24. Cartridge-Activated Devices: ....	92
3.25. Explosive Transfer System: ....	93
3.26. Destruct Charge: ....	94
3.27. Parachute Systems: ....	96
3.27.1.Ordnance Devices. ....	96
3.27.2.Parachutes. ....	96
3.27.3.Normal and Emergency Deployment Modes. ....	96
3.27.4.Surface Impact Release Switch. ....	96
3.28. Fuel Cutoff Systems. ....	96
3.28.1.General Requirements: ....	96
3.28.2.Specific Requirements: ....	96
3.29. Vibration and Shock Isolators: ....	97
3.30. Miscellaneous Components: ....	97

<b>Chapter 4— FTS COMPONENT TEST REQUIREMENTS</b>	<b>98</b>
4.1. Scope And Compliance. ....	98
4.2. Component Tests And Analyses. ....	98
4.3. Test Plans. ....	98
4.4. Test Failures. ....	98
4.5. Failure Analysis. ....	99
4.6. Test Tolerances. ....	99
Table 4.1. Test Tolerances. ....	99
4.7. Test Equipment. ....	100
4.8. Rework and Repair of Components. ....	100
4.9. Test and Analysis Reports. ....	101
4.10. Component Test and Analysis Tables: ....	101
4.10.1.General. ....	101
4.10.2.Test Sequence. ....	102
4.10.3.Quantity of Sample Components Tested: ....	102
4.10.4.Performance Verification Tests. ....	103
4.10.5.Abbreviated Performance Verification Tests. ....	103
4.10.6.Status-of-Health Tests. ....	103
4.11. Component Examination: ....	104
4.11.1.General. ....	104
4.11.2.Visual Examination. ....	104
4.11.3.Dimension Measurement. ....	104
4.11.4.Weight Measurement. ....	104
4.11.5.Identification Check. ....	104
4.11.6.X-Ray and N-Ray Examination. ....	104
4.11.7.Internal Inspection. ....	105
4.11.8.Leakage. ....	105
4.12. General Qualification Testing and Analysis Requirements. ....	105
4.13. Qualification Non-Operating Environments. ....	107
4.13.1.General. ....	107
4.13.2.Storage Temperature. ....	107
4.13.3.High Temperature Storage of Ordnance. ....	108



4.13.4. Transportation Shock. ....	108
4.13.5. Bench Handling Shock. ....	108
4.13.6. Transportation Vibration. ....	109
4.13.7. Fungus Resistance. ....	109
4.13.8. Salt Fog. ....	109
4.13.9. Fine Sand. ....	110
4.13.10. Tensile Load. ....	111
4.13.11. Handling Drop of Ordnance. ....	111
4.13.12. Abnormal Drop of Ordnance. ....	112
4.14. Reserved: ....	112
4.15. Reserved: ....	112
4.16. Qualification Operating Environments. ....	112
4.16.1. General. ....	112
4.16.2. Qualification Sinusoidal Vibration: ....	112
4.16.3. Qualification Random Vibration: ....	113
Figure 4.1. Hard-Mount Qualification of Components On Vibration Isolators Procedure. ....	115
Table 4.2. Minimum Power Spectral Density for Qualification Random Vibration Testing. ....	116
4.16.4. Qualification Acoustic: ....	117
4.16.5. Qualification Shock: ....	117
Table 4.3. Minimum Breakup Qualification Shock Levels. ....	118
4.16.6. Qualification Acceleration: ....	118
4.16.7. Qualification Humidity. ....	119
4.16.8. Qualification Thermal Cycle. ....	120
4.16.9. Qualification Thermal Vacuum. ....	122
4.16.10. Electromagnetic Interference And Electromagnetic Compatibility. ....	124
4.16.11. Reserved: ....	124
4.16.12. Temperature, Humidity, and Altitude. ....	124
4.16.13. Explosive Atmosphere. ....	125
4.17. Acceptance Testing And Analysis. ....	125
4.17.1. General. ....	125
4.17.2. Acceptance Random Vibration. ....	126
Table 4.4. Minimum Power Spectral Density for Acceptance Random Vibration. ....	126

4.17.3.Acceptance Acoustic Vibration. ....	127
4.17.4.Acceptance Thermal Cycle. ....	128
4.17.5.Acceptance Thermal Vacuum. ....	130
4.17.6.Tensile Loads. ....	130
4.18. Reserved: ....	131
4.19. RF Receiving System. ....	131
Table 4.5. RF Receiving System Acceptance Tests (4.19.1). ....	131
Table 4.6. RF Receiving System Qualification Tests (4.19.2). ....	132
4.19.1.General: ....	133
4.19.2.Status-of-Health. ....	134
4.19.3.Link Performance. ....	134
4.19.4.Isolation. ....	134
4.19.5.Abbreviated Status-of-Health. ....	134
4.19.6.Antenna Pattern. ....	134
4.19.7.Abbreviated Antenna Pattern. ....	135
4.20. Flight Termination Receiver. ....	135
Table 4.7. FTR Acceptance Tests (4.20.1). ....	135
Table 4.8. FTR Qualification Tests (4.20.2). ....	137
4.20.1.Reserved: ....	138
4.20.2.Status-of-Health. ....	138
4.20.3.Functional Performance. ....	138
Figure 4.2. Typical Secure Command Message Format. ....	140
4.20.4.Circuit Protection. ....	142
4.20.5.RF Processing. ....	144
4.20.6.Inadvertent Command Output. ....	147
4.20.7.Input Current Monitor. ....	150
4.20.8.Output Functions. ....	150
4.20.9.RF Level Monitor. ....	150
4.20.10.Thermal Performance. ....	150
4.21. Silver-Zinc Batteries. ....	151
Table 4.9. Manually Activated Silver-Zinc Battery Acceptance Tests (4.21.1). ....	151
Table 4.10. Manually Activated Silver-Zinc Battery Qualification Tests (4.21.2). ....	152

Table 4.11. Silver-Zinc Battery Storage Life Test (4.21.3). .....	155
4.21.1.General. ....	156
4.21.2.Cell Capacity: .....	156
4.21.3.Silver-Zinc Battery Status-of-Health Tests: .....	157
4.21.4.Proof Pressure: .....	157
4.21.5.Electrolyte. ....	158
4.21.6.Battery Mounting And Case Integrity. ....	158
4.21.7.Pre-Activation. ....	158
4.21.8.Monitoring Capability. ....	158
4.21.9.Heater Circuit Verification. ....	158
4.21.10.Activation: .....	158
4.21.11.Electrical Performance. ....	158
4.21.12.Activated Stand Time. ....	159
4.21.13.Overcharge. ....	160
4.21.14.Charge-Discharge Cycles. ....	160
4.21.15.Thermal Cycle. ....	160
4.21.16.Discharge And Pulse Capacity. ....	161
4.21.17.Internal Inspection. ....	162
4.21.18.Coupon Cell Acceptance. ....	163
4.22. Commercial Nickel-Cadmium Batteries. ....	163
Table 4.12. Nickel-Cadmium Cell Lot Acceptance Tests (4.22.1). ....	163
Table 4.13. Nickel-Cadmium Battery Acceptance Tests (4.22.2). ....	165
Table 4.14. Nickel-Cadmium Battery Lot Acceptance and Qualification Tests (4.22.3). ....	166
4.22.1.General: .....	168
4.22.2.Venting Devices. ....	169
4.22.3.Cell Inspection and Preparation. ....	169
4.22.4.Cell Conditioning. ....	169
4.22.5.Cell Characterization. ....	169
4.22.6.Charge Retention. ....	170
4.22.7.Capacity and Overcharge At 0°C. ....	170
4.22.8.Post-Acceptance Discharge and Storage. ....	170
4.22.9.Cycle Life and Pulse Margin. ....	171

4.22.10. Status-of-Health. ....	171
4.22.11. Battery Case Integrity. ....	171
4.22.12. Monitoring Capability. ....	171
4.22.13. Heater Circuit Verification. ....	171
4.22.14. Electrical Performance. ....	171
4.22.15. Acceptance Thermal Cycle. ....	173
4.22.16. Qualification Thermal Cycle. ....	174
4.22.17. Operational Stand Time. ....	175
4.22.18. Internal Inspection. ....	175
4.22.19. Cell Leakage. ....	175
4.23. Remotely Activated Silver-Zinc Batteries. ....	176
Table 4.15. Remotely Activated Silver-Zinc Battery Lot Acceptance Tests (4.23.1). ....	176
Table 4.16. Remotely Activated Silver-Zinc Battery Qualification Tests (4.23.2). ....	178
Table 4.17. Remotely Activated Silver-Zinc Battery Age Surveillance Tests (4.23.3) ....	181
4.23.1. General: ....	182
4.23.2. Battery Case Integrity. ....	183
4.23.3. Venting Devices. ....	184
4.23.4. Status-of-Health Tests: ....	184
4.23.5. Heater Circuit Resistance. ....	184
4.23.6. Activation Circuit (EED) Resistance. ....	185
4.23.7. EED No-Fire. ....	185
4.23.8. Monitoring Capability. ....	185
4.23.9. Electrical Performance. ....	185
4.23.10. Discharge and Pulse Capacity. ....	186
4.23.11. Battery Mounting. ....	187
4.24. Thermal Batteries. ....	187
Table 4.18. Thermal Battery Lot Acceptance Tests (4.24.1). ....	187
Table 4.19. Thermal Battery Qualification Tests (4.24.2). ....	187
Table 4.20. Thermal Battery Age Surveillance Test Requirements (4.24.3). ....	189
4.24.1. General: ....	193
4.24.2. Battery Case Integrity. ....	194
4.24.3. Venting Devices. ....	194

4.24.4.Status-of-Health Tests: .....	195
4.24.5.Reserved: .....	196
4.24.6.Activation Circuit (EED) Resistance. ....	196
4.24.7.EED No-Fire. ....	196
4.24.8.Monitoring Capability. ....	196
4.24.9.Electrical Performance. ....	196
4.24.10.Discharge and Pulse Capacity. ....	197
4.24.11.Battery Mounting. ....	198
4.24.12.Storage Life. ....	198
4.25. Miscellaneous Components. ....	198
Table 4.21. Miscellaneous Component Acceptance Tests (4.25.1). ....	199
Table 4.22. Miscellaneous Component Qualification Tests (4.25.2). ....	199
4.26. S&A Devices, EEDs, Rotor Leads, and Booster Charges. ....	201
Table 4.23. S&A Device Acceptance Tests (4.26.1). ....	201
Table 4.24. S&A Device Qualification Tests (4.26.2). ....	202
Table 4.25. EED Lot Acceptance Tests (4.26.3). ....	204
Table 4.26. EED Qualification Tests (4.26.4).(1) ....	205
Table 4.27. EED SLE Tests (4.26.5).(5) ....	208
Table 4.28. S&A Rotor Lead and Booster Charge Lot Acceptance Tests (4.26.6) ....	209
Table 4.29. S&A Rotor Lead and Booster Charge Qualification Tests (4.26.7) ....	210
Table 4.30. S&A Rotor Lead and Booster Charge SLE Tests (4.26.8). ....	211
4.26.1.General. ....	212
4.26.2.S&A Device Status-of-Health. ....	213
4.26.3.S&A Transition. ....	213
4.26.4.Stall. ....	213
4.26.5.Safety Tests. ....	213
4.26.6.Thermal Performance. ....	214
4.26.7.Dynamic Performance. ....	215
4.26.8.EED Status-of-Health. ....	215
4.26.9.Static Discharge. ....	215
Figure 4.3. Static Discharge Test. ....	216

4.26.10.Firing Tests: .....	216
4.26.11.RF Impedance. ....	218
4.26.12.RF Sensitivity. ....	218
4.26.13.No-Fire Energy Level. ....	220
4.26.14.All-Fire Energy Level. ....	220
4.26.15.Barrier Alignment. ....	221
4.26.16.No-Fire Verification. ....	221
4.26.17.Auto-Ignition. ....	221
4.27. High Energy Firing Units. ....	221
Table 4.31. High Energy Firing Unit Acceptance Tests (4.27.1). ....	222
Table 4.32. High Energy Firing Unit Qualification Tests (4.27.2). ....	223
Table 4.33. EBW and EFI Lot Acceptance Tests (4.27.3). ....	224
Table 4.34. EBW and EFI Qualification Tests (4.27.4). ....	226
Table 4.35. EBW and EFI SLE Tests (4.27.5). ....	228
4.27.1.General. ....	230
4.27.2.Firing Unit Status-of-Health. ....	230
4.27.3.Input Command Processing. ....	230
4.27.4.High Voltage Circuitry. ....	231
4.27.5.Output Monitoring: .....	232
4.27.6.Abbreviated Status-of-Health. ....	232
4.27.7.Abbreviated Command Processing. ....	232
4.27.8.Circuit Protection. ....	232
4.27.9.Repetitive Functioning. ....	233
4.27.10.Static Discharge. ....	233
4.27.11.High Energy Initiator Status-of-Health. ....	233
4.27.12.Safety Devices. ....	234
4.27.13.Firing Tests: .....	234
4.27.14.RF Impedance. ....	235
4.27.15.RF Sensitivity. ....	235
4.27.16.No-Fire Energy Level. ....	235
4.27.17.All-Fire Energy Level. ....	236
4.27.18.Auto-Ignition. ....	236

4.27.19.Bridgewire Degradation Test. ....	236
4.28. LFUs, Fiber Optic Cable Energy Transfer Systems, and LIDS. ....	237
Table 4.36. LFU Acceptance Tests (4.28.1). ....	237
Table 4.37. LFU Qualification Tests (4.28.2). ....	238
Table 4.38. LID Lot Acceptance Tests (4.28.3). ....	240
Table 4.39. LID Qualification Tests (4.28.4). ....	242
Table 4.40. LID Age Surveillance Tests (4.28.5). ....	244
Table 4.41. FOCA Acceptance Tests (4.28.6). ....	245
Table 4.42. FOCA Qualification Tests (4.28.7). ....	246
4.28.1.General. ....	248
4.28.2.Input Power and Command Processing. ....	248
4.28.3.Output Firing Circuit. ....	249
4.28.4.Inhibit/Safing Circuitry. ....	249
4.28.5.Output Monitors. ....	247
4.28.6.BIT. ....	250
4.28.7.LFU Status-of-Health. ....	250
4.28.8.LFU Abbreviated Status-of-Health. ....	251
4.28.9.LFU Abbreviated Command Processing. ....	251
4.28.10.LFU Environmental Output Monitoring. ....	251
4.28.11.LFU Repetitive Function. ....	251
4.28.12.Static Discharge. ....	251
4.28.13.LID Status-of-Health. ....	251
4.28.14.Firing Tests. ....	251
4.28.15.Continuity. ....	252
4.28.16.Optical Transmission. ....	252
4.28.17.No-Fire Level. ....	252
4.28.18.All-Fire Level. ....	252
4.28.19.Repetitive Function. ....	252
4.28.20.Auto-Ignition. ....	252
4.28.21.Connector Verification. ....	253
4.28.22.Connector Mate/Demate. ....	253
4.28.23.Contamination Sensitivity. ....	253

4.28.24.Circuit Protection. ....	253
4.28.25.No-Fire Verification. ....	254
4.29. Ordnance Interrupters. ....	254
Table 4.43. Ordnance Interrupter Acceptance Tests (4.29.1). ....	254
Table 4.44. Ordnance Interrupter Qualification Tests (4.29.2). ....	255
Table 4.45. Interrupter Rotor Lead & Booster Charge Acceptance Tests (4.29.3). ....	256
Table 4.46. Interrupter Rotor Lead and Booster Charge Qualification Tests (4.29.4). ....	257
Table 4.47. Ordnance Interrupter Rotor Lead & Booster Charge SLE Tests (4.29.5). ....	259
4.29.1.General. ....	260
4.29.2.Status-of-Health. ....	260
4.29.3.S&A Position Monitor. ....	260
4.29.4.Safety Tests: ....	260
4.29.5.Interrupter Abbreviated Performance. ....	261
4.29.6.Firing Tests: ....	261
4.29.7.Barrier Alignment. ....	262
4.29.8.Repetitive Function. ....	262
4.29.9.Stall. ....	262
4.30. PADs. ....	262
Table 4.48. PAD Lot Acceptance Tests (4.30.1). ....	262
Table 4.49. PAD Qualification Tests (4.30.2). ....	263
Table 4.50. PAD Primer Charge Lot Acceptance Tests (4.30.3). ....	265
Table 4.51. PAD Primer Charge Qualification Tests (4.30.4). ....	266
Table 4.52. PAD SLE Tests (4.30.5). ....	267
4.30.1.General. ....	268
4.30.2.Safety Tests: ....	269
4.30.3.Status-of-Health. ....	269
4.30.4.PAD Firing Tests: ....	269
4.30.5.All-Fire Energy Level. ....	270
4.30.6.Primer Charge Firing Tests: ....	270
4.30.7.Auto-Ignition. ....	270
4.31. ETSS, Ordnance Manifolds, and Destruct Charges. ....	271



Table 4.53. ETS, Ordnance Manifold and Destruct Charge Lot Acceptance Tests (4.31.1). .....	271
Table 4.54. Destruct Charge Qualification Tests (4.31.2). .....	272
Table 4.55. ETS and Ordnance Manifold Qualification Tests (4.31.3). .....	274
Table 4.56. ETS, Explosive Manifold, and Destruct Charge SLE Tests (4.31.4). .....	275
4.31.1.General. ....	276
4.31.2.Firing Tests: .....	276
4.31.3.Penetration Margin. ....	277
4.31.4.Propellant Detonation. ....	277
4.32. Shock and Vibration Isolators. ....	277
Table 4.57. Shock and Vibration Isolator Acceptance Tests (4.32.1). ....	277
Table 4.58. Shock and Vibration Isolator Qualification Tests (4.32.2). ....	278
4.32.1.General. ....	278
4.32.2.Load Deflection. ....	278
4.32.3.Status-of-Health. ....	278
4.32.4.Characterization Tests. ....	277
4.33. Electrical Connectors and Harnesses. ....	279
Table 4.59. Electrical Connector and Harness Tests (4.33.1). ....	279
4.33.1.General. ....	280
4.33.2.Status-of-Heath. ....	280
4.34. Ordnance Interfaces and Manifold Qualification: .....	280
4.34.1.General. ....	280
4.34.2.Interfaces. ....	281
4.34.3.Detonation Flier Plate Ordnance Transfer Systems. ....	281
4.34.4.Deflagration and Pressure Sensitive Ordnance Transfer Systems. ....	281
<b>Chapter 5— FTS COMPONENT, SUBSYS, AND SYS PRELAUNCH TEST/ LAUNCH REQ</b>	<b>282</b>
5.1. General. ....	282
5.1.1. Test Plans. ....	282
5.1.2. Test Notification. ....	282
5.1.3. Test Failures. ....	282
5.1.4. Failure Analysis. ....	282
5.1.5. Test Failure Reports: .....	283

5.1.6. Test Tolerances. ....	283
5.2. Preflight Component Tests. ....	283
5.2.1. Silver-Zinc Batteries. ....	283
5.2.2. Nickel-Cadmium Batteries. ....	283
5.2.3. Remotely Activated Silver-Zinc and Thermal Batteries: ....	284
5.2.4. Preflight Testing of an S&A Device With an Internal EED. ....	284
5.2.5. Acceleration Armed S&As: ....	284
5.2.6. Preflight Testing of an External EED. ....	285
5.2.7. Preflight Testing of an EBW. ....	285
5.2.8. FTS EFI Certification Tests: ....	285
5.2.9. FTS LID Certification Tests: ....	286
5.2.10. Preflight Testing for Command Receiver Decoders and Other Elect Components: ....	286
5.2.11. High Energy Electronic Ordnance Firing Units Component Certification: ....	286
5.2.12. FTS Fuel Shutoff/Cutoff Valve Certification Tests: ....	287
5.3. Preflight Subsystem and System Level Tests. ....	288
5.3.1. RF System Preflight Test. ....	288
5.3.2. Non-Secure Command Receiver Decoder System: ....	289
5.3.3. Secure High-Alphabet Command Terminate System: ....	290
5.4. Post-Launch Data Review: ....	292
<b>Chapter 6— FTS GROUND SUPPORT AND MONITORING EQUIPMENT DESIGN REQ</b>	<b>294</b>
6.1. General Design and Maintenance: ....	294
6.1.1. Design: ....	294
6.1.2. GSE Maintenance: ....	294
6.1.3. Test Equipment Calibration: ....	294
6.2. Destruct Initiator Simulator: ....	294
6.3. Laser Test Equipment: ....	295
6.4. Range Safety Console: ....	295
6.5. FTS Components Provided by the Range User: ....	295
<b>Chapter 7— FLIGHT TERMINATION SYSTEM ANALYSIS</b>	<b>297</b>
7.1. General: ....	297
7.2. System Reliability. ....	297
7.3. Single Failure Point. ....	297

7.4. Fratricide. ....	298
7.5. Bent Pin. ....	298
7.6. RF Link: ....	298
7.7. Sneak Circuit. ....	298
7.8. Software And Firmware. ....	298
7.9. Battery Capacity. ....	299
7.10. Component Maximum Predicted Environment Levels: ....	299
7.11. Failure Analysis. ....	299
7.12. Qualification by Similarity Analysis. ....	299
7.13. Storage, Transportation, Handling, Maintenance Effects. ....	300
7.14. Vehicle Power Analysis. ....	300
7.15. FTR RF Radiation Analysis. ....	301
7.16. Maximum Predicted Environments Analysis. ....	301
7.17. FTS Survivability Analysis. ....	301
7.18. Tip-Off Analysis. ....	301
7.19. Automatic Destruct System Timing Analysis. ....	301
7.20. Destruct Simulator Analysis. ....	301
7.21. Prelaunch and In-Flight FTS Analysis. ....	302
7.21.3.Failure Reports: ....	302
7.22. FTS LID Heat Dissipation Analysis. ....	302
<b>Chapter 8— RESERVED</b>	<b>303</b>
<b>Chapter 9— DOCUMENTATION</b>	<b>304</b>
9.1. General. ....	304
9.1.1. FTS Component Test History: ....	304
9.1.2. Failure Reports. ....	304
9.1.3. In-Flight Anomalies. ....	304
9.2. FTS Report. ....	304
9.3. FTSR Submittal Process. ....	305
9.3.1. Initial and Updates. ....	305
9.3.2. Final Submittal. ....	305
9.4. Final Approval. ....	305
9.5. FTSR Format. ....	305

9.5.1. FTSR Main Body: .....	306
9.5.2. Appendixes: .....	309
<b>Attachment 1— INDEPENDENT VERIFICATION AND VALIDATION</b>	<b>310</b>
Table A1.1. Problem Severity Categories. ....	313
Table A1.2. Problem Probability Categories. ....	314
<b>Attachment 2— ELECTRONIC PIECE-PART UPSCREENING REQUIREMENTS</b>	<b>316</b>

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**TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 5**

<b>Chapter 1 INTRODUCTION</b>	<b>5</b>
1.1. Organization of the Volume: .....	5
1.1.1. Main Chapters. ....	5
1.1.2. Open Text. ....	5
1.1.3. Bordered Paragraphs: .....	5
1.2. Range User Responsibilities. ....	5
<b>Chapter 2 FACILITIES AND STRUCT. DESIGN AND CONSTR. SITE POLICIES</b>	<b>7</b>
2.1. Design, Construction, and Modification Policy. ....	7
2.2. Location Planning Requirement. ....	7
2.3. Construction Site Safety Policy. ....	7
2.3.6. United States Army Corps of Engineers Safety and Health Requirements Manual. .	8
<b>Chapter 3 DOCUMENTATION REQUIREMENTS</b>	<b>9</b>
3.1. Conventional and Critical Facility Determination. ....	9
3.2. Documentation Review and Approval Process: .....	9
3.3. Conventional Facilities and Structures Documentation Requirements: .....	9
3.3.1. Determining Criticality. ....	9
3.3.2. Conventional Facility Design Drawings and Specifications. ....	9
3.4. Critical Facilities and Structures Documentation Requirements: .....	9
3.4.1. Critical Facility and Structure Design Criteria Document: .....	9
3.4.2. Critical Facility and Structure Test Plans and Test Reports: .....	10
3.4.3. Facility Safety Data Package. ....	10
<b>Chapter 4 CONVENTIONAL FACILITIES AND STRUCTURES</b>	<b>11</b>
4.1. Conventional Facility and Structure Design Standards: .....	11
4.2. Conventional Facility and Structure Elevators: .....	11
4.3. Conventional Facility and Structure Life Safety Code Requirements. ....	11
4.4. Conventional Facility and Structure Electrical Equipment: .....	11
4.5. Conventional Facility and Structure Personnel Anchorage and Anchorage Connectors:	11
4.6. Seismic Design: .....	12
4.7. Portable/Mobile Structures Design: .....	13
4.8. Structural Steel: .....	13

4.8.1. Structural Steel General Design Requirements: .....	13
4.8.2. Bolts and Fasteners: .....	13
4.8.3. Welding: .....	13
4.8.4. Structural Steel Materials: .....	14
4.9. Design Load Criteria: .....	14
4.10. Antenna Towers. ....	14
4.11. Robot Systems. ....	14
<b>Chapter 5 CRITICAL FACILITIES AND STRUCTURES</b>	<b>15</b>
5.1. Critical Facility and Structure General Design Requirements. ....	15
5.1.1. Critical Facility and Structure Design Standards. ....	15
5.1.2. Critical Facility and Structure Elevators. ....	15
5.1.3. Critical Facility and Structure Electrical Design: .....	15
5.1.4. Critical Facility and Structure Lightning Protection: .....	15
5.1.5. Critical Facility and Structure Electrical Equipment: .....	16
5.1.6. Critical Facility and Structure Fencing: .....	19
5.2. Special Critical Facility Systems and Structures. ....	19
5.2.1. Air Monitoring Systems: .....	19
5.2.2. Mobile Service Towers. ....	21
5.2.3. Hazardous Commodity Lockers. ....	21
5.2.4. Battery Storage and Processing Areas: .....	21
5.2.5. Cable-Operated Overhead Doors: .....	21
5.3. Explosives Storage, Handling, and Processing Facilities. ....	23
5.3.1. Explosives Site Plans: .....	23
5.3.2. Explosive Facilities General Design Requirements: .....	23
5.3.3. Explosives Facilities Area Warning Systems: .....	24
5.3.4. Hypergolic Propellant Main and Ready Storage Facilities: .....	25
5.3.5. Enclosed Hypergolic Propellant Processing Facilities. ....	29
<b>Chapter 6 FACILITY AND STRUCTURE INSPECTION AND SYST. TEST REQ.</b>	<b>36</b>
6.1. Critical Facility and Structure Initial Inspection Requirements. ....	36
6.2. Facility and Structure Emergency and Critical Systems Test Requirements: .....	36
<b>Attachment 1— FACILITY SAFETY DATA PACKAGE</b>	<b>38</b>
A1.1.1.Purpose. ....	38

A1.1.2.Content: .....	38
A1.1.3.Applicability. ....	38
A1.1.4.Submittal Process. ....	38
A1.1.5.Final Approval. ....	38
A1.2.1.Content. ....	38
A1.2.2.Data Requirements: .....	38
A1.2.3.Format. ....	39
A1.3.1.Criteria/requirement. ....	43
A1.3.2.System. ....	43
A1.3.3.Compliance. ....	43
A1.3.4.Noncompliance. ....	43
A1.3.5.Not applicable (with rationale). ....	43
A1.3.6.Resolution. ....	43
A1.3.7.Reference (verifying compliance). ....	43
A1.3.8.Approved Noncompliances. ....	43

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**TABLE OF CONTENTS FOR AFSPCMAN 91-710 VOLUME 6**

<b>Chapter 1— INTRODUCTION</b>	<b>10</b>
1.1. Applicability. ....	10
1.2. Organization of the Volume: ....	10
1.2.1. Main Chapters. ....	10
1.2.2. Open Text. ....	10
1.2.3. Bordered Paragraphs: ....	10
1.3. Compliance Documents. ....	11
<b>Chapter 2— RESPONSIBILITIES AND AUTHORITIES</b>	<b>12</b>
2.1. Range Safety, 45 and 30 Space Wings. ....	12
2.1.1. Review and Approval. ....	12
2.1.2. General: ....	12
2.1.3. Pad Safety. ....	12
2.2. Range User Responsibilities. ....	14
2.2.1. Range User Control Authority Responsibilities. ....	14
2.2.2. Conduct of Operations: ....	15
2.2.3. Notification of Hazardous and Safety Critical Operations to Range Agencies: .....	15
2.2.4. Document Preparation and Maintenance: ....	15
2.2.5. Operational Duties: ....	17
<b>Chapter 3— GROUND OPERATIONS POLICIES</b>	<b>18</b>
3.1. Personnel Safety. ....	18
3.2. Stopping Unsafe Operations: ....	18
<b>Chapter 4— DOCUMENTATION REQUIREMENTS</b>	<b>19</b>
4.1. Ground Operations Plans. ....	19
4.2. Test and Inspection Plans. ....	19
4.2.1. Equipment and System Logs and Test Records: ....	19
4.2.2. Hazardous Facility Inspection Records and Reports. ....	19
4.3. Safety and Emergency Plans: ....	20
4.3.1. Operations Safety Plans and Danger Area Information Plans ....	20
4.3.2. Facility Emergency Operating Plans. ....	22
4.3.3. Emergency Evacuation Plans: ....	22



<b>AFSPCMAN 91-710 V1 1 JULY 2004</b>	<b>41</b>
4.4. Procedures: .....	22
4.5. Range User Training Plan. ....	23
4.6. Mishap Reporting: .....	23
<b>Chapter 5— GROUND OPERATIONS SAFETY REQUIREMENTS</b>	<b>24</b>
5.1. Ground Operations Personnel Requirements: .....	24
5.1.1. Personnel Training, Certification and Experience. ....	24
5.1.2. Ground Operations Safety Orientation and Training: .....	24
5.1.3. Personnel Conduct: .....	24
5.1.4. Work Time Restrictions: .....	24
5.2. Hazardous Ground Operations General Requirements: .....	25
5.2.1. Pathfinder Requirements: .....	25
5.2.2. Control of Access to Hazardous Operations. ....	26
5.2.3. Hot Work Operations: .....	27
5.2.4. Control of Hazardous Energy Sources: .....	28
5.2.5. Confined Space, Tank Entry, and Tank Cleaning: .....	28
5.2.6. Tethering of Equipment: .....	28
5.3. Personal Protective Equipment: .....	28
5.3.1. Range User Responsibilities. ....	28
5.3.2. PPE Compatibility. ....	28
5.3.3. Clothing Requirements in Industrial and Missile Operating Areas: .....	28
5.4. Fall Protection. ....	29
5.5. Smoking Areas: .....	30
5.6. Operating Restrictions Due to Lightning: .....	31
5.6.1. General. ....	31
5.6.2. ER Lightning Hazard Watches and Hazard Warnings: .....	31
5.6.3. WR Lightning/Thunderstorm Watches and Warnings. ....	32
5.7. Operating Restrictions Due to High Winds: .....	33
5.7.1. For Winds of 18-29 Knots as Measured on or Closest to Specific Facilities. ....	33
5.7.2. For Winds of 30 Knots or More as Measured on or Closest to Specific Facilities: ..	33
5.8. Facility Use: .....	33
5.8.1. Facility Use General Requirements: .....	33
5.8.2. Hazardous Facility Use General Requirements: .....	33

5.8.3. Hazardous Facility Inspection: .....	34
<b>Chapter 6—MATERIAL HANDLING EQUIPMENT, CRANE AND HOIST, PERSONNEL PLATFORM, POWERED INDUSTRIAL TRUCK, AND ELEVATOR OPS</b>	<b>36</b>
6.1. Material Handling Equipment Operations. ....	36
6.1.1. MHE Operating Standards: .....	36
6.1.2. MHE Operator Qualification and Training: .....	36
6.1.3. MHE Periodic Test and Inspection Requirements: .....	37
6.1.4. MHE General Operations: .....	37
6.1.5. Sling Operations: .....	37
6.1.6. Hydraset and Load Cell Operations: .....	37
6.1.7. Handling Structure Operations: .....	38
6.2. Crane and Hoist Operations: .....	38
6.2.1. Crane and Hoist Operating Standards. ....	38
6.2.2. Crane Operator Training and Certification: .....	38
6.2.3. Crane and Hoist Inspection and Periodic Test Requirements: .....	39
6.2.4. Crane and Hoist Recurring Data Requirements: .....	40
6.2.5. Crane and Hoist Retest and Reinspection: .....	40
6.2.6. Dual Crane Lift Operating Requirements. ....	40
6.2.7. WR First Use Tag Program: .....	41
6.2.8. Mobile Cranes. ....	41
6.2.9. Lifting Operations: .....	41
6.2.10. Suspended Load Operations: .....	44
6.3. Personnel Work Platform Operations: .....	45
6.3.1. Removable, Extendible, and Hinged Personnel Work Platforms: .....	45
6.3.2. Aerial Work Platforms: .....	46
6.4. Powered Industrial Trucks: .....	47
6.4.1. Powered Industrial Truck Standards. ....	47
6.4.2. Powered Industrial Truck Designations. ....	47
6.4.3. Powered Industrial Truck Operations: .....	47
6.5. Elevator Usage: .....	47
<b>Chapter 7—ACOUSTIC HAZARD OPERATIONS</b>	<b>49</b>
7.1. Acoustic Hazard Operating Standards. ....	49

<b>AFSPCMAN 91-710 V1 1 JULY 2004</b>	<b>43</b>
7.2. Acoustic Hazard Operations Personnel Protection Requirements: .....	49
7.3. Acoustic Operations: .....	49
<b>Chapter 8—NON-IONIZING RADIATION OPERATIONS</b>	<b>50</b>
8.1. Non-Ionizing Radiation Operating Standards: .....	50
8.2. Radio Frequency Procedures. ....	50
8.3. RF Operations: .....	50
8.3.1. RF Operations:.....	51
8.3.2. RF Transmission Operations for EEDs and Open Grain Solid Propellant:.....	52
8.4. Optical/Laser Operations: .....	52
8.4.1. Optical/Laser Operating Standards. ....	52
8.4.2. Optical/Laser Operation Personnel Protection Requirements: .....	52
8.4.3. Optical/Laser Procedures. ....	52
8.4.4. Optical/Laser Inspection: .....	52
8.4.5. Optical/Laser Operations: .....	52
<b>Chapter 9—RADIOACTIVE (IONIZING) RADIATION SOURCES OPERATIONS</b>	<b>54</b>
<b>Chapter 10—HAZARDOUS MATERIALS OPERATIONS</b>	<b>55</b>
10.1. Hazardous Materials Operating Standards: .....	55
10.2. Hazardous Materials Operations PPE. ....	55
10.3. Hazardous Materials Procedures. ....	55
10.4. Hazardous Materials Operations: .....	55
10.5. Restrictions on the Use of Static-Producing and Flammable Materials: .....	56
10.6. Hazardous Commodity Lockers: .....	57
10.7. Disposal of Contaminated Liquid Propellant, Gas, or Other Regulated Wastes: .....	57
<b>Chapter 11—GROUND SUPPORT AND FLIGHT HARDWARE PRESSURE SYSTEMS OPERATIONS</b>	<b>59</b>
11.1. Pressure Systems Operating Standards: .....	59
11.2. Pressure Systems Personnel Requirements: .....	59
11.2.1. Pressure Systems Training and Certification. ....	59
11.2.2. Pressure Systems PPE: .....	59
11.3. Pressure Systems Procedures: .....	61
11.4. <b>Pressure Systems Test, Inspection, and Maintenance Requirements:</b> .....	<b>62</b>

11.4.1.General Test Requirements: .....	62
11.4.2. <b>Ground Support Pressure Systems General Inspection Requirements:</b> .....	62
11.4.3.Pressure Systems General Maintenance: .....	63
11.4.4.Pressure Systems Tests. ....	63
11.4.5.Ground Support Pressure Vessels and Liquid Holding Tanks Recertification. ....	64
11.4.6.Pressure Vessel and Liquid Holding Tank Recertification Documentation. ....	64
11.5. Pressure Systems Operating Requirements: .....	64
11.5.1.General Operating Requirements. ....	64
11.5.2.Pressure Systems Containing Liquid Propellant. ....	67
11.5.3.Releases of Toxic Vapors: .....	70
11.5.4.Emergency Decontamination of Facilities and Personnel. ....	70
11.5.5.Handling Leaks and Spills of Liquid Propellant: .....	71
<b>Chapter 12— RESERVED</b>	<b>74</b>
<b>Chapter 13— ORDNANCE OPERATIONS</b>	<b>75</b>
13.1. Ordnance Operations Procedure Requirements: .....	75
13.1.3.Procedures shall include all on-base transportation. ....	75
13.2. Ordnance Transportation, Receipt, and Storage: .....	75
13.2.1.Ordnance Transportation, Receipt, and Storage Standards: .....	75
13.2.2.Ordnance Transportation General Requirements: .....	75
13.2.3.ER Ordnance Delivery and Receipt: .....	76
13.2.4.Ordnance Shipment Inspection: .....	77
13.2.5.Ordnance Storage: .....	77
13.3. Ordnance Systems Grounding: .....	77
13.3.1.Ordnance Systems Grounding PPE: .....	77
13.3.2.Ordnance Processing Restrictions on the Use of Static-Producing Materials: .....	81
13.3.3.Ordnance System Static Ground Point Test. ....	81
13.3.4.Ordnance Systems Grounding Operations: .....	81
13.4. Ordnance Operations: .....	82
13.4.1.Ordnance Operating Standards: .....	82
13.4.2.Ordnance Facility Inspection: .....	82
13.4.3.Ordnance Operations General Requirements: .....	83
13.4.4.Ordnance Operations Pre-Operational Requirements: .....	84

13.4.5. Ordnance Operating Requirements: .....	85
13.4.6. Laser Initiated Ordnance Operations Personnel Access Criteria: .....	86
13.5. Explosive Ordnance Disposal: .....	87
13.5.1. Rendered Safe Ordnance. ....	87
13.5.2. Obtaining AF EOD Services. ....	87
13.5.3. Range Safety Approval for Shipment of Damaged or Rendered Safe Ordnance: ....	87
13.6. Ordnance Facilities Operations: .....	87

**Chapter 14— ELECTRICAL SYSTEMS OPERATIONS**

14.1. Electrical Systems Operating Standards and Definitions: .....	88
14.1.1. Electrical Systems Operating Standards: .....	88
14.1.2. Electrical Equipment Operations in Hazardous (Classified) Locations: .....	88
14.1.3. Photography: .....	90
14.2. Electrical Systems Operations Personnel and Special Insulated Equipment: .....	91
14.3. Electrical Systems Procedures: .....	91
14.4. Electrical Equipment and Systems Test, Inspection, and Maintenance Requirements: .....	92
14.4.1. Grounding Systems Tests: .....	92
14.4.2. Electrical Equipment Inspection. ....	93
14.4.3. Electrical Equipment Maintenance and Testing: .....	93
14.5. Electrical Systems Operating Requirements: .....	93
14.5.1. Electrical Systems General Operating Requirements. ....	93
14.5.2. Electrical Systems Pre-Operational Requirements: .....	94
14.5.3. Electrical Systems Operating Requirements: .....	94
14.6. Battery Operations: .....	95
14.6.1. Battery Operating Standards: .....	95
14.6.2. Battery Operations Personnel Requirements: .....	95
14.6.3. Battery Procedures: .....	96
14.6.4. Lithium Batteries Special Requirements: .....	96
14.6.5. Battery Maintenance, Storage, and Operations: .....	96

**Chapter 15— MOTOR VEHICLE OPERATIONS**

15.1. Motor Vehicle Operating Standards. ....	97
15.2. Motor Vehicle Operating Requirements: .....	97
15.2.1. Operator Instructions: .....	97

15.2.2. Indoor Operations. ....	97
15.2.3. Ordnance and Propellant Area Parking: ....	97
15.2.4. Internal Combustion Engine Vehicles. ....	98
15.2.5. Hazardous Commodities Vehicle Transportation Standards. ....	98
15.2.6. Hazardous Location Restrictions. ....	98
<b>Chapter 16— CONVOY OPERATIONS</b>	<b>99</b>
16.1. General: ....	99
16.2. Convoy Operations Procedures. ....	99
16.3. Convoy Operations Requirements. ....	99
<b>Chapter 17—LAUNCH OPERATIONS</b>	<b>101</b>
17.1. Operations Safety Launch Countdown: ....	101
17.1.1. Operations Safety Launch Countdown Pre-Operational Requirements. ....	101
17.1.2. Operations Safety Launch Countdown General Requirements. ....	101
17.1.3. Launch Countdown Operations: ....	101
17.2. LDCG/LST Operations: ....	102
17.2.1. LDCG/LST Duties and Responsibilities: ....	102
17.2.2. LDCG/LST Operations Requirements: ....	102
17.3. Post-Launch Operations: ....	103
17.4. Launch Abort and Misfire/Hangfire Operations: ....	103
17.4.1. General. ....	103
17.4.2. Common Abort or Misfire/Hangfire Operations: ....	103
17.4.3. Launch Vehicles Using Liquid Propellant Stages Abort or Misfire/Hangfire Ops: ....	104
17.4.4. Launch Vehicles Using Solid Propellant Stages or Solid Propellant Starting Devices Abort or Misfire/Hangfire Operations: ....	104
17.5. Range User Launch Operations Responsibilities: ....	104
17.5.1. Launch Operations Procedures. ....	104
17.5.2. Range User Support of LDCG/LST. ....	104
17.5.3. Post-Launch Pad Support. ....	105
<b>Chapter 18—SOLID ROCKET MOTORS AND ROCKET MOTOR SEGMENTS OPS</b>	<b>106</b>
18.1. Solid Rocket Motors And Rocket Motor Segments Operations General Requirements. ....	106
18.2. Solid Rocket Motor and Rocket Motor Segment Transportation: ....	106

<b>AFSPCMAN 91-710 V1 1 JULY 2004</b>	<b>47</b>
18.3. Solid Rocket Motor and Rocket Motor Segment Inspections: .....	107
18.4. Solid Rocket Motor and Rocket Motor Segment Processing and Handling: .....	107
<b>Attachment 1— GROUND OPERATIONS PLAN</b>	<b>112</b>
<b>Attachment 2— HAZARDOUS AND SAFETY CRITICAL PROCEDURES</b>	<b>115</b>
<b>Attachment 3— INDEX OF OPERATIONS/AREAS SAFETY PLANS</b>	<b>121</b>
<b>Attachment 4— INDEX OF EXPLOSIVE (OPERATING AND AREA) SAFETY PLANS</b>	<b>123</b>
<b>Attachment 5— MISCELLANEOUS SAFETY PLANS</b>	<b>124</b>
<b>Attachment 6— OVERHEAD CRANES / HOISTS INSPECTION AND TEST SCHEDULE</b>	<b>125</b>
Table A6.1. Inspection and Test Schedule. ....	125
<b>Attachment 7— RANGE SAFETY LAUNCH COMMIT CRITERIA</b>	<b>129</b>
Figure A7.1. Instantaneous Critical Electric Field (Ec) Versus Altitude. ....	139

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**TABLE OF CONTENTS FOR AFSPCMAN91-710 VOLUME 7**

<b>Attachment 1— GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION</b>	<b>3</b>
<i>References</i> .....	<b>3</b>
<i>Abbreviations and Acronyms</i> .....	<b>13</b>
<i>Terms</i> .....	<b>27</b>

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## CHAPTER 1

### INTRODUCTION

**1.1. Objective.** The objective of this publication is to establish and enforce Range User safety requirements to ensure that the public, launch area, and launch complex personnel and resources are provided an acceptable level of safety and that all aspects of prelaunch and launch operations adhere to applicable public laws. The mutual goal of the ranges and Range Users shall be to conduct their missions safely, with a strong commitment to public safety.

#### **1.2. Applicability:**

**1.2.1. Range Users.** The requirements, policies, processes, procedures, and approvals defined in this publication shall be applicable to all Range Users conducting or supporting operations on the AFSPC ranges.

#### **1.2.2. Tailoring:**

1.2.2.1. Based upon this document, a tailored edition may be developed for each specific Range Users' program. The tailored edition shall be placed on the Range User's contract or applied through the applicable ranges Universal Documentation System or for FAA licensed launch operations, enforced through a Commercial Space Operations Support Agreement. Use of a tailored edition of this document is recommended and is beneficial to both the Range User and Range Safety. See Volume 1, Attachment 1, for further tailoring instructions.

1.2.2.2. Developing a tailored edition of AFSPCMAN91-710. The tailored edition should look like AFSPCMAN91-710 with the following exceptions:

1.2.2.2.1. The tailored edition shall be constructed in the following manner:

1.2.2.2.1.1. Insert a document heading/title that reads, "AFSPCMAN91-710 TAILORED FOR" Program Name, date of the applicable contract/agreement/CSOSA/etc.", centered at the top of each page.

1.2.2.2.1.2. Date of tailored edition.

1.2.2.2.1.3. Insert "PROPRIETARY" at the top, centered directly over heading material, and at the bottom of each page (if requested by the Range User).

1.2.2.2.1.4. Remove the following items from AFSPCMAN91-710 heading (front page):

1.2.2.2.1.4.1. Remove "docid" information, i.e. AFSPCMAN91-710VX.

1.2.2.2.1.4.2. "BY ORDER OF THE COMMANDER  
AIR FORCE SPACE COMMAND"

1.2.2.2.1.4.3. The Air Force Shield

1.2.2.2.1.4.4. OPR and Certifier information.

1.2.2.2.1.4.5. Pages and Distribution information.

1.2.2.2.2. Remaining heading information shall be left justified.

1.2.2.2.3. Change "**AIR FORCE SPACE COMMAND MANUAL 91-710 VOLUME X**" to "**Extracted from AIR FORCE SPACE COMMAND MANUAL 91-710 VOLUME X**"

1.2.2.2.4. Change "**COMPLIANCE WITH THIS PUBLICATION IS MANDATORY**" to "**COMPLIANCE WITH THIS TAILORED EXTRACT OF AFSPCMAN91-710 IS MANDATORY**"

**1.2.3. New Programs.** This publication is applicable to all new programs with program introduction (PI) submittals dated after the initial publication of AFSPCMAN 91-710. Range Users are encouraged to perform PIs at the earliest possible time. Formal PI to Range Safety for launch vehicles is accomplished through the Space Wing Programs and Plans (SW/XP) office. Informal PIs, such as those for payloads that do not go through the formal Universal Documentation System (UDS) process, may be provided through the sponsoring Range User. Before the PI, informal meetings to discuss Range 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 have begun significant design before the PI should approach Range Safety to discuss applicable requirements. Formal meetings with Range Safety shall be made through the SW/XP office.

**1.2.4. Previously Approved Programs.** Existing program and noncompliance approvals approved before the initial publication date of AFSPCMAN 91-710 shall be honored. However, existing programs shall comply with this publication for (1) major modifications that affect the launch vehicle's operation or safety characteristics; (2) new applications of previously approved components, systems, or subsystems; (3) discovery of previously undetected noncompliances; and (4) where hazard analyses, mishaps, incident investigations, or other sources indicate that the implementation of all or parts of this publication are necessary.

**1.3. Basis for the Requirements.** This publication is based on, but not limited to, the responsibilities or standards contained in or applied by the following laws and directives:

1.3.1. Public Law (PL) 10, 10 United States Code (U.S.C.), Section 172, *Ammunition Storage Board*.

1.3.2. PL 91-596, U.S.C. Title 29, *Occupational Safety and Health Act* (OSHA).

1.3.3. 49 U.S.C. Subtitle IX, *Commercial Space Transportation*, Chapter 701, *Commercial Space Launch Activities*, 49 U.S.C. § 70101 – 70121; 14 Code of Federal Regulations (CFR) Chapter III.

1.3.4. Presidential Directive (PD)/National Security Council (NSC) 25, *Scientific or Technological Experiments with Possible Large Scale Adverse Environmental Effects and Launch of Nuclear Systems into Space*, dated December 14, 1977, revised by letter May 8, 1996

1.3.5. Department of Defense Directive (DoDD) 3100.10, *Space Policy*.

1.3.6. Department of Defense Directive 3200.11, *Major Range and Test Facility Base*.

1.3.7. Department of Defense Directive 3230.3, *DoD Support for Commercial Space Launch Activities*.

1.3.8. Air Force Policy Directive (AFPD) 91-1, *Nuclear Weapons and Systems Surety*.

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

1.3.10. AFPD 63-12, *Assurance of Occupational Safety, Suitability, and Effectiveness*.

- 1.3.11. AFI 91-202, *Air Force Mishap Prevention Program.*
- 1.3.12. AFSPCI91-700, *Specialized Safety Publications.*
- 1.3.13. AFSPCI91-701, *Range Safety Program Policy and Requirements.*
- 1.3.14. AFI 91-110, *Nuclear Safety Review and Launch Approval for Space or Missile Use of Radioactive Material and Nuclear Systems.*
- 1.3.15. *Memorandum of Agreement between the Department of the Air Force and the Federal Aviation Administration on Safety for Space Transportation and Range Activities.***

## CHAPTER 2

### RESPONSIBILITIES AND AUTHORITIES

**2.1. General.** Range safety is a joint responsibility of the United States Air Force (USAF) as the owner and operator of the ranges and of all Range Users. The responsibility for protecting the public, launch area, and launch complex personnel and resources is of paramount consideration in range launch operations.

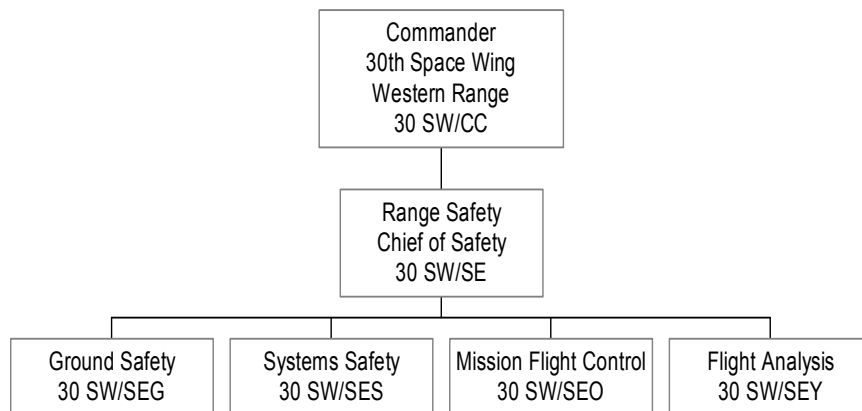
**2.2. Headquarters Air Force Space Command Responsibilities.** The Headquarters Air Force Space Command (HQ AFSPC) operates the AFSPC ranges, including providing base support, personnel, and other government assets. The AFSPC Commander (AFSPC/CC) is responsible for establishing range safety policy for AFSPC ranges as outlined in AFSPCI91-701, *Range Safety Program Policy and Requirements*. HQ AFSPC is also responsible for establishing common range safety user requirements as outlined in this publication for the AFSPC space wings to implement and enforce.

### 2.3. Space Wing Responsibilities:

#### 2.3.1. Commanders, 30th Space Wing and 45th Space Wing:

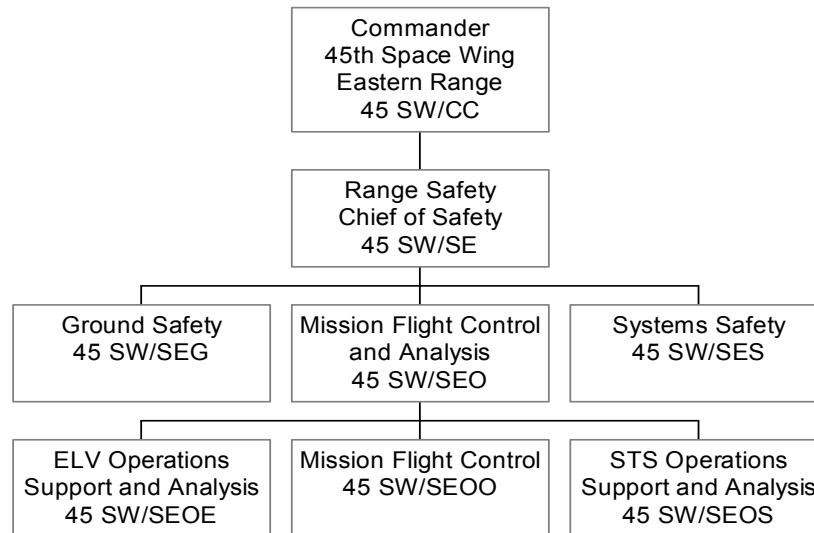
2.3.1.1. The Space Wing Commanders (SW/CCs) have overall authority and responsibility for public safety at AFSPC ranges as directed by the AFSPC/CC. This delegation is provided via the MAJCOM chain of command and AFI 91-202, as supplemented. Figure 2.1. shows the AFSPC Range Safety organizational structure.

**Figure 2.1. 30th SW and 45th SW Safety Organizations.**



(45th Continued next page)

(45th Continued)



2.3.1.2. The SW Commanders or their designated representatives 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 SW Commanders shall coordinate all actions between the ranges to ensure that consistent and standard range safety requirements and approvals are levied on all Range Users.

2.3.1.4. The SW Commanders shall ensure range-owned resources are protected. Where government property or facilities are leased to launch system operators, the SW Commanders 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 SW Commanders shall approve or disapprove all waivers that affect public safety.

**2.3.2. Relationship with Range Users.** 30 SW/SE and 45 SW/SE are responsible for initiating, establishing, and implementing Range User interface processes to ensure that the requirements of this publication are met and, if desired, tailored to meet individual Range User safety program requirements. To meet these responsibilities, 30 SW/SE and 45 SW/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 of this volume.

### 2.3.3. General Description of the Eastern and Western Ranges:

#### 2.3.3.1. Eastern Range:

2.3.3.1.1. The ER consists of the launch head at Cape Canaveral Air Force Station (CCAFS), Florida; owned or leased facilities on downrange sites such as Antigua and Ascension; and in the context of launch operations, the Atlantic Ocean, including all surrounding land, sea, and air space within the reach of any launch vehicle extending eastward into the Indian and Pacific Oceans. Figure 2.2 shows the typical launch sector for launches from the ER; Figure 2.3 shows owned or leased facilities on sites downrange from the ER.

2.3.3.1.2. Range management activities are concentrated at Patrick Air Force Base (PAFB), Florida.

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

2.3.3.1.4. Launch activities conducted by ER personnel operating outside the geographical limits described above may occur under DoD or USAF direction or under the auspices of agreements made by those agencies. In such cases, the term *Eastern Range* or *ER* is expanded to include these situations and locations and apply, as required, for the specific mission, launch, launch area, and impact area.

Figure 2.2. Typical Launch Sector for Launches from the ER..

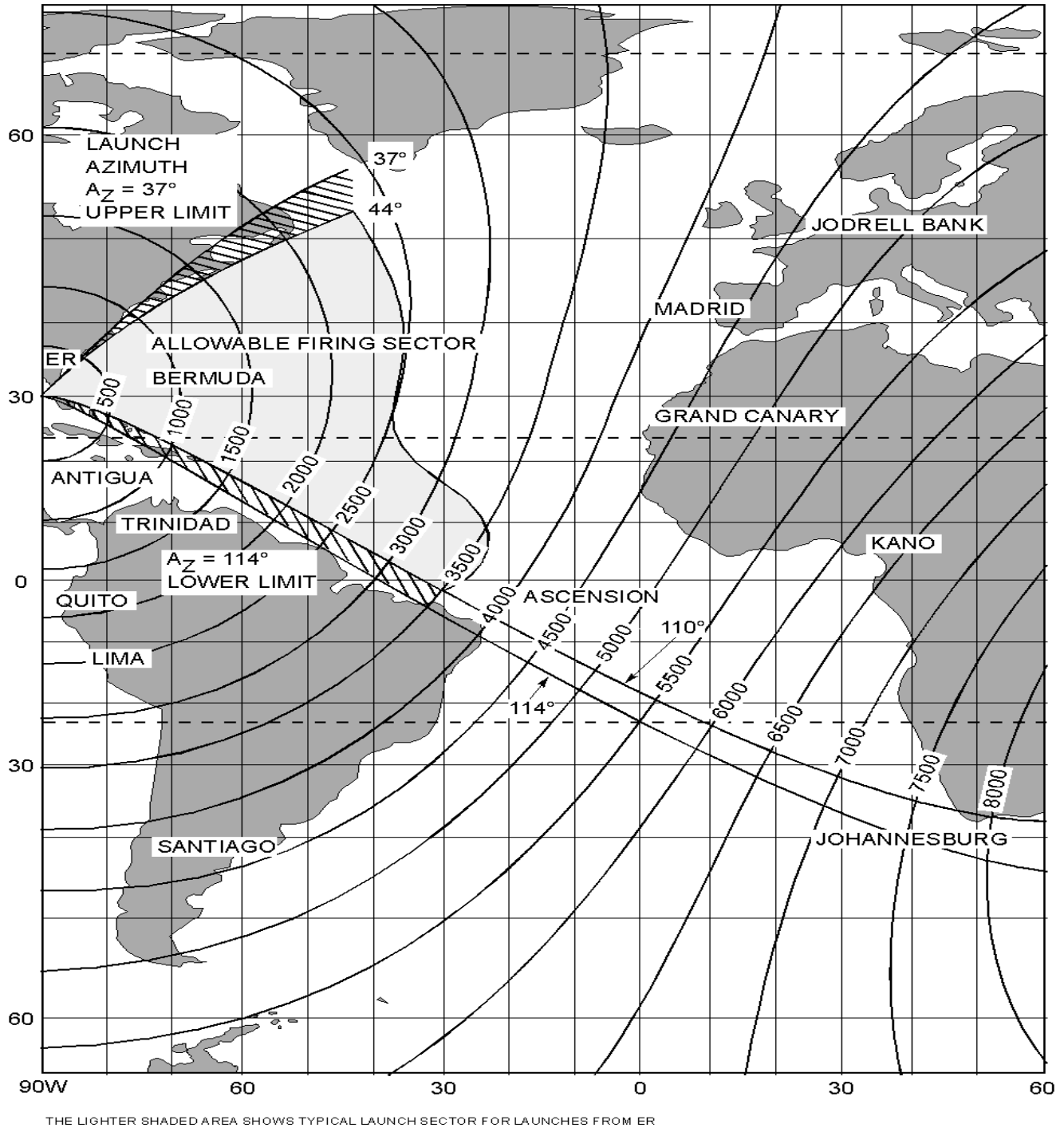
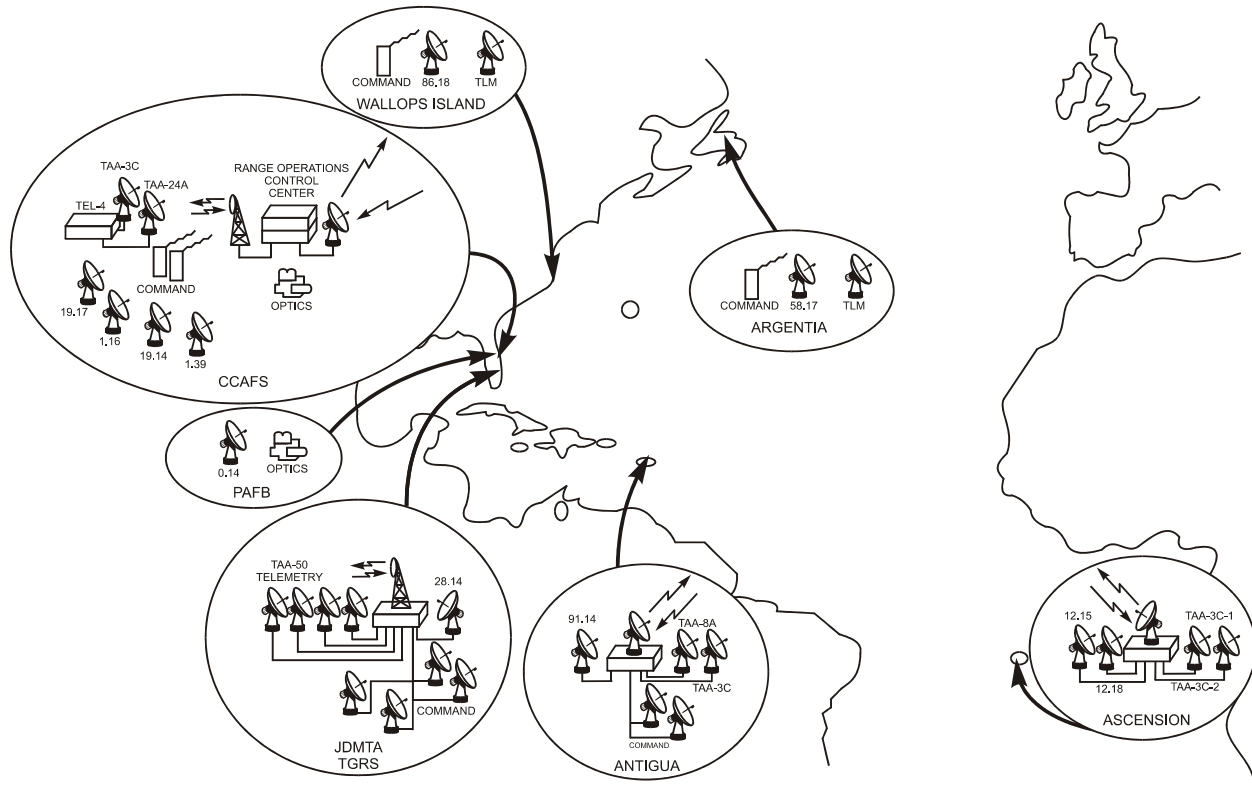


Figure 2.3. Owned or Leased Facilities on Sites Downrange from the ER.



### 2.3.3.2. Western Range:

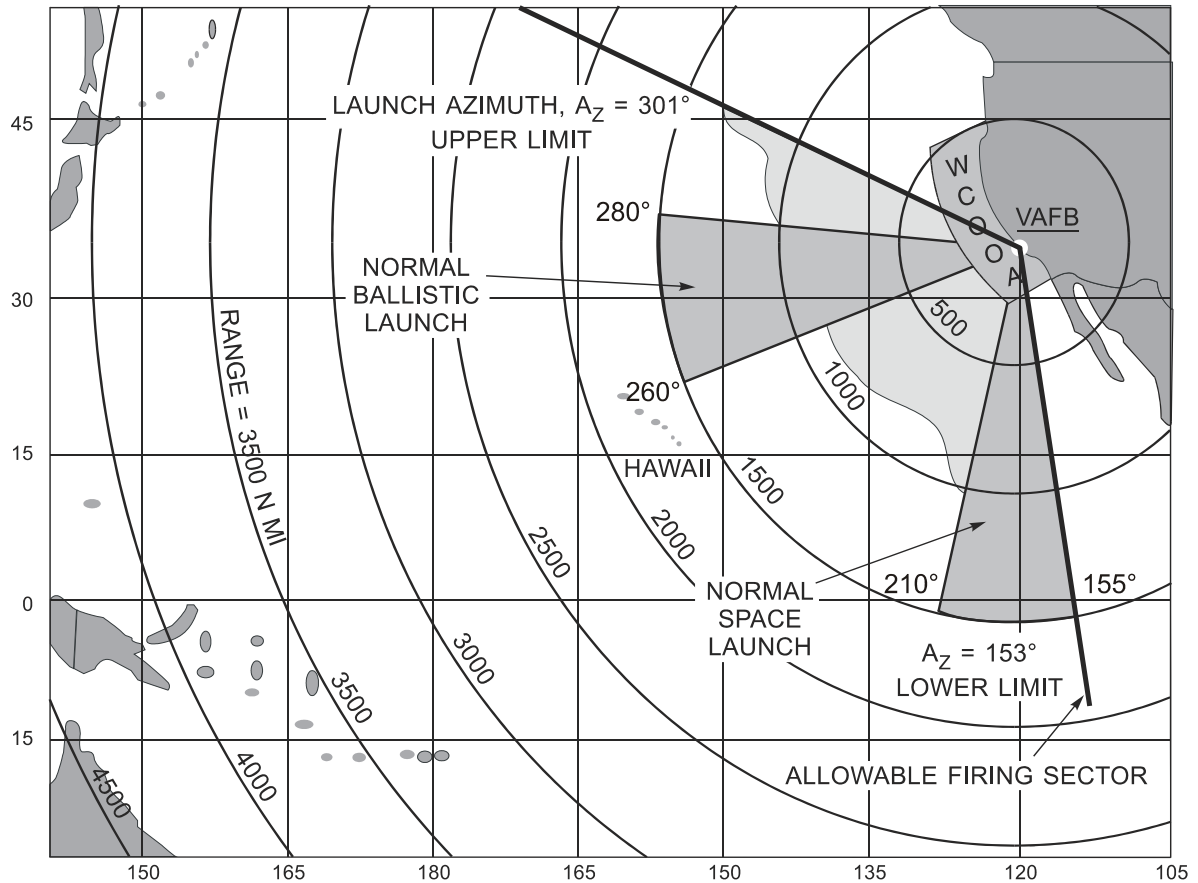
2.3.3.2.1. The WR is the launch head at VAFB, California and extends along the West Coast of the continental US westward through the Pacific and Indian Oceans. Figure 2.4 shows the typical launch sector for launches from the WR; Figure 2.5 shows owned or leased facilities on sites uprange along the Pacific Coast and downrange from the WR.

2.3.3.2.2. Range management activities as well as launch and prelaunch processing activities are concentrated at VAFB in California.

2.3.3.2.3. Launch activities conducted by WR personnel operating outside the geographical limits described above may occur under DoD or USAF 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, launch area, and impact area.



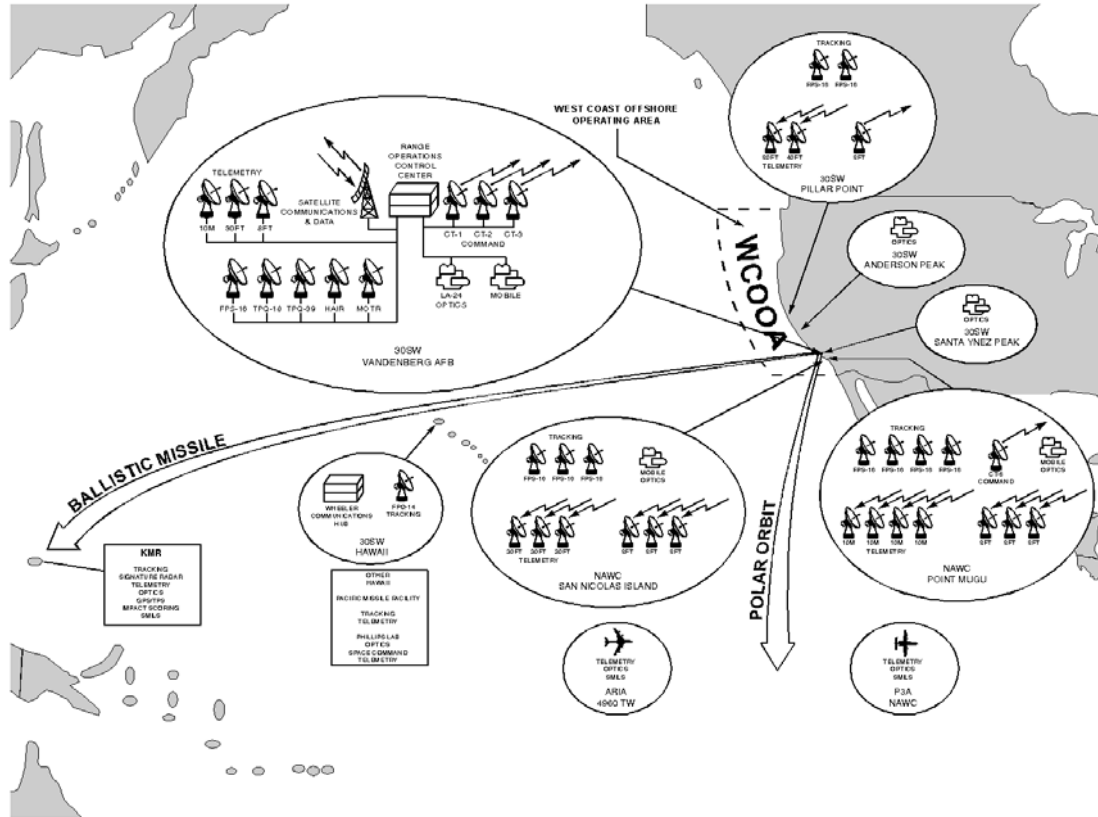
Figure 2.4. Typical Launch Sector for Launches from the WR.



THE LIGHTER SHADED AREA SHOWS TYPICAL LAUNCH SECTOR FOR LAUNCHES FROM WESTERN RANGE.

MAP NOT TO SCALE. LEGEND - DISTANCES APPROXIMATE

Figure 2.5. Owned or Leased Facilities on Sites Uprange and Downrange from the WR.



**2.3.3.3. Range Differences.** The WR and ER have some differences in Range Safety requirements. The differences are caused by geographical differences that change risk levels for launch operations, organizational variations, and different Range User requirements such as those associated with manned space flights at the ER and ballistic launches into the Reagan Test Site and aircraft tests at the WR. At present, where a requirement differs, the Range User may standardize to the more stringent requirement or meet the requirements of each range, whichever option is technically or economically more desirable. Specific WR and ER differences are noted throughout this publication.

**2.3.4. Chiefs of Safety, 30th and 45th Space Wings.** The Chiefs of Safety, 30th Space Wing (30 SW/SE) and 45th Space Wing (45 SW/SE), the designated safety representatives for the SW Commanders, are responsible for the following:

- 2.3.4.1. Establishing and enforcing the Range Safety Program.
- 2.3.4.2. Providing single points of contact at the range for each Range User safety program.
- 2.3.4.3. Ensuring that the Range Safety Program meets the needs of the ranges and Range Users and does not impose undue or overly restrictive requirements on Range User programs.
- 2.3.4.4. Approving or disapproving all waivers other than those that affect public safety.

**2.3.5. Range Safety Offices.** Unless otherwise noted, the use of the term *Range Safety* in this publication refers to 30 SW/SE and 45 SW/SE. The Range Safety Offices provide Systems Safety, Flight Safety Analysis, Pad Safety (45 SW), Mission Flight Control (30 SW), and 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 the ranges. The Safety Offices also provide traditional Air Force ground safety programs. The responsibilities of the Chiefs of Safety or their designated representatives apply throughout all phases of a launch program (planning, generation, execution, and recovery) and include, but are not limited to, the following:

2.3.5.1. Enforcing safety requirements to ensure that public safety, launch area safety, and launch complex safety are adequately provided by and for all programs using the ranges.

2.3.5.2. Evaluating, training, and approving Range Users who wish to assume “control authority” for launch complex safety in accordance with Attachment 7 of this volume.

2.3.5.3. Providing oversight, review, approval, and monitoring for all public safety and launch area safety concerns during prelaunch operations at the launch complex and launch vehicle or payload processing facilities.

2.3.5.4. Auditing operations at a launch complex and associated support facilities for launch complex safety concerns in accordance with a jointly accepted Launch Complex Safety Training and Certification program (Attachment 7 of this volume). If the Range User control authority decides not to or cannot implement the plan, Range Safety shall assume complete safety responsibility.

2.3.5.5. Reviewing and approving flight plans, design, inspection, procedures, testing, and documentation of all hazardous and safety critical launch vehicles, payloads, and ground support equipment, systems, subsystems, facilities, and material to be used at the ER and WR. Review and approval shall be in accordance with the requirements of volumes 2 through 6 of this publication.

2.3.5.6. Flight Safety Review with the SW/CC. Prior to each launch, Range Safety shall brief the SW/CC of the safety status of the launch vehicle. The briefing shall include vehicle hazards, the status of any applicable waivers and any other issues that contribute to the risk of the flight. The briefing shall be in the format chosen by the SW/CC and may be accomplished at the Launch Readiness Review (LRR) or via a separate safety briefing.

2.3.5.7. Determining the need for and approving the airborne Flight Safety System (FSS); reviewing and approving the design, test, and documentation for airborne FSSs; monitoring and verifying the installation, checkout, and status of the flight termination system (FTS) in accordance with Range Safety instructions at locations designated by Range Safety.

2.3.5.8. Determining criteria for flight termination action; assessing risks to protect the general public, launch area, and launch complex personnel and property; developing and using mathematical models to increase the effectiveness of errant vehicle control while minimizing restrictions on launch vehicle flight; establishing mission rules and criteria for flight termination action in conjunction with the Range User.

2.3.5.9. Determining collision avoidance (COLA) launch hold requirements for mannable orbiting objects and providing the COLA requirements letter documenting mission specific criteria. AFI 91-202 provides additional requirements for minimizing risk of collision with other objects and for on-orbit collision avoidance; however, neither of these issues is the responsibility of the ranges. At present, the Safety Office is only interested in COLAs to mannable/manned vehicles

such as the International Space Station and the Space Transportation System from launch to orbital insertion.

2.3.5.10. Providing applicable Range Safety Operations Requirement (RSOR) and Operations Supplement (Ops Sup) documents; providing a Range Safety Launch Operations Approval Letter no later than the (LRR) (45 SW/SE may provide a verbal GO instead); evaluating and issuing safety approval for personnel authorized to remain in hazardous launch areas; and providing the final Range Safety approval to launch.

2.3.5.11. Providing Range Safety certified Mission Flight Control Officers (MFCOs) and associated Range Safety support personnel for launch operations and, together with qualified personnel from 1 ROPS and 2 ROPS, exercising safety operations waiver authority as delegated by the SW Commander, monitor real-time launch vehicle progress, and act as the sole authority for the real-time determination and execution of flight termination.

2.3.5.12. Supporting the Launch Disaster Control Group (LDCG ER)/Launch Support Team (LST WR) and advising the onsite commander regarding disaster preparedness and response and, as necessary or as requested, providing technical assistance in the event of failures and mishaps.

2.3.5.13. Assessing Range Safety Critical Launch Commit Criteria for launch operations.

2.3.5.14. Establishing a configuration control process for maintaining Range Safety documentation in a timely, technically correct, easily understood manner that is accessible to Range Users, including tailored Range Safety Requirements and standards developed jointly with other agencies.

2.3.5.15. Ensuring safety is consistent with operational requirements, including the prevention of test objects from violating established limits through impact for vehicles with suborbital trajectories and through orbital insertion or escape velocity for space vehicles (Department of Defense Directive [DoDD] 3200.11, paragraph 4.2.9.8).

2.3.5.16. Ensuring public safety up until the time of flight at which the launch vehicle/spacecraft achieves a sustainable orbit or escape velocity for space vehicles, or through final impact for vehicles with suborbital trajectories and can be shown to pose no statistically significant additional safety risk.

2.3.5.17. Approving or disapproving equivalent level of safety (ELS) requests.

### **2.3.6. Other Space Wing Organizations With Safety Program Responsibilities:**

**2.3.6.1. Commanders, 30th Launch Group and 45th Launch Group.** The Commanders, 30th Launch Group (30 LCG) and 45th Launch Group (45 LCG), are responsible for the following:

2.3.6.1.1. Reviewing and accepting all prelaunch and launch operations procedures at CCAFS and VAFB for USAF programs, including hazardous and safety critical procedures that may affect public safety or launch area safety, after ensuring they have been approved by Range Safety.

2.3.6.1.2. As a control authority, in accordance with the Launch Complex Safety Training and Certification Plan, reviewing and approving prelaunch and launch operations procedures for USAF programs that are limited to launch complex safety concerns.

**2.3.6.2. Commanders, 30th Operations Group and 45th Operations Group.** The Commanders, 30th Operations Group (30 OG) and 45th Operations Group (45 OG), are responsible for the following:

2.3.6.2.1. Providing and ensuring that 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.

2.3.6.2.2. Providing certified MFCOs and associated Range Safety support personnel to implement the rules and requirements designed by Range Safety for protecting the public during launch operations.

**2.3.6.3. Commanders, 30th Mission Support Group and 45th Mission Support Group.** The Commanders, 30th Mission Support Group (30 MSG) and 45th Mission Support Group (45 MSG), are responsible for the following:

2.3.6.3.1. Determining, coordinating, and enforcing fire safety, environmental management, and explosive ordnance disposal requirements.

2.3.6.3.2. Providing certified LDCG (ER) or LST (WR) commanders to direct operations resulting from an accident with primary responsibility for directing life saving and resource protection efforts. The LDCG/LST commanders serve as on-scene commanders for all LDCG/LST activities that impact public and government safety.

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

**2.3.6.4. Commanders, 30th Medical Group and 45th Medical Group.** The Commanders, 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 Protection 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.** In accordance with 49 U.S.C., Subtitle IX Commercial Space Transportation, Chapter 701, Commercial Space Launch Activities, U.S.C. § § 70101 – 70121, the FAA has responsibility for public safety of licensed launches. The range safety requirements in this publication have been written with the intent of achieving commonality with the FAA requirements. The FAA performed launch site safety assessments of the two AFSPC national launch ranges and determined the level of safety obtained by the existing range safety processes to be adequate. The FAA will not require a license applicant to demonstrate the adequacy of the range services it proposes to use if the applicable launch site safety assessment included those services and if those services remain adequate. SW Commander discretion to accept higher risk for the launch of government payloads does not apply to licensed launches without a Range User obtaining relief from the FAA. (“Memorandum of Agreement between the Department of the Air Force and Federal Aviation Administration on Safety for Space Transportation and Range Activities,” dated 16 January 2001). FAA documents can be found on the FAA/AST web site at <http://ast.faa.gov>.

2.4.1. The FAA and the applicable Range Safety office shall jointly review and approve all requests by an FAA licensed launch operator (Range User) not to comply with any 14 CFR Part 417 **Launch Safety** requirement. 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 launches and may prohibit, suspend, or end immediately a licensed launch before flight if, at any time, the FAA determines the launch 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 in accordance with funding requirements of DoDD 3200.11.

2.5.1.2. Programs intending to perform launch 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 in accordance with 45 SWI 99-101, *45 SW Mission Program Documents*. Funding requirements at the WR are addressed in Eastern and Western Range 127-1, Range Safety Requirements, *Range User Handbook*.

**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 Range 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 and approval in accordance with Attachment 2 of this volume.

**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, payload, and ground support equipment, systems, subsystems, facilities, and materials to be used at the ranges in accordance with 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 SW/CC or his designee for approval. Range User responsibilities include the following:

2.5.3.1. Providing safe systems, equipment, facilities, and materials in accordance with this publication; ensuring 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 Range Safety launch commit criteria (Volume 6, Attachment 7).

2.5.3.2. Developing and obtaining Range Safety review and approval for all required data and/or documents necessary for their planned operations. The review and approval for these documents, identified in Chapter 5 of this volume and in volumes 2 through 6, shall be in accordance with data submission lead times identified in this publication.

2.5.3.3. Submitting data for mission rules, launch commit criteria, and flight control operations; obtaining a Range Safety Launch Operations Approval Letter or verbal approval at the LRR; participating in safety critical operations; submitting telemetry measurement lists and tape, the Range User Countdown Checklist, and any special requirements for launch.

2.5.3.4. Ensuring that the requirements of 49 U.S.C. § § 70101 - 70121 and FAA regulations, 14 CFR Chapter III are met for licensed launches.

2.5.3.5. Performing risk analyses and implementing design and mission plans consistent with acceptable risk to the general public for deorbiting launch vehicles, upper stages and spacecraft.

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

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

2.5.3.8. Verifying compliance with this publication. The use of subcontractors does not relieve the Range User of 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, interfacing and integrating with other Range Users or associated contractors in their safety programs.

2.5.3.10. Preparing a Safety Assessment Report (SAR). The SAR shall summarize the results of all hazards analyses performed in accordance with 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 activities:

2.5.4.1. Notifying Range Safety of any intended launch of radioactive materials during the concept phase of the program.

2.5.4.2. At the WR, requesting and obtaining launch approval for radioactive materials from the Wing Vice Commander through the Radiation Safety Committee (RADSAFCOM).

2.5.4.3. As applicable, ensuring compliance with PD/NSC 25 as outlined in DoDD 3100.10, with implementation through AFI 91-110 and any Space Wing supplements and providing certification as detailed in volumes 2 and 3 of this publication.

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

2.5.5.1. Conducting their operations in a safe manner.

2.5.5.2. Planning and conducting hazardous and safety critical operations only in accordance with Range Safety or, as applicable, Safety Control Authority approved procedures and in accordance with the current edition of the applicable operations safety plan (OSP) for the launch complex, facility, or area in use and for ordnance and propellant operations and areas.

2.5.5.3. Observing, evaluating, and enforcing compliance with Range Safety requirements by all personnel within launch complexes, assembly, and checkout areas, propellant and ordnance storage areas, and other areas as deemed appropriate by Range Safety.

2.5.5.4. Maintaining an accurate written or computerized log of events during launch countdown for three years or three launches, whichever is greater.

**2.5.6. Control Authority Responsibilities.** Range Users have the option to provide “operational safety control authority” within the launch complex. As defined in this publication, the control authority for safety includes areas within a complete launch complex (or missile silo) and adjacent facilities used by the control authority for launch vehicle and/or payload processing. If this option is used, Range Safety shall audit the program on an unannounced and periodic basis. Range Safety shall perform these duties if a control authority is not qualified. Range Safety can assume these responsibilities for qualified control authorities, if requested. Pad Safety shall audit the program, perform duties, and assume responsibilities, if requested. When certified in accordance with the Launch Complex Safety Training and Certification Requirements, the “control authority” shall be responsible for the following: (See Attachment 7 of this volume for the Launch Complex Safety Training and Certification Requirements).

2.5.6.1. Reviewing and approving all procedures relating to the performance of any hazardous operation and safety critical operation that are limited to launch complex safety.

2.5.6.2. Reviewing and approving Facility Emergency Operating Plans (FEOPs) and OSPs that are limited to launch complex safety.

2.5.6.3. Ensuring hazardous facilities and safety critical and hazardous operations limited to launch complex safety are periodically inspected, as required.

2.5.6.4. Monitoring hazardous and safety critical operations that are limited to launch complex safety, as required.

2.5.6.5. Defining the threat envelopes of all hazardous operations limited to launch complex safety and establishing safety clearance zones to protect launch complex personnel and resources.

2.5.6.6. Ensuring that all personnel performing hazardous operations that are limited to launch complex safety are provided adequate training to ensure proper conduct of their jobs and tasks.

2.5.6.7. Ensuring that adequate personal protective equipment is provided to launch complex personnel as defined by this publication and approved OSPs.

2.5.6.8. Ensuring that all hazardous operations affecting launch complex safety are conducted using formal written procedures approved in accordance with Attachment 7 of this volume.

### **2.5.7. Occupational Safety and Health:**

2.5.7.1. Per AFI 91-301, *Air Force Occupational and Environmental Safety, Fire Prevention, and Health (AFOSH) Program*, Range Users (contractors/licensed launch 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 an inherent responsibility to protect any government employees and property when such are involved in contractor operations or on contractor-leased facilities. Range Safety shall assume no liability for Range User or contractor compliance or noncompliance with OSHA requirements.

2.5.7.2. USAF civilian and military personnel Range Users are required to comply with all DoD and Air Force 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. (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 POLICY

#### 3.1. General:

3.1.1. It is the policy of the ranges to ensure that the risk to the public, launch area, and launch complex personnel and resources is managed to an acceptable level. This policy shall be implemented by employing risk management in three categories of safety: Public Safety, Launch Area Safety, and Launch Complex Safety.

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

3.1.3. It is the policy of the ranges to avoid the use of waivers. However, the SW Commanders have the authority to tailor or waive any requirement in this publication and to accept risks that exceed those defined in Table 3.1 and Figure 3.1 of this chapter for a specific mission based on national or mission needs. When the specific mission risks are greater than an expected casualty ( $E_c$ ) of  $300 \times 10^{-6}$ , the SW Commanders shall advise the 14 AF/CC. Refer to AFSPCI91-701 for risk approval levels.

3.1.4. Launch risk guidance has been established and can be found in 3.2 and 3.3 of this volume. Further information on acceptable risk criteria can be found in Attachment 4 of this volume.

3.1.5. Imminent danger situations are subject to the following:

3.1.5.1. 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.

3.1.5.2. 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.

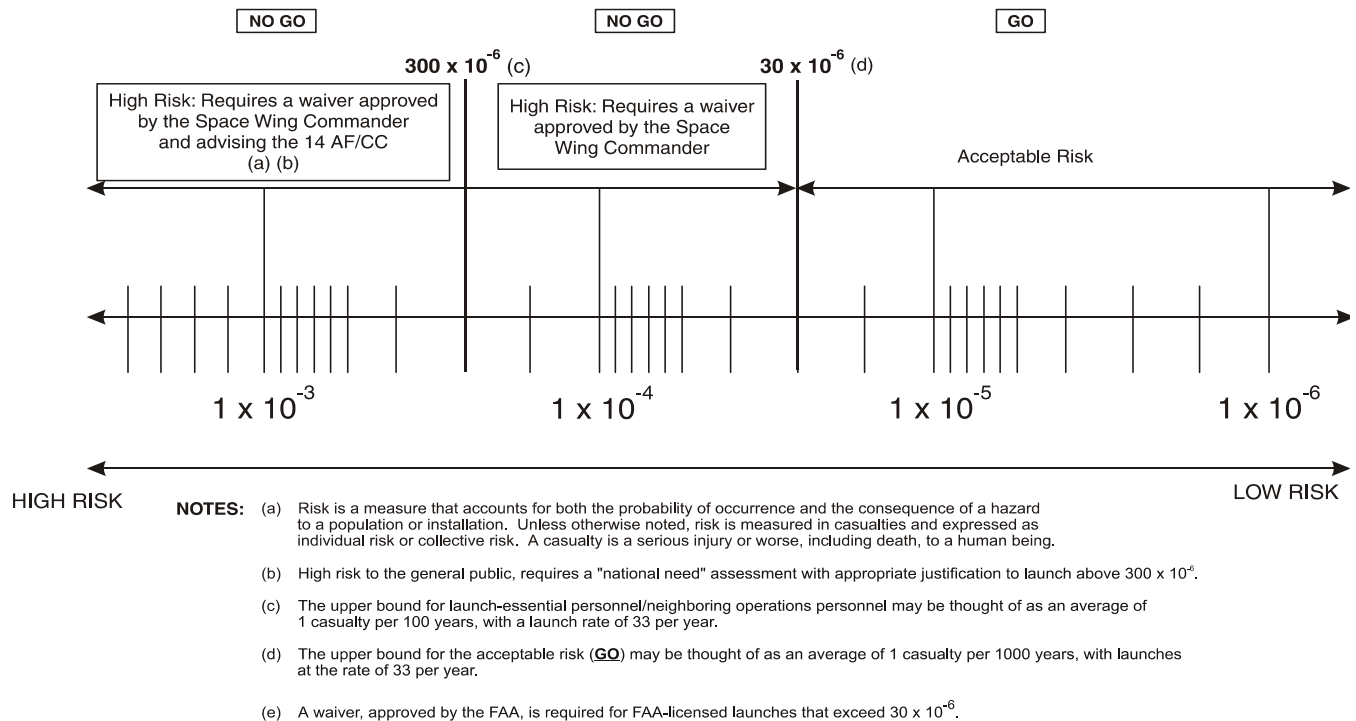
3.1.5.3. All imminent danger situations shall be reported to Range Safety not later than 1 hour from the time the situation is identified.

3.1.5.4. In an imminent danger situation, the system, equipment, or facility shall be immediately placed in the safest condition possible until the situation is resolved.

**3.2. Public Safety.** The ranges shall strive to ensure that the risk to the public, including foreign countries (personnel and resources), from range operations meets the criteria established in this publication. Figure 3.1 shows the risk management criteria guidance for personnel to be used for determining acceptable risk for individual launches. The value of  $30 \times 10^{-6}$  shall be used by the ranges as a level defining “acceptable launch risk without SW Commander review.” Based on national need and the approval of the SW Commanders, non-FAA licensed launches may be permitted using a predicted risk above  $30 \times 10^{-6}$ . Refer to AFSPCI91-701 for risk approval levels. Range Commanders Council Standard 321 provides relevant background information on launch risk acceptability. The ranges and Range Users work together to

determine risk based on data provided by Range Users and Range Safety models. See Attachment 4 of this volume for definitions of terms and further guidance.

**Figure 3.1. Acceptable Public Exposure Launch Operation Risk Guidance.**



### 3.2.1. Prelaunch and Launch Operations:

3.2.1.1. Range Safety shall review, approve, and through Pad Safety, monitor, and impose safety holds, when necessary, on all prelaunch and launch operations conducted on the ranges. These actions are required to ensure that the hazards associated with propellants, ordnance, radioactive material, and other hazardous systems do not expose the public, launch area, or launch complex to risks greater than those considered acceptable by public law and state documents. These documents include, but are not limited to, PL 99-499 42 U.S.C. 11001-11050, *Superfund Amendments and Reauthorization Act (SARA), Title III: Emergency Planning and Community Right-to-Know Act (CPRCA)*; 29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals*; 40 CFR 355, *Emergency Planning and Notification*; 40 CFR 68, *Chemical Accident Prevention Provisions*, subpart G, *Risk Management Plan*; Executive Order 12856, *Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements*; and California Occupational Safety and Health Administration (CAL-OSHA).

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

3.2.1.3. Range Safety shall ensure that each Range User provides each launch system with a capability that allows Range Safety to manually and positively initiate a holdfire that prevents launch

in the event of loss of Range Safety critical systems or violation of mandatory Range Safety launch commit criteria (Volume 6, Attachment 7).

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 already underway if it violates public, launch area, or launch complex safety or Range 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 (WR), the Range User, FAA representative for licensed launches, or any responsible supervisor in charge of a launch operation.

3.2.1.4. Quantity distance (QD) explosives siting shall be accomplished for all explosives facilities in accordance with AFMAN 91-201, *Explosives Safety Standards*.

**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 vehicle, or commanding flight termination action, or could cause unauthorized issuance of FTS commands. Some other examples of Range Safety critical systems include, but are not limited to, the holdfire system, impact prediction system, Pad Safety Supervisor/Pad Safety Officer console, and the Flight Safety Project Officer (FSPO) console. Range Safety criticality shall be determined during initial acquisition activities by the Range Safety organization at the launch range. (See Volume 4 for further details.)

3.2.2.1. All Range Safety critical systems shall be designed to ensure that no single point of failure (SPOF), including both hardware and software, will deny the capability to monitor and terminate or result in the inadvertent termination of a launch vehicle or payload, as applicable.

3.2.2.2. When possible, 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 Volume 4 of this publication.

3.2.2.3.1.2. The ground FTS shall have a reliability of 0.999 at the 95 percent confidence level for a 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. These requirements shall be met by combining the design approach and testing requirements of Volume 4 of this publication.

3.2.2.3.2.2. The ground RTS reliability shall be 0.999 at the 95 percent confidence level for a 1-hour duration, as required.

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.

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.

### **3.2.3. Control of Errant Vehicle Flight:**

3.2.3.1. Range Safety shall verify that all launch vehicles launched from or onto the ranges have a positive, range-approved method of controlling errant vehicle flight to meet the objective of minimizing risks to the public, launch area, and launch complex personnel and resources. Normally, control systems on launch vehicles using the ranges shall consist of an airborne FSS that shall meet all the requirements of volumes 2 and 4 of this publication. A thrust termination system may be considered as an alternative to an FSS; however, quantification of risks shall be determined, and the requirements in Volume 2 shall be met. The alternative thrust termination concept and design shall be approved by the SW Commander.

3.2.3.2. Range Safety shall establish flight termination criteria and Range Safety mission flight rules to ensure that operations do not exceed acceptable public safety limits. At the ER, mission rules and flight termination policy for the space transportation system (STS) shall be in accordance with the Johnson Space Center Operational Flight Rules, Rules and Agreements, Section R.

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

3.2.3.3.1. No intact launch vehicle, scheduled debris or payload, or launch vehicle and payload subsystems shall be allowed to intentionally impact on land except in the launch area inside the impact limit lines. *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 policy may allow errant launch vehicles to fly to obtain maximum data until they would present an unacceptable risk to the public or until Range Safety can no longer control the launch vehicle.

**3.3. Launch Area Safety.** The following requirements are in addition to those specifically identified for launch area safety in 3.2 of this volume. (See Attachment 4 of this volume and Volume 7 of this publication for the definitions of terms related to risk.)

3.3.1. The ranges shall ensure that all personnel and USAF or third party resources located on any AFSPC range, including CCAFS or VAFB 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. Figure 3.2. shows nominal launch area and launch complex hazard consequence and probability categories correlated to different levels of acceptability for prelaunch hazards not associated with launch or Range Safety launch commit criteria. Numbers provided in Figure 3.2. are guides only and are not necessarily hard limits.

Figure 3.2. Acceptability Guidelines for Prelaunch Launch Area/Launch Complex Hazard Consequences and Probability Categories.

Hazard Severity		Potential Consequences			Probability*				
Category	Personnel Illness/Injury	Equipment Loss (\$)	Unit Downtime	Data Compromise	A	B	C	D	E
I	Catastrophic May cause death.	> 1,000,000	> 4 months	Data is never recoverable or primary program objectives are lost.					
II	Critical May cause severe injury or severe occupational illness.	200,000 to 1,000,000	2 weeks to 4 months	May cause repeat of test program.					
III	Marginal May cause minor injury or minor occupational illness.	10,000 to 200,000	1 Day to 2 Weeks	May cause repeat of test period.					
IV	Negligible Will not result in injury or occupational illness.	< 10,000	< 1 Day	May cause repeat of data point, or data may require minor manipulation or computer rerun.					

Risk Priority:  Unacceptable  Waiver required  Operation permissible

\*Probability refers to the probability that the potential consequence will occur in the life cycle of the system (test/activity/operation). Use the following list to determine the appropriate Risk Level.

DESCRIPTION**	Threshold Level	Probability Value	Specific Individual Item	Fleet or Inventory***
A Frequent	$3 \times 10^{-1}$	Likely to occur repeatedly	Continuously experienced	
B Reasonably probable	$8 \times 10^{-2}$	Likely to occur several times	Will occur frequently	
C Occasional	$8 \times 10^{-3}$	Likely to occur sometime	Will occur several times	
D Remote	$8 \times 10^{-4}$	Unlikely to occur, but possible	Unlikely, but can reasonably be expected to occur	
E Extremely Improbable	$8 \times 10^{-5}$	Very unlikely to occur, but still possible.	Unlikely to occur, but possible	

3.3.3. Launch-Essential Personnel. Allowable collective risk for launch-essential launch area personnel is  $300 \times 10^{-6}$ . Allowable individual risk for launch-essential personnel is  $10 \times 10^{-6}$ .

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

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

3.3.3.3. 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 SW Commanders.

3.3.4. The SW Commanders can allow for neighboring operations personnel to be assessed at the same risk level as launch-essential personnel ( $300 \times 10^{-6}$ ).

3.3.5. 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.

3.3.6. 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.

3.3.7. 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.

3.3.8. 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 in accordance with this publication and approved OSPs.

3.3.9. 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.

3.3.10. 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.

3.3.11. 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.

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



3.3.11.2. Procedures and policies that are applied for public and launch area safety shall be used to reduce risks to launch area USAF and third party physical resources to acceptable levels.

3.3.11.3. Siting, design, and use of USAF 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.

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

3.3.11.5. 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.

3.3.11.6. The installation commander shall be responsible for implementation of resource safety requirements for an area on the installation not assigned to a specific USAF squadron/detachment commander or other Range User. The installation commanders at the ER are the Cape Commander for CCAFS and the Wing Commander for Patrick Air Force Base. The installation commander at the WR is the Wing Commander for Vandenberg Air Force Base.

3.3.11.7. 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.

**3.4. Launch Complex Safety.** The following requirements are in addition to those also specifically identified for launch complex safety in 3.2 and 3.3 of this volume.

3.4.1. As the control authority, the single contractor or licensed launch operator, full-time government tenant organization, or USAF squadron/detachment commander has the responsibility for launch complex safety and shall exercise the function in accordance with the Launch Complex Safety Training and Certification requirements. The control authority may delegate this responsibility to the Chiefs of Safety.

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

3.4.3. 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.

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

## CHAPTER 4

### RANGE SAFETY PROCESSES

**4.1. Range Safety and Range User Interface Process.** Due to the complexity of present launch vehicle 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 as early as possible. Range Users will first be introduced to Range Safety through the SW/XP office or, as applicable, through the sponsoring Range User. The PM will assist in establishing interfaces with other SW 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 A.1. This process can be tailored to apply to payloads, ground support equipment, critical facilities, and/or hazardous and safety critical operations. The top row of boxes represents the sub-processes for establishing the program concept and applicable Range Safety requirements per this publication. The second row of boxes represents the sub-processes for analysis, design, and testing for the program per volumes 2 through 5 of this publication. The third row of boxes represents the sub-processes for operations and launch at the ranges per volumes 1 and 6 of this publication. The details of this process can be found in volumes 2 through 6 of this publication, as indicated. In addition, Eastern and Western Range 127-1, Range Safety Requirements, *Range User Handbook*, describes this process in greater detail. Attachment 6 of this volume contains a detailed tailored version of this process specifically developed for generic payloads and payload buses.

#### **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 30/45 SW/XP office. The purpose of this meeting is to present program concepts regarding flight plans; launch complex selection; launch vehicle, payload, and ground support equipment; the FSS; and facility design, operations, and launch complex safety responsibility to determine if there are any major safety concerns that could impact the program.

4.3.2. This TIM may occur at anytime but shall be no later than the formal program introduction (PI) via the 30/45 SW/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 the program. The purpose of tailoring the publication is to ensure that only applicable requirements are identified and to determine whether or not 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 1 of this volume.

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 licensed programs at AFSPC ranges per the memorandum of agreement between HQ AFSPC and the FAA/AST on 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 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), Volume 2].

4.5.2. Combined or independent safety reviews in association with the Concept Design Review (cDR), Preliminary Design Review (PDR), and Critical Design Review (CDR) for launch vehicle, payload, and associated ground support equipment design [Missile System Prelaunch Safety Package (MSPSP), Volume 3], airborne FSS and associated ground support equipment design [Flight Termination System Report (FTSR), Volume 4], critical facility design [Facility Safety Data Package (FSDP), Volume 5], and ground operations plans (GOPs), Volume 6.

4.5.2.1. cDRs shall provide design and operations detail to at least the system level.

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

4.5.2.3. CDRs shall provide design and operating detail to the component and piece part level.

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

**4.6. ELS Determinations and Waivers:**

**4.6.1. General.** Range Users shall identify the need for any potential ELS determination and/or waiver regarding requirements in this publication to Range Safety for resolution. 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 cDR. Details and requirements for submitting non-compliance requests can be found in Attachment 3 of this volume.

**4.6.2. ELS Determination.** The phrase *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 AFSPC ranges have been referred to in the past as *meets intent certifications*. ELS determinations are normally incorporated during the tailoring process.

**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, including launch 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 or qualitative risk analysis, and the activity may or may not exceed the public risk criteria.

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. A “get-well” plan shall be required except for those with lifetime effectivity.

4.6.3.4. The FAA shall be included in the waiver process for licensed programs at AFSPC ranges per the memorandum of agreement between HQ AFSPC and FAA/AST on Resolving Requests for Relief from Common Launch Safety Requirements.

4.6.3.5. The SW Commanders shall approve or disapprove all waivers affecting public safety.

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

**4.6.4. Submittal.** The Range User shall submit all waiver requests for review and approval separately. 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 or launch 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 systems, including launch 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 1.2.3. of this volume. Attachment 6 of this volume 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, SAFETY 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 also 4.6).

#### **5.2. Safety Authorizations:**

5.2.1. Programs launching from the AFSPC ranges shall obtain authorizations from the appropriate authority.

5.2.2. Programs operating from an AFSPC range shall use an FTS that is jointly approved for flight at all AFSPC ranges. This includes government and FAA-licensed programs. Departures from this policy shall be approved by all AFSPC ranges. Departures from this policy 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 AFSPC range.

5.2.3. Programs launching from AFSPC ranges shall obtain authorizations for common requirements from the appropriate SW authorities.

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

5.2.3.2. In general, if a program is approved at either of the current AFSPC 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, AFSPCMAN 91-710 tailoring noncompliances, 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. SW Commanders.** The following safety approvals shall be authorized only by the SW Commanders:

5.3.1.1. Tailored versions of AFSPCMAN 91-710 affecting public safety.

5.3.1.2. Co-signatory with NASA/Johnson Space Center on STS Range Safety Flight Rules, including termination criteria.

5.3.1.3. Range Safety launch commit criteria for all launch vehicles.

5.3.1.4. The launch of launch vehicles containing explosive warheads.

5.3.1.5. The launch of nuclear payloads.

5.3.1.6. Waivers affecting public safety.

5.3.1.7. Alternative thrust termination concepts and design.

5.3.1.8. Launch Complex Safety Training and Certification Plan (Volume 1, Attachment 7).

**5.3.2. Chiefs of Safety.** The following safety approvals shall be authorized by the Chiefs of Safety or a designated representative:

5.3.2.1. Tailored versions of AFSPCMAN 91-710 not affecting public safety (Volume 1, Attachment 1).

5.3.2.2. All ELSs and all waivers that do not affect public safety.

5.3.2.3. SSPP (Attachment 2 of this volume).

5.3.2.4. Launch vehicle and payload flight plans, PFDP, and FFDP (Volume 2).

5.3.2.5. Aircraft and Ship Intended Support Plans (ISPs) (Volume 2).

5.3.2.6. Directed Energy Plans (DEPs) (Volume 2).

5.3.2.7. MSPSP (Volume 3, Attachment 1).

5.3.2.8. Airborne FTSR (Volume 4, Chapter 9).

5.3.2.9. FSDP (Volume 5, Attachment 1).

5.3.2.10. Hazardous and Safety Critical Procedures (Volume 1 and Attachments 1 and 2 of Volume 6).

5.3.2.11. Range Safety Launch Operations Approval Letter (Volumes 1 and 6).

5.3.2.11.1. WR. A Range Safety Launch Operations Approval Letter to launch from or onto the WR shall be provided to the Range User no later than the scheduled LRR conducted before a planned launch operation. Receipt of this letter depends on the Range User having obtained the previously required approvals described in this volume.

5.3.2.11.2. ER. Launch Operations Approval Letters are not normally used on the ER. Wing Safety's GO at the LRR constitutes approval to launch and is contingent upon the Range User having obtained the required approvals identified in this volume. However, a Range Safety Launch Operations Approval Letter can be provided, if requested.

5.3.2.11.3. Lack of launch operations approval may result in the launch being withdrawn from the Range schedule.

5.3.2.12. Final Range Safety Approval for Launch (Volumes 1 and 6).

5.3.2.12.1. Holdfire checks, flight safety system checks, and other safety critical checks shall be performed satisfactorily; environmental conditions shall be met; and all Range Safety launch commit criteria shall be "green" before final approval to launch.

5.3.2.12.2. Given that holdfire checks, flight safety system checks, other safety critical checks, and environmental conditions are satisfactory and all Range Safety launch commit criteria are "green," Range Safety shall provide a final approval to launch as follows: At the ER, the Chief of Safety provides approval by relaying to the MFCO, "CLEAR TO LAUNCH." 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 vehicles.

5.3.2.14. Range Safety Mission Rules, including termination criteria for expendable launch vehicles.

5.3.2.15. Safety Assessment Report.

5.3.2.16. 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 Explosive Safety Board (DDESB).

**5.4.2. Use of Radioactive Sources for Space Operations.** The use of radioactive sources for space operations requires approval in accordance with the procedures in Volume 3.

**5.5. Documentation and Data Requirements.** Volumes 2 through 6 of this publication have “Documentation Requirements” or “Data Requirements” sections that describe the information that shall be submitted and the processes that shall be used to obtain the necessary approvals to operate at the 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 volumes. While developing the required documentation, Range Users are encouraged to work closely with Range Safety to facilitate the approval process. The Eastern and Western Range 127-1, Range Safety Requirements, *Range User Handbook* provides additional helpful information regarding documentation requirements. The Range User is responsible for providing the following documents (not all inclusive):

5.5.1. Tailored version of AFSPCMAN 91-710, if desired (Attachment 1 of this volume).

5.5.2. Tailored version of an SSPP (Attachment 2 of this volume).

5.5.3. Launch Complex Safety Training and Certification Plan, if desired (Attachment 7 of this volume).

5.5.4. Flight Plans, PFDPs and FFDPs, ISPs, and DEPs (Volume 2).

5.5.5. MSPSP and associated test plans and reports (Volume 3 and Attachment 1 of Volume 3).

5.5.6. Airborne FTSR (Volume 4, Chapter 9).

5.5.7. FSDP for all critical facilities and launch complexes including applicable test plans, test reports, demolition plans, and explosive quantity distance site plans (Volume 5 and Attachment 1 of Volume 5).

5.5.8. GOPs, hazardous and safety critical procedures, recycle procedures, FEOPs, Emergency Evacuation Plans (EEPs), and, as applicable, Emergency Response Plan (ERP) for graphite/epoxy composite overwrapped and Kevlar-wrapped pressure vessels (Volume 6 and Attachments 1 and 2 of Volume 6).

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

5.5.10. ELS or waiver request justification (Attachment 3 of this volume).

5.5.11. Safety Assessment Report.

## CHAPTER 6

### INVESTIGATING AND REPORTING MISHAPS AND INCIDENTS

**6.1. Mishaps and Incidents Involving Air Force Personnel and Resources.** In accordance with AFI 91-204, *Safety Investigations and Reports*, the ranges shall investigate and report all mishaps and incidents involving USAF personnel and resources.

**6.2. Non-Air Force Personnel and Resources:**

6.2.1. The AFSPC ranges shall not report or investigate non-Air Force mishaps under AFI 91-204 auspices. However, Range Safety shall assist and participate in non-Air Force mishap investigations that affect or could affect public safety, launch area safety, or Air Force resources and may assist in non-Air Force mishap investigations that affect or could affect launch complex safety or non-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.

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

**6.3. Reporting Space Launch System Anomalies.** Any anomaly with potential safety implications occurring in a launch vehicle or system during prelaunch processing, launch, flight, or post-launch processing shall be promptly reported to Range Safety for review. Range Users shall notify the Range Safety office 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.** This publication shall normally be updated at least once every four years; however, it may be updated more frequently, if required. If circumstances warrant, revisions may be made on a volume-by-volume basis.

**7.2.** Permanent changes shall be performed in accordance with the requirements in Attachment 5 of this volume.

**7.3.** Changes requiring immediate attention, such as those based on a previously unknown risk or safety compromise, shall be made as necessary and distributed as Change Notices.

**7.4.** All changes to this publication shall be coordinated among the AFSPC ranges before being submitted to HQ AFSPC/SEC for incorporation. All affected Range Users shall be informed of any changes to this publication.

## CHAPTER 8

### RANGE USER INFORMATION SOURCES

**8.1. Range User Handbook.** The Eastern and Western Range 127-1, Range Safety Requirements, *Range User Handbook* is available to all Range Users. This handbook provides informational tools to help Range Users achieve the Range Safety “concept-to-launch” process in the most efficient manner possible. Contact the Range Safety Office to obtain a copy or download the handbook from the Range Safety web site.

#### **8.2. Organization of the Volumes:**

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

**8.2.2. Open Text.** The open text contains the actual mandatory performance-based requirements. The only tailoring expected for these requirements would be the deletion of non-applicable requirements. For example, solid rocket motor performance requirements would be deleted for launch systems that do not use solid rocket motors.

#### **8.2.3. Bordered Paragraphs:**

8.2.3.1. Bordered paragraphs are non-mandatory and are used to identify some of the potential detailed technical solutions that meet the performance requirements. In addition, the bordered paragraphs contain 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 technical solutions are provided for the following reasons:

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

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

8.2.3.1.3. 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.

8.2.3.2. 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:

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

8.2.3.2.2. 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.

8.2.3.3. 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 AFSPCMAN 91-710 for that specific program.

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

**8.3. AFSPC Range Safety Web Site Access.** The official version of AFSPCMAN 91-710 will be posted on the HQ AFSPC publications web site. The web address for this site is <https://halfway.peterson.af.mil/pubs/series91.htm>. Access to this site can be accomplished through PETECENTRAL (<https://petecentral/>) then clicking on the following in the order shown: library, forms/pub, electronic publications, AFSPC publications, series 91, and AFSPCMAN 91-710. Range Users can access AFSPCMAN 91-710, as well as the disposition of comments to this publication, via a separate section of HQ AFSPC/DOSL's Launch Information Support Network (LISN) web site. The web address for the LISN web site is <https://lisn.spacecom.af.mil/>. This site is password protected. Once at the site, Range Users must click on Request Access to LISN and complete the required paperwork to obtain a password. After obtaining a password, Range Users can click on AFSPC SE Range Safety Rqmts to obtain access to AFSPCMAN 91-710 and comment dispositions.

BILLY R. COLWELL, Colonel, USAF  
Director of Safety

## ATTACHMENT 1

### THE AFSPCMAN 91-710 TAILORING PROCESS

#### **A1.1. Introduction:**

**A1.1.1. Purpose.** Tailoring provides a means for formulating a specific edition of AFSPCMAN 91-710, incorporating only those requirements that apply to a particular Range User program. Additionally, tailoring documents whether or not the Range User will meet the requirements as written or achieve an ELS through an acceptable alternative. A tailored version of the publication is denoted as AFSPCMAN 91-710 Tailored [T]. Programs that launch from only one of the AFSPC ranges shall be tailored by the appropriate SW/SE section. A combined 30/45 SW/SE team shall tailor programs that intend to launch from more than one of the AFSPC ranges. The FAA shall be included in the tailoring process for licensed programs at AFSPC ranges. Programs launching from AFSPC ranges shall have an FTS that is jointly approved for flight at all ranges for all launching vehicles (government or FAA licensed). Departures from this policy shall be approved by all affected ranges. Tailoring refers to the process used at AFSPC ranges beginning at program introduction (PI) where AFSPC (Range Safety) organizations and a Range User review each safety requirement and jointly document whether or not the requirement is applicable to the Range User; and if it is applicable, whether or not the Range User will meet the requirement as written or achieve an ELS through an 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.

**A1.1.2. Content.** This attachment describes the rationale for tailoring, the tailoring process, and the requirements for documenting tailored editions of the publication.

**A1.1.3. Applicability.** The tailoring process is applicable to all programs (boosters, solid rocket motors, upper stages, payloads, 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.

**A1.1.4. 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 Range User and Range Safety personnel who have specific tailoring authority.

**A1.1.5. Tailoring Rationale.** Tailoring shall be accomplished based on the following 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.

##### **A1.1.5.1. Deletion of a Requirement:**

A1.1.5.1.1. When a requirement is not applicable to a Range User program, the requirement shall be deleted.

A1.1.5.1.2. The original paragraph number and headings shall remain, but the non-applicable text shall be removed and replaced with the abbreviation *N/A*.

##### **A1.1.5.2. Change to a Requirement:**

A1.1.5.2.1. ELS determinations may be provided and approved by the HPWT through the change process; however, the HPWT cannot provide or approve waivers.

A1.1.5.2.2. A change is allowed to tailor the requirement to a particular system as long as the intent of the requirement is met and the ELS is maintained.

A1.1.5.2.3. The change shall be written in the place of the original requirement.

A1.1.5.2.4. The existing numbering system shall remain the same to the maximum extent possible.

A1.1.5.2.5. Additional paragraphs may be added; however, using the remaining unaffected paragraph numbers is not allowed.

A1.1.5.2.6. 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.

#### **A1.1.5.3. Addition to a Requirement:**

A1.1.5.3.1. An addition to a requirement is allowed when there are no existing requirements addressing new technology, when unforeseen hazards are discovered, when federal or industry standards change, and for similar reasons.

A1.1.5.3.2. An addition shall be added with new paragraph numbers in the section for which it is appropriate or in a new section if no other section applies.

A1.1.5.3.3. All changes shall be highlighted in bold. Insertions/additions of text, including partial insertions, shall be shown with the new text marked with underline.

#### **A1.1.5.4. Range User Information Only:**

A1.1.5.4.1. 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.

A1.1.5.4.2. All "Range User Information Only" requirements shall be highlighted with an asterisk before the affected paragraph.

**A1.1.5.5. Waivers.** Waivers are not rationale for the deletion of requirements. The requirements shall remain in the AFSPCMAN 91-710[T] and the waiver process shall be used for the disposition of the requirement.

#### **A1.1.5.6. Risk-Cost Benefit Analysis:**

A1.1.5.6.1. 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.

A1.1.5.6.2. A risk-cost benefit analysis, based on the criteria defined in Figure 3.1 and Table 3.1 of Chapter 3 of this volume, shall be submitted to Range Safety.

A1.1.5.6.3. Based on risk-cost benefit analysis data, Range Safety and the Range User shall reach agreement on the disposition of the requirement in question.

A1.1.5.6.4. If the application of an AFSPCMAN 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.

#### **A1.1.6. Scheduling Technical Interchange Meetings:**

A1.1.6.1. TIMs are required for Range Users to present their systems to Range Safety and to participate in the active tailoring of the publication.

A1.1.6.2. 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 (wordsmithing) is started.

A1.1.6.3. AFSPCMAN 91-710[T] TIM data shall be provided to Range Safety at least 30 days before scheduled TIMs.

#### **A1.2. Tailoring Process:**

##### **A1.2.1. Preparation of an Optional Draft Edition of AFSPCMAN 91-710:**

A1.2.1.1. If desired, the Range User and/or Range Safety may produce an optional draft edition of AFSPCMAN 91-710[T] based on conceptual data and meetings.

A1.2.1.2. The purpose of a draft AFSPCMAN 91-710 [T] is to eliminate all non-applicable requirements, leaving only applicable requirements from which detailed tailoring can be performed.

A1.2.1.3. The draft AFSPCMAN 91-710 [T] shall be delivered as soon as possible and is negotiable.

##### **A1.2.2. Generation of Tailoring Requests:**

A1.2.2.1. AFSPCMAN 91-710 [T] Tailoring Requests shall be used to document proposed AFSPCMAN 91-710 [T] deletions, changes, and additions.

A1.2.2.2. Tailoring Requests should be completed before scheduled TIMs and submitted to Range Safety for review or they may be completed during TIMs. An example of a tailoring request is in the Eastern and Western Range 127-1, Range Safety Requirements, *Range User Handbook*.

A1.2.2.3. 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.

##### **A1.2.2.4. Completing Tailoring Requests:**

A1.2.2.4.1. The original AFSPCMAN 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.

A1.2.2.4.2. Deletions of requirements that are non-applicable and need no formal explanation may all be listed on one or more Tailoring Request forms.

A1.2.2.4.3. Tailoring Requests dealing with similar or related requirements and rationale may all be combined on the same Tailoring Request form.

**A1.2.2.5. Disposition of Tailoring Requests:**

A1.2.2.5.1. If necessary, Range Safety shall comment on the proposed change and dispose of it as "approved as written," "approved with provided comments," or "disapproved."

A1.2.2.5.2. When agreement is reached and a Tailoring Request is approved, Range Safety and Range User representatives shall sign and date the form.

**A1.2.3. Publication of AFSPCMAN 91-710 [T]:****A1.2.3.1. Final Publication:**

A1.2.3.1.1. The goal for final publication of an AFSPCMAN 91-710 [T] is as soon as possible, but should be no later than 30 days after the CDR. Tailoring can be an ongoing process and tailored documents should be considered living documents that may change throughout the life of the program.

A1.2.3.1.2. In some cases, it may be necessary to complete the AFSPCMAN 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 AFSPCMAN 91-710 [T] publication.

**A1.2.3.2. The tailored edition shall look like AFSPCMAN91-710 with the following exceptions::**

A1.2.3.2.1. The document title/heading shall read, "AFSPCMAN91-710VX TAILORED FOR Program Name". This title shall be centered at the top of each page..

A1.2.3.2.2. The date of the applicable contract/CSOSA/agreement/etc. shall be listed under the title and centered at the top of each page.

A1.2.3.2.3. The date of the tailored edition shall be on the cover page of the document.

A1.2.3.2.4. The term "PROPRIETARY" shall be placed at the top and bottom of each page, centered directly over the title/heading (if requested by the Range User).

A1.2.3.2.5. The following items from the front page (title page) of AFSPCMAN91-710 shall be removed:

A1.2.3.2.5.1. "Docid" information (i.e. AFSPCMAN91-710VX).

A1.2.3.2.5.2. "BY ORDER OF THE COMMANDER  
AIR FORCE SPACE COMMAND"

A1.2.3.2.5.3. Air Force Space Command Shield.

A1.2.3.2.5.4. OPR and certifier information.

A1.2.3.2.5.5. Number of pages and distribution information.

A1.2.3.2.6. The remaining heading information shall be left justified.

A1.2.3.2.7. Change "**AIR FORCE SPACE COMMAND MANUAL 91-710 VOLUME X**" TO "**Extracted from AIR FORCE SPACE COMMAND MANUAL 91-710 VOLUME X**".

A1.2.3.2.8. Change "**COMPLIANCE WITH THIS PUBLICATION IS MANDATORY**" TO "**COMPLIANCE WITH THIS TAILORED EXTRACT OF AFSPCMAN91-710 IS MANDATORY**".

A1.2.3.2.9. In the introduction, the section identified as "**NOTES:**" shall read as follows:

**"NOTES:**

1. Volume 1 includes a complete table of contents for all the volumes of AFSPCMAN91-710. In addition, each individual volume contains its own table of contents. Volume 7 contains a glossary of references, acronyms, abbreviations, and terms for use with all volumes. Special publication formatting features are described in paragraph 8.2. of volume 1.

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."

A1.2.3.2.10. All deleted information shall be removed from the tailored edition.

A1.2.3.2.11. All added information shall be inserted in the tailored edition as a separate paragraph immediately following the most applicable paragraph in AFSPCMAN91-710. The added paragraph shall not be numbered. The add-in paragraphs shall be clearly labeled as, "(Program Name - Added)....."

A1.2.3.2.12. The signature block that appears on the last page of the official version of AFSPCMAN91-710, prior to the attachments, shall be removed from the tailored version.

**A1.2.3.3. Effectivity of AFSPCMAN 91-710 [T]:**

A1.2.3.3.1. Each AFSPCMAN 91-710 [T] shall contain a preface paragraph detailing its effectivity.

A1.2.3.3.2. At a minimum, the types of vehicles, the time period, and the number of vehicles to which the AFSPCMAN 91-710 [T] applies shall be addressed.

**A1.2.3.4. Assumptions:**

A1.2.3.4.1. Each AFSPCMAN 91-710 [T] shall contain a preface paragraph detailing the critical assumptions that were made in writing the tailored edition.

A1.2.3.4.2. The nature of the assumptions shall be such that a change may invalidate the AFSPCMAN 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 AFSPCMAN 91-710 [T].

A1.2.3.4.3. 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.

**A1.2.3.5. Management Summaries:**



A1.2.3.5.1. Management summaries shall be prepared to specifically identify AFSPCMAN 91-710 [T] deletions, changes, and additions. Management summaries shall be used to assist management in their review of editions of AFSPCMAN 91-710 [T].

A1.2.3.5.2. The management summary shall consist of all signed AFSPCMAN 91-710 [T] Tailoring Requests and a list of all HPWT members.

A1.2.3.5.3. A copy of the management summary and the final AFSPCMAN 91-710 [T] ready for signature shall be provided to the SW Commander and/or the Chief of Safety for their signature.

#### **A1.2.4. Approvals:**

A1.2.4.1. 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.

A1.2.4.2. Tailored volumes affecting public safety (normally Volumes 1, 2 and 4) shall be approved and signed by the on the front page of the AFSPCMAN 91-710 [T] by the Chief of Safety or a designated representative and the Range User authorized representative.

A1.2.4.3. Tailored volumes not affecting public safety (normally Volumes 3, 5, and 6) shall be approved and signed by the appropriate Range Safety section chief or a designated representative and the appropriate Range User representative.

A1.2.4.4. Each complete, final AFSPCMAN 91-710 [T] affecting public safety shall be approved and signed by the SW Commander and the appropriate Range User representative.

#### **A1.2.5. Revisions to AFSPCMAN 91-710 [T]:**

A1.2.5.1. Any revision to the publication shall be evaluated against each program AFSPCMAN 91-710 [T] to determine applicability.

A1.2.5.2. Any revisions to AFSPCMAN 91-710 [T] shall be made in accordance with the AFSPCMAN 91-710 change process.

## ATTACHMENT 2

### SYSTEM SAFETY PROGRAM REQUIREMENTS

#### A2.1. Introduction:

**A2.1.1. Purpose.** This attachment establishes the minimum requirements for a Range User's System Safety Program for range 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 Air Force programs. The program includes the corresponding requirements for a Range User System Safety Program Plan (SSPP) and identifies hazard analysis and risk assessment requirements.

**A2.1.2. Tailoring.** Tailoring of this attachment and the requisite SSPP is highly recommended. The tailoring process is defined in Attachment 1 of this volume. When conflicting requirements or deficiencies are identified in range 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.

**A2.1.3. Special Provisions.** The ranges recognize that 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. It is not the intent of the ranges for the requirements in this attachment to cause duplicate work. Additionally, the analyses and other requirements performed by the ranges in Volume 2, Flight Analyses and 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 system safety management and organization in the System Safety Program Plan shall note that these analyses and other applicable requirements are performed by the ranges.

**A2.1.4. 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.

**A2.2. 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.

**A2.2.1. Task 1: Establish a Range User Safety Program.** By the time of the Range User's program introduction, the Range User shall have established a Safety Program that meets the tailored requirements of this publication which includes the following:

A2.2.1.1. Establishing a safety management system. A Range User program manager shall be responsible for the following:

A2.2.1.1.1. Establishing, controlling, incorporating, directing, and implementing the system safety program policies.

A2.2.1.1.2. 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.

A2.2.1.1.3. 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.

A2.2.1.1.4. 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.

A2.2.1.2. 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:

A2.2.1.2.1. Reviewing and approving all safety analyses, reports, and documentation required by this publication and submitted to Range Safety for approval.

A2.2.1.2.2. Reviewing and approving all hazardous and safety critical test plans and procedures conducted at the Ranges and verifying that all safety requirements are incorporated.

A2.2.1.3. 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.

A2.2.1.4. Establishing a system safety organization or function and lines of communication within the program organization and with associated organizations (government and contractor).

A2.2.1.5. 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.

A2.2.1.6. Designating the organizational unit responsible for executing each safety task.

A2.2.1.7. Establishing the authority for resolution of identified hazards.

A2.2.1.8. 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.

A2.2.1.8.1. 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:

A2.2.1.8.1.1. Description of each hazard, including an associated hazard risk index.

A2.2.1.8.1.2. Status of each hazard and the status of the associated controls for each hazard.

A2.2.1.8.1.3. 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.

A2.2.1.8.1.4. Identification of residual risk.

A2.2.1.8.1.5. Action persons and organizational element.

A2.2.1.8.1.6. The recommended controls to reduce the hazard to a level of risk acceptable to Range Safety.

A2.2.1.8.1.7. The signature of Range Safety accepting the risk effecting closure of the Hazard Log item.

A2.2.1.9. Establishing the order of precedence for satisfying system safety requirements and resolving identified hazards as follows:

A2.2.1.9.1. Designing for Minimum Risk. From program inception, design 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.

A2.2.1.9.2. 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.

A2.2.1.9.3. 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.

A2.2.1.9.4. 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 (per Volume 1, Table 3.1). Procedures may include the use of personal protective equipment. Precautionary notations shall be standardized as specified by Range Safety. Tasks and activities judged to be safety critical by Range Safety require certification of personnel proficiency.

A2.2.1.10. Defining system safety program milestones and relate these to major program milestones, program element responsibility, and required inputs and outputs.

A2.2.1.11. Establishing System Safety Program reviews and audits.

A2.2.1.11.1. Conducting, documenting, and making the following documentation available to Range Safety upon request:

A2.2.1.11.1.1. The Range User range safety program plan and supporting risk assessment data.

A2.2.1.11.1.2. Associate contractor system safety program plan and supporting risk assessment data.

A2.2.1.11.1.3. Support contractor system safety program plan and supporting risk assessment data.

A2.2.1.11.1.4. Subcontractor system safety program plan and supporting risk assessment data.

A2.2.1.11.2. Providing support for the following:

A2.2.1.11.2.1. Safety reviews and audits performed by representatives of Range Safety.

A2.2.1.11.2.2. 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.

A2.2.1.11.2.3. Safety reviews shall be held in association with program cDR, PDR, and CDRs. Generally, the safety reviews shall address the following:

A2.2.1.11.2.3.1. Program systems and operations overview.

A2.2.1.11.2.3.2. Presentation of Range Safety required documentation and hazard analyses.

A2.2.1.11.2.3.3. AFSPCMAN 91-710 noncompliances.

A2.2.1.11.2.3.4. Open safety issues.

A2.2.1.12. Establishing an incident alert and notification, investigation and reporting process, to include notification of Range Safety.

A2.2.1.13. 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.

**A2.2.2. Task 2: Develop a System Safety Program Plan.** The Range User shall develop and implement a Range Safety approved System Safety Program Plan (SSPP) encompassing the total safety program throughout the system life cycle. 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 AFSPCMAN 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 program introduction and a final at least 45 days before any program cDR. The SSPP shall include the following information:

**A2.2.2.1. System Safety Organization.** The System Safety Organization section shall describe the following:

A2.2.2.1.1. 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.

A2.2.2.1.2. The organizational relationship between other program functional elements having responsibility for tasks with range safety impacts and the system safety management and engineering organization.

A2.2.2.1.3. Review and approval authority of applicable tasks by key system safety personnel.

A2.2.2.1.4. The responsibility and authority of key system safety personnel, other Range User organizational elements involved in the range safety effort, contractors, and system safety groups.

A2.2.2.1.5. 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.

A2.2.2.1.6. Identification of the organizational unit responsible for executing each task.

A2.2.2.1.7. Identification of the authority in regard to resolution of all identified hazards.

A2.2.2.1.8. 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.

A2.2.2.1.9. 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 noncompliances to safety requirements or program waivers.

A2.2.2.1.10. Details of how resolution and action relative to system safety will be accomplished at the program management level possessing resolution authority.

**A2.2.2.2. System Safety Program Milestones.** The SSPP shall:

A2.2.2.2.1. Define system safety program milestones and relate these to major program milestones, program element responsibility, and required inputs and outputs.

A2.2.2.2.2. Provide and maintain a program schedule of safety tasks, including start and completion dates, reports, and reviews.

A2.2.2.2.3. 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.

**A2.2.2.3. System Safety Data.** The SSPP shall:

A2.2.2.3.1. Identify deliverable data by title, number, and means of delivery such as hard copy or electronic submission. **NOTE:** MIL-STD-882 is a good source for identifying the initial Data Item Descriptions.

A2.2.2.3.2. Identify non-deliverable system safety data and describe the procedures for accessibility by Range Safety and retention of data of historical value.

**A2.2.2.4. System Safety Interfaces.** The SSPP shall identify, in detail:

A2.2.2.4.1. The interface between system safety and all other applicable safety disciplines such as nuclear safety, Range Safety, explosive and ordnance safety, chemical and biological safety, laser safety, and any others.

A2.2.2.4.2. 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.

A2.2.2.4.3. The interface between system safety and all system integration and test disciplines.

**A2.2.3. 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 before the cDR and used to provide guidance for the tailoring of AFSPCMAN 91-710. 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 constraint. 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:

A2.2.3.1. Hazardous components such as fuels, propellants, lasers, explosives, toxic substances, hazardous construction materials, pressure systems, and other energy sources.

A2.2.3.2. 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.

A2.2.3.3. 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.

A2.2.3.4. Environmental constraints including the operating environments such as drop, shock, vibration, extreme temperatures, humidity, noise, exposure to toxic substances, health hazards, fire, electrostatic discharge, lightning, electromagnetic environmental effects, ionizing and non-ionizing radiation including laser radiation.

A2.2.3.5. 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).

A2.2.3.6. Those test unique hazards that will be a direct result of the test and evaluation of the article or vehicle.

A2.2.3.7. 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.

A2.2.3.8. Training and certification pertaining to hazardous and safety critical operations and maintenance of hazardous and safety critical systems.

A2.2.3.9. 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.

A2.2.3.10. 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.

#### **A2.2.4. Task 4: Perform and Document Subsystem, System, Facility, and Operating and Support Hazard Analyses:**

**A2.2.4.1. 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 or 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:

A2.2.4.1.1. 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.

A2.2.4.1.2. 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.



A2.2.4.1.3. That the safety design criteria in the hardware, software, and facilities specifications have been satisfied.

A2.2.4.1.4. 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.

A2.2.4.1.5. 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.

A2.2.4.1.6. Test plan and procedure recommendations to integrate safety testing into the hardware and software test programs.

A2.2.4.1.7. That system level hazards attributed to the subsystem are analyzed and that adequate control of the potential hazard is implemented in the design.

A2.2.4.1.8. 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.

A2.2.4.1.9. SSHA Software:

A2.2.4.1.9.1. Software used to control safety critical computer system functions shall be developed in accordance with Volume 3, Chapter 16 of this publication.

A2.2.4.1.9.2. Range Users shall identify all safety critical computer system functions in accordance with Volume 3, Chapter 16 and develop a SSHA for each.

A2.2.4.1.9.3. Software shall be put under formal configuration control of a Software Configuration Control Board (SCCB) in accordance with Volume 3, Chapter 16 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.

A2.2.4.1.9.4. 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.

A2.2.4.1.10. 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.

A2.2.4.1.11. SSHA Submittal. A draft SSHA shall be submitted before the CDR and the final shall be provided with the final MSPSP (See Attachment 1 of Volume 3).

**A2.2.4.2. 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 iden-

tified 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:

A2.2.4.2.1. Compliance with specified safety design criteria.

A2.2.4.2.2. 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.

A2.2.4.2.3. Degradation in the safety of a subsystem or the total system from normal operation of another subsystem.

A2.2.4.2.4. Design changes that affect subsystems.

A2.2.4.2.5. Effects of reasonable human errors

A2.2.4.2.6. 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.

A2.2.4.2.7. That the safety design criteria in the hardware, software, and facilities specifications have been satisfied.

A2.2.4.2.8. 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.

A2.2.4.2.9. 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.

A2.2.4.2.10. SHA Software:

A2.2.4.2.10.1. Software used to control safety critical computer system functions shall be developed in accordance with Volume 3, Chapter 16 of this publication.

A2.2.4.2.10.2. Range Users shall identify all safety critical computer system functions in accordance with Volume 3, Chapter 16 and develop an SHA for each.

A2.2.4.2.10.3. Software shall be put under formal configuration control of a Software Configuration Control Board (SCCB) in accordance with Volume 3, Chapter 16 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.

A2.2.4.2.10.4. 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.

A2.2.4.2.11. 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.

A2.2.4.2.12. SHA Submittal. A draft SHA shall be submitted before the CDR and the final shall be provided with the final MSPSP (See Attachment 1 of Volume 3).

**A2.2.4.3. 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:

A2.2.4.3.1. Activities that occur under hazardous conditions, their time periods, and the actions required to minimize risk during these activities and time periods

A2.2.4.3.2. 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

A2.2.4.3.3. Requirements for safety devices and equipment, including personnel safety and life support equipment.

A2.2.4.3.4. Warnings, cautions, and special emergency procedures such as egress, rescue, escape, render safe, explosive ordnance disposal, and backout, including those necessitated by failure of a computer software-controlled operation to produce the expected and required safe result or indication.

A2.2.4.3.5. Requirements for packaging, handling, storage, transportation, maintenance, and disposal of hazardous materials.

A2.2.4.3.6. Requirements for safety training and personnel certification.

A2.2.4.3.7. Effects of non-developmental hardware and software across the interface with other system components or subsystems.

A2.2.4.3.8. Potentially hazardous system states under operator control.

A2.2.4.3.9. 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.

A2.2.4.3.10. 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.

A2.2.4.3.11. Updating the O&SHA. The Range User shall update the O&SHA as a result of any system design or operational changes.

A2.2.4.3.12. O&SHA Submittal. A draft O&SHA shall be submitted at least 90 days before the start of any hazardous operations and the final shall be provided with the final Ground Operations Plan (See Attachment 1 of Volume 6).

**A2.2.4.4. 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 Attachment 1 of Volume 5.

**A2.2.5. Task 5: Perform and Document a Safety Assessment Report.** 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 Volumes 1 through 6 of this publication, and shall summarize the following information:

A2.2.5.1. 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.

A2.2.5.2. 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 and Figure 3.1 of this volume.)

A2.2.5.3. 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.

A2.2.5.4. 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 and Figure 3.1 of this volume, and that the system is ready to test or operate or proceed to the next acquisition phase.

A2.2.5.5. Recommendations applicable to hazards at the interface of Range User systems with other systems, as required.

A2.2.5.6. A formal request for Range Safety approval to conduct operations at the ranges.

## ATTACHMENT 3

## SUBMITTING AFSPCMAN 91-710 NONCOMPLIANCE REQUESTS

**A3.1. Introduction:**

**A3.1.1. Purpose.** Equivalent levels of safety (ELS) and waivers are used when Range Users cannot meet the requirements of this publication.

**A3.1.2. Content.** This attachment describes the noncompliance categories and the process for submitting ELSs and waivers.

**A3.1.3. Applicability:**

A3.1.3.1. The noncompliance process is applicable to all programs including boosters, solid rocket motors, upper stages, payloads, ground support equipment, facilities, and others that operate at the ranges or elsewhere if governed under Range Safety unless grandfathered in accordance with the criteria stated below.

A3.1.3.2. The noncompliance process is also applicable to all programs regardless of which version of the old Range Safety Standards (such as AFETR 127-1, ESMCR 127-1, ERR 127-1, WSMCR 127-1, WRR 127-1, and EWR 127-1) is under contract.

A3.1.3.3. The flight plan approval process does not fall within the intent of this attachment except when it involves launch vehicle and/or payload hardware.

**A3.1.4. 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.

A3.1.4.1. Existing programs make major modifications that affect the launch vehicle'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.

A3.1.4.2. The Range User has determined that it is economically and technically feasible to incorporate new requirements into the system.

A3.1.4.3. 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.

A3.1.4.4. 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.

A3.1.4.5. A system or procedure is modified and a new requirement reveals that a significant risk exists.

A3.1.4.6. Accident and incident investigations and reports may dictate compliance with the publication.

### **A3.1.5. Noncompliance Categories.**

**A3.1.5.1. Public Safety.** Public safety noncompliance deals with safety requirements involving risks to the public, including foreign countries, their personnel and/or their resources.

**A3.1.5.2. Launch Area Safety.** Launch area safety noncompliances deal with safety requirements involving risks that are limited to personnel and/or resources on AFSPC ranges, including CCAFS and VAFB and may be extended to KSC. Launch area safety involves multiple licensed users, government tenants, or USAF squadrons.

**A3.1.5.3. Launch Complex Safety.** Launch complex safety noncompliances 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 USAF squadron/detachment (control authority). Launch complex safety is limited to risks confined to a physical space for which the single control authority is responsible.

### **A3.1.6. Effectivity of Noncompliances:**

#### **A3.1.6.1. Lifetime:**

A3.1.6.1.1. Lifetime waivers are undesirable and shall be limited to those situations where it is virtually impossible to meet the requirement or meet the intent of the requirement.

A3.1.6.1.2. Lifetime ELSs are allowed provided equivalent safety is maintained.

#### **A3.1.6.2. Time Limited:**

A3.1.6.2.1. 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, impact on schedule, and the minimum time needed to satisfactorily modify or replace the noncompliant system or to modify the noncompliant operation.

A3.1.6.2.2. 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.

### **A3.1.7. Conditions for Issuance of ELSs and Waivers:**

**A3.1.7.1. 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.

**A3.1.7.2. 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.

### **A3.1.8. Risk-Cost Benefit Analysis:**

A3.1.8.1. 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.

A3.1.8.2. Risk-cost benefit analyses based on the criteria defined in Table 3.1 of this volume shall be submitted to Range Safety.

A3.1.8.3. 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, and AF resources. However, Range Safety shall be the sole authority for the determination and disposition of requirements that affect public safety.

A3.1.8.4. If the application of an AFSPCMAN 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.

### **A3.2. Submitting Noncompliances:**

**A3.2.1. Format.** Range Users shall submit noncompliances in writing using any format that contains the same information as the Noncompliance Request form, if mutually agreed to by the Range User and Range Safety. An example format can be found in the Eastern and Western Range 127-1, Range Safety Requirements, *Range User Handbook*.

**A3.2.2. Content.** The following items shall be included in the letter or memorandum:

A3.2.2.1. Title: ELS or Waiver of (requirement a) for (requirement b).

A3.2.2.2. Descriptive Title of ELS or Waiver request.

A3.2.2.3. ELS or Waiver category.

A3.2.2.4. ELS or Waiver effectivity.

A3.2.2.5. Background.

A3.2.2.5.1. Summary of Range Safety requirement.

A3.2.2.5.2. Statement of the noncompliance.

A3.2.2.5.3. Reason for request.

A3.2.2.6. Conditions for ELS or Waiver.

A3.2.2.6.1. Hazard mitigation.

A3.2.2.6.2. Get Well Plan.

### **A3.2.3. Process:**

A3.2.3.1. 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.

A3.2.3.2. Public safety ELSs and waivers such as those including flight plan approval, FTS 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 (ELSS) or the Space Wing Commander (waivers)

approval or design change before manufacture of the booster, spacecraft, FTS, or other system in question.

A3.2.3.3. Launch area safety and launch complex safety ELSs and waivers normally require two weeks to two months to process depending on the nature of the noncompliance and the requested effectivity.

A3.2.3.4. The Space Wing shall coordinate all noncompliance requests with affected agencies, as appropriate. A coordinated review and resolution of requests for relief from common AF-FAA launch safety requirements shall be per procedures developed between the AFSPC and the FAA. The Space Wing shall also coordinate all noncompliance requests with the affected Range User.

#### **A3.2.4. Approvals:**

A3.2.4.1. Programs launching from only the ER or WR require only the appropriate 30 SW/SE or 45 SW/SE approvals.

A3.2.4.2. Programs launching from both ranges require approvals from 30 SW/SE and 45 SW/SE.

A3.2.4.3. Waivers dealing with public safety shall be approved by the SW Commanders.

A3.2.4.4. Waivers other than public safety shall be approved by the Chiefs of Safety or their designated representatives.

A3.2.4.5. ELSs shall be approved by appropriate 45 SW/SE or 30 SW/SE Chiefs of Safety or their designated representatives.



## ATTACHMENT 4

### ACCEPTABLE RISK CRITERIA

**A4.1. Introduction.** The risk criteria defined in this attachment apply to all programs and missions operating at the ranges.

#### **A4.2. Definition of Terms and Guidance Information:**

##### **A4.2.1. Casualty:**

A4.2.1.1. Definition. A casualty is a serious injury or worse, including death, to a human.

A4.2.1.2. Guidance Information. Casualty modeling is a critical part of any risk analysis performed before flight to establish launch commit criteria that protect against casualties. Abbreviated Injury Scale (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 satisfies the risk criteria for launch-essential personnel and the public. The 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.

##### **A4.2.2. Risk:**

A4.2.2.1. 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 casualties and expressed as individual risk or collective risk.

##### **A4.2.2.2. Individual Risk:**

A4.2.2.2.1. 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 ( $E_c$ ) at a specific location and event.

A4.2.2.2.2. 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.

##### **A4.2.2.3. Collective Risk:**

A4.2.2.3.1. Definition. Collective risk is the combined risk to all individuals exposed to a particular hazard during a specific period of time or event such as a specific phase of flight, launch area, downrange (overflight). Unless otherwise noted, collective risk is the mean number of casualties predicted ( $E_c$ ) to result from a given hazard.

A4.2.2.3.2. Guidance Information. For launch, the collective risk per hazard may be determined for each of the different phases of flight, such as the launch area or downrange/overflight, or accumulated through all phases of the vehicle's flight.

#### A4.2.2.4. Accumulated Risk:

A4.2.2.4.1. Definition. Accumulated risk is the combined collective risk to all individuals exposed to a particular hazard through all phases of an operation.

A4.2.2.4.2. 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.

#### A4.2.2.5. Aggregated Risk:

A4.2.2.5.1. Definition. Aggregated risk is the accumulated risk due to all hazards associated with a flight.

A4.2.2.5.2. 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.

#### A4.2.2.6. Launch-Essential Personnel:

A4.2.2.6.1. Definition. Launch-essential personnel are those persons necessary to safely and successfully complete a specific hazardous operation or launch.

A4.2.2.6.2. 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 Space Wing Commander.

#### A4.2.2.7. Public:

A4.2.2.7.1. Definition. Public refers to all persons not in the launch-essential category. There are two sub-categories of public: neighboring operations personnel and the general public.

##### A4.2.2.7.2. Neighboring Operations Personnel:

A4.2.2.7.2.1. Definition. Neighboring operations individuals are individuals, not associated with the specific operation or launch currently being conducted, required to perform safety, security, or critical tasks at the launch base and who are notified of a neighboring hazardous operation and are either trained in mitigation techniques or accompanied by a properly trained escort.

A4.2.2.7.2.2. 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 personnel may include individuals performing launch processing tasks for another launch, but do not include individuals in training for any job or individuals performing routine activities such as administrative, maintenance, support, janitorial. Neighboring operations personnel may be allowed within safety clearance zones and hazardous launch areas and would not be evacuated with the general public. Neighboring operations personnel 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 neighboring operations personnel, with the concurrence of the SW Commander. For a

commercially licensed launch, the FAA as well as the range must approve the numbers and locations of neighboring operations personnel.

#### A4.2.2.7.3. General Public:

A4.2.2.7.3.1. Definition. The general public consists of all individuals that are not in the launch-essential personnel or neighboring operations personnel categories.

A4.2.2.7.3.2. Guidance Information. For a specific launch, the general public includes all visitors, media, and other non-essential personnel at the launch base, as well as persons located outside the boundaries of the launch site.

#### A4.2.2.7.4. Probabilistic Modeling:

A4.2.2.7.4.1. 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.

A4.2.2.7.4.2. 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.

#### A4.2.2.7.5. Deterministic Modeling:

A4.2.2.7.5.1. 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.

A4.2.2.7.5.2. 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.

### A4.3. Description of Risk Criteria:

A4.3.1. As shown in Table A4.1, comparing normally accepted public, day-to-day accident risk exposure to normal launch vehicle and payload launch operating risks indicates that, under any circumstances, the annual collective risk for launch operations is small.

A4.3.2. Individual hazardous activities may exceed guidance levels based on national need or mission requirements. ELSs or waiver requests are required.

A4.3.3. 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 not be aggregated. Risk guidance levels in 3.2 and 3.3 of this volume are derived from the criteria shown in Table A4.1.

**Table A4.1. Normally Accepted Public Ambient Collective Accident Risks.**

<b>Hazardous Events</b>	<b>Average US Individual Casualty<sup>j</sup> Risk per Year</b>	<b>Collective Casualty Risk per Year for Population in ER and WR Launch Area<sup>a</sup></b>	<b>Equivalent Launch Collective Casualty Risk per Year</b>	<b>Launch Guidance Limits: Collective Casualty Risks per Launch</b>
All Accidents	$7.2 \times 10^{-2b}$	$1.8 \times 10^4$		
Motor Vehicle Accidents	$8.0 \times 10^{-3b}$	$2.0 \times 10^3$		
Air Travel Accidents	$6.4 \times 10^{-4c}$	$1.6 \times 10^2$		
Natural Hazards <sup>d</sup>	$2.6 \times 10^{-4e}$	$6.5 \times 10^1$		
Hypothetical Nuclear Plant Accident	$4.0 \times 10^{-6e}$	1.0		
Aviation Overflight Accidents		$1.8 \times 10^{-2f}$		
Maximum Risk Acceptable <sup>g</sup> for Accident in National Need Launch			$1 \times 10^{-2}$	$300 \times 10^{-6h}$
Maximum Risk Acceptable <sup>g</sup> for Accidents in Launches Unless High Management Review			$1 \times 10^{-3}$	$30 \times 10^{-6i}$

**Notes:**<sup>a</sup> Total population of  $2.5 \times 10^5$  assumed exposed to ER or WR launch area accidents.

<sup>b</sup> 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  $2.5 \times 10^8$ .

<sup>c</sup> 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.

<sup>d</sup> Lightning, tornadoes, hurricane (earthquake negligible).

<sup>e</sup> From *Reactor Safety Study*, WASH-1400/NUREG-75/014, 1975.

<sup>f</sup> 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.)

<sup>g</sup> If the risk is  $> 30 \times 10^{-6}$  but  $< 300 \times 10^{-6}$ , a SW Commander waiver is required. If the risk is  $> 300 \times 10^{-6}$  but  $< 3000 \times 10^{-6}$ , in addition to the SW Commander waiver, the 14 AF/CC shall be advised of the risk. If the risk is  $> 3,000 \times 10^{-6}$ , in addition to the SW Commander waiver and notifying the 14 AF/CC, approval shall be obtained from the AFSPC/CC.

<sup>h</sup> At most one such launch per year assumed for calculation purposes only. In practice, there is no such limit.

<sup>i</sup> From Risk Commonality/Acceptability Workshop, August 1990. Based on an equivalent to an average of one casualty per 1,000 years with launches at the rate of 33 per year.

<sup>j</sup> A casualty is a serious injury or worse, including death to a human.

A4.3.4. The following risk acceptability criteria are provided as guidance for the SW Commanders and as planning information for Range Users.

A4.3.5. The risk associated with the total flight to all members of the general public, excluding persons in waterborne vessels and aircraft, shall not exceed an expected average number of 0.00003 casualties ( $E_c \leq 30 \times 10^{-6}$ ) from impacting inert and explosive debris,  $E_c \leq 30 \times 10^{-6}$  for toxic release (exposure to rocket propellant effluent), and  $E_c \leq 30 \times 10^{-6}$  for far field blast overpressure. The  $E_c$  criterion for each hazard applies to each launch from liftoff through orbital insertion, including planned impact for an orbital launch, and through final impact for a suborbital launch. Range Safety shall determine the public risk due to other hazards associated with the proposed flight of a launch vehicle on a case-by-case basis.

A4.3.6. The risk to an individual member of the public shall not exceed an  $E_c$  of 0.000001 per launch ( $E_c \leq 1 \times 10^{-6}$ ).

A4.3.7. The probability of debris impact to all waterborne vessels ( $P_{iv}$ ) shall not exceed 0.00001 ( $P_{iv} \leq 1 \times 10^{-5}$ ) in each debris impact hazard area identified by Range Safety.

#### **A4.4. Risk Assessment Approach and Policy:**

A4.4.1. The overall risk assessment approach at AFSPC launch ranges is to accumulate the risks (both in the launch area and down range/overflight) due to the various hazards (debris, blast, and toxics), but not to aggregate the risks. Refer to the definitions of terms for an explanation of accumulated and aggregated risks. Each hazard risk is treated separately.

A4.4.2. Accumulated Risk Criteria Levels. 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.

A4.4.2.1. Hazard Risks  $\leq 10$  in 1,000,000 ( $E_c \leq 10 \times 10^{-6}$ ). 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. Range Safety is the approval authority for risks  $\leq 10$  in 1,000,000 ( $E_c \leq 10 \times 10^{-6}$ ).

A4.4.2.2. Hazard Risks  $>10$  through 30 in 1,000,000 ( $E_c >10 \times 10^{-6}$  through  $30 \times 10^{-6}$ ). This level of risk may require the Range User to take additional measures to protect personnel and resources. Examples include fix/correct/improve existing noncompliances, 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 risks  $>10$  through 30 in 1,000,000 ( $E_c >10 \times 10^{-6}$  through  $30 \times 10^{-6}$ ).

A4.4.2.3. Hazard Risks  $>30$  through 300 in 1,000,000 ( $E_c >30 \times 10^{-6}$  through  $300 \times 10^{-6}$ ). This level of risk may require the Range User to take additional measures to protect personnel and resources. Examples include fix/correct/improve existing noncompliances, improve risk analyses to reduce the level of uncertainty, require a day-of-launch risk analysis, establish disaster aversion criteria. The SW Commanders, based on their assessment of national need, may approve launches with risks  $>30$  through 300 in 1,000,000 ( $E_c >30 \times 10^{-6}$  through  $300 \times 10^{-6}$ ). FAA-licensed launches with risks greater than 30 in 1,000,000 ( $E_c >30 \times 10^{-6}$ ) require a waiver from both the SW Commander and the FAA.

A4.4.2.4. Hazard Risks  $>300$  in 1,000,000 ( $E_c >300 \times 10^{-6}$ ). This level of risk may require the Range User to take additional measures to protect personnel and resources. Examples include fix/correct/improve existing noncompliances, improve risk analyses to reduce the level of uncertainty, require a day-of-launch risk analysis, establish disaster aversion criteria.. The SW Commanders, based on their assessment of national need, may approve launches with risks greater than 300 in 1,000,000 ( $E_c >300 \times 10^{-6}$ ). However, the SW Commander shall advise the 14 AF/CC before allowing launches that exceed an  $E_c$  of  $300 \times 10^{-6}$ . FAA-licensed launches with risks greater than 300 in 1,000,000 ( $E_c >300 \times 10^{-6}$ ) require a waiver from both the SW Commander and the FAA.

#### A4.4.3. Acceptable Accumulated Risk Level Criteria for Each Hazard:

A4.4.3.1. Debris, 30 in 1,000,000 ( $E_c = 30 \times 10^{-6}$ ).

A4.4.3.2. Blast, 30 in 1,000,000 ( $E_c = 30 \times 10^{-6}$ ).

A4.4.3.3. Toxics, 30 in 1,000,000 ( $E_c = 30 \times 10^{-6}$ ).

#### A4.5. Risk Analysis:

A4.5.1. AIS level 3 shall be used to quantify casualties in risk analysis models.

A4.5.2. 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 were determined by Range Safety to be too risky, Range Users shall perform a tier 2 (sophisticated) risk analysis. The tier 1 thresholds reflect 1 percent probability of effect.

#### A4.5.2.1. Hazard Parameters:

##### A4.5.2.1.1. Debris:

A4.5.2.1.1.1. 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 down range/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.

##### A4.5.2.1.2. Blast Overpressure:

A4.5.2.1.2.1. 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 5

## MAKING CHANGES TO AFSPCMAN 91-710

**A5.1. Introduction:**

**A5.1.1. 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.

**A5.1.2. 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.

**A5.1.3. Applicability.** The publication change process is applicable to all Range Users and range organizations that are responsible for establishing and enforcing Range User requirements.

**A5.2. Change Process.** Changes to AFSPCMAN 91-710 shall be submitted using the 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. A sample of this form may be found in the Eastern and Western Range 127-1, Range Safety Requirements, *Range User Handbook*. While the Change Request form is preferred, alternative formats may be accepted so long as all the 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.

**A5.2.1. Completing Change Requests.** Change Requests shall include the following information:

A5.2.1.1. Date of request.

A5.2.1.2. Name of originator.

A5.2.1.3. Name of company or agency.

A5.2.1.4. Address of company or agency.

A5.2.1.5. E-mail address, telephone number, and fax number, as applicable.

A5.2.1.6. The numeric designation of the affected paragraph.

A5.2.1.7. The text for the suggested change.

A5.2.1.8. The rationale for the suggested change.

**A5.2.2. Submitting Change Requests.** Completed Change Requests shall be submitted to the 45 SW/SE Office of the Chief of Safety, Systems Safety Engineering Support, 1201 Edward H. White Street, Patrick Air Force Base, Florida 32925-3238. Change Requests can also be submitted electronically via the following Range Safety e-mail address: [ewr1271@patrick.af.mil](mailto:ewr1271@patrick.af.mil).

**A5.2.3. Range User Review.** Range Safety shall provide all Range Users the opportunity to review and comment on all Range Safety evaluations of all material Change Requests before final resolution with the exception of administrative requests that may not be included.

**A5.2.4. Disposition of Change Requests:**

A5.2.4.1. The 45 SW/SE is designated as the lead range for administratively processing changes to AFSPCMAN 91-710. The 45 SW/SE shall resolve all changes in complete coordination with

the 30 SW/SE. AFSPC/SE shall retain overall approval authority of AFSPCMAN 91-710 and associated changes. AFSPC/SE is responsible for ensuring coordination with lateral and external organizations, standardizing requirements between the AFSPC ranges when appropriate, and arbitrating any disputes to changes to AFSPCMAN 91-710.

A5.2.4.2. The disposition of Change Requests falls into the following three categories:

A5.2.4.2.1. Concur As Written.

A5.2.4.2.2. Concur With The Intent. In such cases, the Change Request will be rewritten.

A5.2.4.2.3. Do Not Concur. Rationale for not accepting the proposed change will be provided.

**A5.2.5. Range User Notification.** Approved changes to the publication shall be issued periodically, typically biennially. Changes requiring immediate Range User attention shall be published as required as official publication Change Notices. A sample Change Notice is included in the Eastern and Western Range 127-1, Range Safety Requirements, *Range User Handbook*.

## ATTACHMENT 6

### GENERIC PAYLOAD POLICY AND APPROVAL REQUIREMENTS

**A6.1. 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 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 Range Safety requirements.

**A6.1.1. Policy.** To take advantage of previously approved generic payload/launch systems and their associated ground processing safety data, the policies described below shall be followed; however, they may be modified to meet individual program requirements:

A6.1.1.1. Range Safety and the Range User shall conduct initial planning meetings to establish a generic payload/launch system approval process.

A6.1.1.2. 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.

A6.1.1.3. 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.

A6.1.1.3.1. 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.

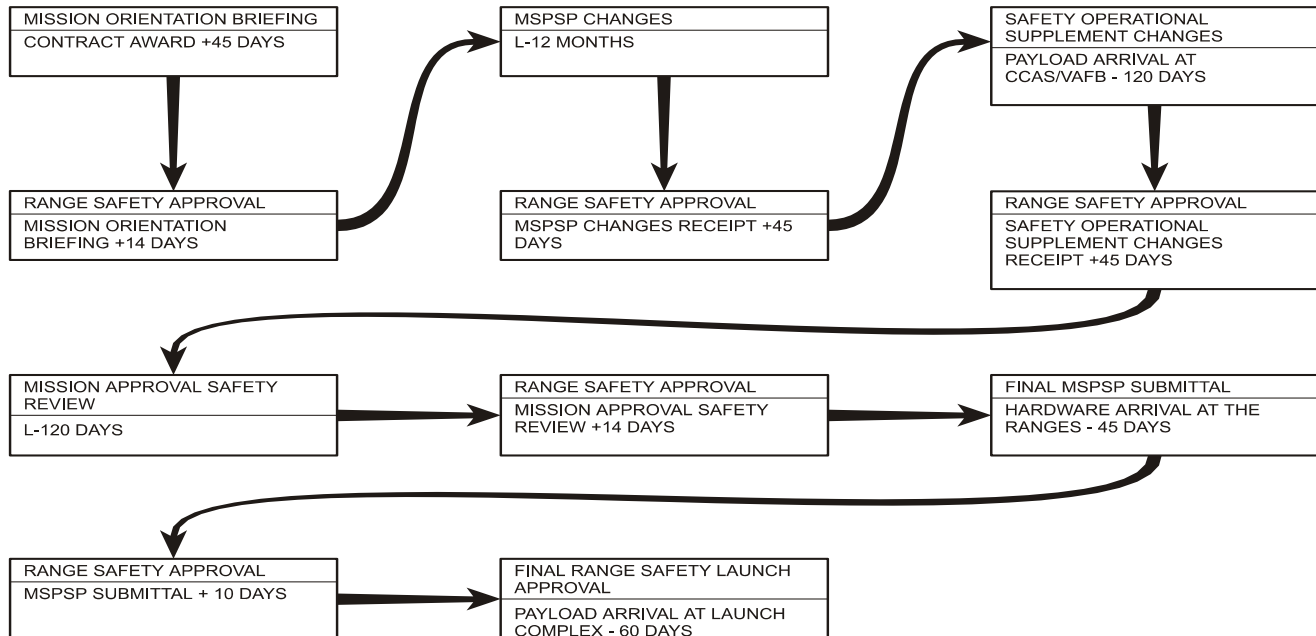
A6.1.1.3.2. Data submittal and Range Safety response times shall be established based on the joint safety assessment and modified only upon agreement of all parties.

A6.1.1.4. 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.

**A6.2. Approval Process for Existing Payload Buses.** For existing payload buses with approved baseline Missile System Prelaunch Safety Packages (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 A6.1 and described below:

**Figure A6.1. Approval Process for Existing Payload buses.**



### A6.2.1. Launch Services and Mission Orientation Briefing:

A6.2.1.1. A launch services and mission orientation safety briefing shall be conducted for Range Safety approximately 45 days after contract award for the mission. The briefing shall cover the following topics:

- A6.2.1.1.1. Changes to the launch vehicle.
- A6.2.1.1.2. Changes to the payload bus.
- A6.2.1.1.3. Planned payload additions for the mission.
- A6.2.1.1.4. Changes to hazardous systems and operations (the focus of this review).

A6.2.1.2. 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.

### A6.2.2. Data Review and Approval:

#### A6.2.2.1. Mission Unique Missile System Prelaunch Safety Package:

A6.2.2.1.1. 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.

A6.2.2.1.2. Range Safety shall provide responses 45 calendar days after receipt of the data package.

**A6.2.2.2. Ground Operations Plan and Hazardous and Safety Critical Procedures:**

A6.2.2.2.1. 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.

A6.2.2.2.2. Range Safety shall provide responses 45 calendar days after receipt of the data.

**A6.2.3. Mission Approval Safety Review:**

A6.2.3.1. A mission approval safety review shall be conducted approximately L - 120 days to obtain Range Safety approval for launch vehicle and payload processing, transport to the payload launch pad, payload launch vehicle mating, and launch pad payload processing.

A6.2.3.2. Unless there are significant issues, Range Safety shall provide mission safety approval 14 calendar days after the safety review.

**A6.2.4. 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 Launch Readiness Review (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.

**A6.3. Approval Process for New Payload Buses.** For new payload buses, the Range User shall submit a request for generic status at program introduction. 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 A6.2 for existing payloads.

**A6.4. Incidental Range Safety Issues.** Incidental Range 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 an individual launch requirements. ELS or waiver requests are required.

## ATTACHMENT 7

## LAUNCH COMPLEX SAFETY TRAINING AND CERTIFICATION

**A7.1. Introduction:**

**A7.1.1. Purpose.** This attachment provides 30 SW/SE and/or 45 SW/SE operational safety training and certification requirements for launch complex safety. These requirements shall be used by Range Users who wish to assume control authority for launch complex safety. These requirements may be jointly tailored by the Range User and Range Safety to meet special or unique program requirements in accordance with Attachment 1 of this volume. Minimum standards, roles, and responsibilities for a launch complex safety program are defined in this attachment.

**A7.1.2. Applicability.** The requirements in this attachment apply to all full-time government tenant organizations, single FAA-licensed users, or USAF squadron/detachments that assume launch complex safety control authority and responsibility for hazardous procedures identified by Range Safety as *launch complex safety* operations. Responsibilities and authorities are defined in volumes 1 and 6 of AFSPCMAN 91-710.

**A7.1.3. Launch Complex Safety Training and Certification Requirements:**

A7.1.3.1. The control authority shall implement a Launch Complex Safety Training and Certification Plan in accordance with the Launch Complex Safety Training and Certification Requirements available from the Range Safety Offices.

A7.1.3.2. The Launch Complex Safety Training and Certification Plan process includes the following steps:

A7.1.3.2.1. Range Safety and the control authority jointly tailor the subject document.

A7.1.3.2.2. The control authority submits a plan to comply with the subject document.

A7.1.3.2.3. The Chief of Safety reviews and approves the plan.

A7.1.3.2.4. The complex control authority safety plan shall include qualification and certification documentation of personnel performing the safety function for review and approval by the Chiefs of Safety.

A7.1.3.2.5. Range Safety shall audit launch complex safety procedures and processes as necessary.

**A7.2. Launch Complex Operations Safety Program General Requirements:**

A7.2.1. The Range User shall establish and maintain a launch complex operations safety program to support efficient and effective achievement of overall operations safety objectives. The safety training and certification program shall be referred to as the *Launch Complex Operations Safety Program*.

A7.2.2. The Range User shall implement the requirements defined in this attachment using a Range User-prepared Operations Safety Training and Certification Plan.

**A7.2.3. Safety Management System.** The Range User shall establish and maintain a safety management system to implement provisions of this attachment. The launch complex safety control authority shall be responsible for the following:

A7.2.3.1. Establishing, controlling, incorporating, directing, and implementing the launch complex operations safety program.

A7.2.3.2. Establishing internal reporting systems and procedures for investigation and disposition of launch complex safety operations mishaps and incidents, including potentially hazardous conditions not yet involved in a mishap or incident and reporting such matters to Range Safety; preparing and maintaining an Accident Reporting Plan.

A7.2.3.3. Reviewing and approving launch complex safety hazardous procedures.

#### **A7.2.4. Launch Complex Operations Safety Personnel Responsibilities and Qualifications:**

##### **A7.2.4.1. Safety Manager:**

**A7.2.4.1.1. Safety Manager Responsibilities.** The Range User shall establish and maintain a launch complex operations safety manager directly responsible to the launch complex safety control authority. At a minimum, the Range User safety manager shall be responsible for the following:

A7.2.4.1.1.1. Approving all launch complex safety operations analyses, reports, and documentation.

A7.2.4.1.1.2. Approving all launch complex safety hazardous procedures and verifying they comply with federal (OSHA/Environmental Protection Agency [EPA]) operation requirements and the requirements of AFSPCMAN 91-710, particularly those defined in volumes 1, 3, 5, and 6.

**A7.2.4.1.2. Safety Manager Qualifications.** The launch complex safety operations safety manager shall have a minimum of 10 years of applicable managerial or supervisory experience including at least 7 years experience in 3 of the 4 functional areas listed below. A Bachelor of Science in Engineering and a Certified Safety Professional (CSP) or Professional Engineer (PE) are also required.

A7.2.4.1.2.1. Large missile, space vehicle, rocket, torpedo, prelaunch, launch, post-launch operations and/or recovery operations.

A7.2.4.1.2.2. System safety hazard analysis and/or design, or research and development testing of ordnance, explosives, other types of munitions, pyrotechnics, cryogenic, toxic/hypergolic propellants, high pressure gases, radioactive materials, or other hazardous systems/components.

A7.2.4.1.2.3. Nuclear safety and/or ionizing/non-ionizing radiation safety hazard analysis and/or design, or research and development testing.

A7.2.4.1.2.4. Preparation and/or review and approval of hazardous operating procedures for space vehicle, missile, and/or weapons systems.

##### **A7.2.4.2. Safety Personnel:**

**A7.2.4.2.1. Safety Personnel Responsibilities.** Safety personnel shall be directly responsible to the launch complex safety operations safety manager. At a minimum, Range User launch complex safety personnel shall be responsible for the following:

A7.2.4.2.1.1. Preparing and/or reviewing launch complex safety operations analyses, reports, and documentation.

A7.2.4.2.1.2. Performing a detailed safety engineering review of launch complex safety hazardous procedures to ensure compliance with federal (OSHA/EPA), state, or local operation requirements and the requirements in AFSPCMAN 91-710, particularly those defined in volumes 1, 3, 5, and 6.

A7.2.4.2.1.3. Performing safety, surveillance, and monitoring of all launch complex safety hazardous operations.

**A7.2.4.2.2. Safety Personnel Qualifications.** Launch complex safety personnel shall meet rigid qualification standards and shall be fully experienced, trained, and certified to perform launch complex safety duties.

A7.2.4.2.2.1. All safety personnel shall have at least four years of applicable experience in at least three of the four functional areas identified in A7.2.4.1.2.

A7.2.4.2.2.2. Personnel who prepare or provide detailed safety engineer review of launch complex safety analyses, reports, documentation, and hazardous procedures shall have a Bachelor of Science degree in Engineering and a CSP or PE.

A7.2.4.2.2.3. The launch complex safety work force shall be composed of and have the following levels of experience. An engineering degree may be used to satisfy three years of the required experience, or an equivalent combination of education, experience, and training may be deemed acceptable by the 30 SW/SE or 45 SW/SE.

A7.2.4.2.2.3.1. At least 30 percent shall have more than eight years of applicable experience in at least three of the four functional areas identified in A7.2.2.1.2.

A7.2.4.2.2.3.2. An additional 50 percent shall have at least six years applicable experience in at least three of the four functional areas identified in A7.2.2.1.2.

A7.2.4.2.2.3.3. An additional 10 percent shall have at least four years applicable experience in at least three of the four functional areas identified in A7.2.2.1.2.

A7.2.4.2.2.3.4. The remaining 10 percent may be trainees.

**A7.2.5. Launch Complex Operations Safety Personnel Training Requirements.** The launch complex safety operations safety manager and safety personnel shall have initial and/or refresher training in the following areas every three years:

A7.2.5.1. Recognition of launch complex safety hazards including:

A7.2.5.1.1. Overhead and mobile crane and hoists

A7.2.5.1.2. Slings.

A7.2.5.1.3. Handling structures.

A7.2.5.1.4. Personnel work platforms.

A7.2.5.1.5. Acoustic hazards.

A7.2.5.1.6. Non-ionizing radiation.

A7.2.5.1.7. Laser systems.

A7.2.5.1.8. Ionizing radiation sources.



- A7.2.5.1.9. Hazardous materials.
- A7.2.5.1.10. Airborne and ground pressure systems.
- A7.2.5.1.11. Airborne and ground cryogenic systems.
- A7.2.5.1.12. Airborne and ground hypergolic systems.
- A7.2.5.1.13. Airborne and ground ordnance systems.
- A7.2.5.1.14. Solid propellants.
- A7.2.5.1.15. Airborne and ground electrical and electronic equipment.
- A7.2.5.1.16. Motor vehicles.
- A7.2.5.1.17. Forklifts.
- A7.2.5.1.18. Computer controlled systems such as cranes and robots.
- A7.2.5.1.19. Facilities.

A7.2.5.2. Failure modes for launch complex systems including cause and effect.

A7.2.5.3. Preventive and control measures for launch complex safety hazards.

A7.2.5.4. Safety devices for launch complex systems.

A7.2.5.5. Protective equipment.

A7.2.5.6. Monitoring and warning devices for launch complexes.

A7.2.5.7. Operations hazards analysis techniques.

A7.2.5.8. Human engineering principles.

A7.2.5.9. Emergency procedures.

A7.2.5.10. Hazardous procedures approval and ELS process.

A7.2.5.11. Preparation and handling of hazardous materials.

A7.2.5.12. Federal (OSHA/EPA), state, local, and Air Force (AFSPCMAN 91-710, particularly those in volumes 1, 3, 5, and 6) hazardous operations requirements.

A7.2.5.13. Accident investigations.

A7.2.5.14. Nondestructive examination techniques.

A7.2.5.15. Single failure point analysis.

**A7.2.6. Compliance.** Compliance with all launch complex safety operations requirements of federal (OSHA/EPA), state, and/or local regulations, and AFSPCMAN 91-710 (particularly those defined in volumes 1, 3, 5, and 6) is mandatory. When the Range User launch complex safety operations safety program plan is approved by Range Safety, it provides a basis of understanding between the Range User and Range Safety as to how the launch complex operations safety program will be accomplished.

**A7.2.7. Conflicting Requirements.** When conflicting requirements or deficiencies are identified in launch complex operations 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.

**A7.3. Foundation of Launch Complex Operations Safety Program.** The requirements for the foundation of a launch complex operations safety program are as follows:

A7.3.1. Establishing and executing a launch complex operations safety program which meets the tailored requirements of this attachment.

A7.3.2. Developing and maintaining 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.

A7.3.3. Establishing and maintaining a launch complex operations safety organization with designated functional responsibilities, interfaces, and lines of communication within and throughout the program organization and with associated organizations (government and contractor).

A7.3.4. Designating the organizational unit responsible for executing each safety task.

A7.3.5. Establishing the authority for resolution of identified launch complex operational hazards.

A7.3.6. Defining launch complex operational safety program milestones and relating these to major program milestones, program element responsibility, and required inputs and outputs.

A7.3.7. Establishing an incident alert and notification, investigation, and reporting process, to include notification of Range Safety.

A7.3.8. Establishing and executing a launch complex safety operations safety program that complies with the following:

A7.3.8.1. Launch complex safety operation requirements in AFSPCMAN 91-710, particularly those defined in volumes 1, 3, 5, and 6.

A7.3.8.2. As applicable, U.S.C. Title 29, Occupational Safety and Health Act (OSHA). Range Users (contractors/licensed launch operators/foreign entities) are fully responsible for the safety and health of their employees in accordance with OSHA regulations.

A7.3.8.3. As applicable, AFI 91-301. Air Force organizations and personnel are required to comply with AFI 91-301 and all DoD safety and health requirements. Other DoD and federal government agency personnel shall comply with their applicable safety and health requirements.

**A7.4. Launch Complex Operations Safety Program Plan:**

A7.4.1. The Range User shall develop a launch complex operations safety program plan (LCOSPP) that describes the tasks and activities of launch complex safety operations safety management and safety personnel required to identify, evaluate, eliminate, and control launch complex operations hazards. It shall identify the launch complex safety control authority and define the responsibilities and authorities of each of the program organizations functional positions with safety program responsibilities, including the safety manager.

A7.4.2. The approved plan shall account for all AFSPCMAN 91-710 (particularly those in volumes 1, 3, 5 and 6) and federal, state, and local regulations pertaining to launch complex safety operations on an item-by-item basis.

A7.4.3. The Range User shall submit a draft LCOSSP to Range Safety for review and approval within 90 days of the date the Range User wishes to assume control authority for launch complex safety operations.

A7.4.4. The LCOSPP shall include the following sections:

**A7.4.4.1. Launch Complex Operations Safety Organization.** The Organization section shall describe the following:

A7.4.4.1.1. The launch complex operations safety organization and any other program functional organization with safety program responsibilities, using charts to show the organizational and functional relationships and lines of communication.

A7.4.4.1.2. The organizational relationship between other functional elements having responsibility for tasks with launch complex safety operations impacts and the launch complex operations safety organization.

A7.4.4.1.3. Preparation and/or review and approval authority of applicable tasks by launch complex operations safety.

A7.4.4.1.4. The responsibility and authority of launch complex operations safety personnel, other Range User organizational elements involved in the launch complex safety effort, support contractors, and system safety groups.

A7.4.4.1.5. A description of the methods by which safety personnel or other program personnel may raise issues of concern directly to the control authority, program manager, or the program manager's supervisor within the organization.

A7.4.4.1.6. Identification of the organizational unit responsible for performing each task.

A7.4.4.1.7. Identification of the authority responsible for resolving launch complex safety operations hazards.

A7.4.4.1.8. The staffing of the launch complex operations safety organization for the duration of the program including personnel loading and a summary of the qualifications of safety personnel assigned to the effort, including those who possess coordination and approval authority.

A7.4.4.1.9. The process by which Range User management decisions are made, including such decisions as timely notification of unacceptable risks, necessary action, incidents or malfunctions, and waivers to operations safety requirements.

A7.4.4.1.10. Details of how resolution and action relative to launch complex operations safety will be accomplished at the program management level possessing resolution authority. Attachment 2 of this volume contains additional guidance.

**A7.4.4.2. Launch Complex Operations Safety Program Milestones.** The LCOSPP shall:

A7.4.4.2.1. Provide a program schedule of safety tasks, including start and completion dates, reports, and reviews. This should be an attachment that can be updated as program schedules change.

A7.4.4.2.2. Identify subsystem, component, and software safety activities as well as integrated system level activities such as design analyses, tests, and demonstrations applicable to the launch complex operations safety program but specified elsewhere to avoid duplication. Attachment 2 of this volume contains additional guidance.

**A7.4.4.3. LCOSPP Data.** The LCOSPP shall provide the following data:

A7.4.4.3.1. A list of all analyses, reports, and documentation used by safety personnel to review and approve hazardous launch complex safety procedures and execute the safety program.

A7.4.4.3.2. A list of all hazardous procedures categorized as launch complex safety procedures by Range Safety.

A7.4.4.3.3. The procedures for accessibility of the data by Range Safety and for retention of the data for historical and legal requirements.

**A7.4.4.4. Interfaces.** The LCOSPP shall identify the following interfaces in detail:

A7.4.4.4.1. The interface between launch complex operations safety and all other applicable safety disciplines such as nuclear safety, Range Safety, explosive and ordnance safety, chemical and biological safety, and laser safety.

A7.4.4.4.2. The interface between launch complex operations safety, program management, systems engineering, systems safety engineering, and all other support disciplines such as maintainability, quality control, reliability, software development, human factors engineering, and medical support (health hazards assessments).

A7.4.4.4.3. The interface between launch complex operations safety and all system integration and test disciplines; Attachment 2 of this volume contains additional guidance.

**A7.4.4.5. Internal Reviews and Audits.** The LCOSPP shall describe the procedures for accomplishing the following:

A7.4.4.5.1. Annual review of the launch complex operations safety program to verify compliance, relevancy, adequacy, and ensure documentation is current.

A7.4.4.5.2. Launch complex safety management and operational reviews (self-audits) to identify program deficiencies and ensure safety program effectiveness.

**A7.5. Launch Complex Operations Safety Hazards Analysis.** The Range User shall perform and document the following safety hazard analyses in accordance with the requirements specified in Attachment 2 of this volume:

A7.5.1. A Launch Complex Safety Operating and Support Hazard Analysis (O&SHA) in accordance with the requirements in Attachment 2 of this volume.

A7.5.2. Safety analyses of Engineering Change Proposals (ECPs), Specification Change Notices (SCNs), Software Problem Reports (SPRs), Program or Software Trouble Reports (PTRs, STRs), and requests for AFSPCMAN 91-710 (Volume 6) waiver to determine the launch complex safety impact on the system in accordance with the requirements in Attachment 2 of this volume.

A7.5.3. A safety compliance assessment to identify and verify compliance with Air Force, federal, state, local, and industry codes to ensure that the hazardous systems are being operated properly in accordance with the requirements in accordance with Attachment 2 of this volume.

**A7.6. Range Safety Audits:**

A7.6.1. Launch complex safety audits shall be conducted by Range Safety on a periodic basis.

A7.6.2. The audit shall measure the status of each safety task, interrelationship between safety and other program disciplines, identification and implementation of safety requirements/criteria, and documented evidence that reflects planned versus actual safety accomplishment.

A7.6.3. Each audit shall evaluate program milestones, safety program milestones, and incompatibilities that require remedial corrective action.

A7.6.4. The Range User shall initiate positive corrective actions where deficiencies are revealed by the audits.

A7.6.5. Components, equipment, conditions, designs, or procedures that provide unusual safety problems shall be audited.

A7.6.6. Audits shall include verification or corrective action on problems revealed by previous audits.

A7.6.7. The Range User shall support these Range Safety audits by providing access to documentation that substantiates compliance with federal, state, local, and AFSPCMAN 91-710 (particularly Volume 6) launch complex operations safety requirements.

**A7.7. 30 SW/45 SW Safety Program Approval.** The Range User launch complex operations safety program shall be approved by the 30 SW/CC or 45 SW/CC, as appropriate, once the following tasks have been accomplished:

A7.7.1. The Range User shall submit a letter to the 30 SW/45 SW Commander stating that they wish to exercise control authority over launch complex safety operations, and the Commander has agreed.

A7.7.2. The Range User shall identify those launch complex safety operations/procedures they wish to have control authority for and provide this list to Range Safety.

A7.7.3. Range Safety shall identify those operations/procedures that can be classified as launch complex safety operations.

A7.7.4. The Range User and Range Safety will jointly tailor this attachment and volumes 1 and 6 of AFSPCMAN 91-710.

A7.7.5. The Range User shall prepare the launch complex operations safety program plan and submit it to Range Safety for review and approval.

A7.7.6. The Range User shall prepare operating hazards analyses (as required) and submit them to Range Safety for review and approval.

A7.7.7. The Range User control authority for launch complex safety shall submit a certification of compliance and substantiating data to Range Safety for review and approval.

**A7.8. Safety Program Decertification:**

A7.8.1. As appropriate, the Range User launch complex operations safety program can be decertified by the 30 SW/CC or 45 SW/CC for the following reasons:

A7.8.1.1. The safety program, as implemented, does not comply with the range-approved launch complex operations safety program requirements.

A7.8.1.2. Internal audits or Range Safety audits of the safety program indicate serious deficiencies that are not being corrected in a time frame acceptable to Range Safety.

A7.8.1.3. Numerous anomalies and/or accidents caused by operational deficiencies in the safety program.

A7.8.2. 30 SW/CC and 45 SW/CC actions following safety program decertification may include:

A7.8.2.1. Range Safety and its operations safety group (contractor for the 45 SW) shall assume control of launch complex safety operations.

A7.8.2.2. Launch complex safety operations shall be terminated until the safety program is approved by 30 SW/CC or 45 SW/CC, as appropriate.

## ATTACHMENT 8

### RANGE SAFETY CONCEPT-TO-LAUNCH PROCESS

#### **A8.1. Key Descriptions:**

A8.1.1. Range Safety Milestones. Represents distinct activities or groupings of activities in the Range Safety approval process.

A8.1.2. AFSPCMAN 91-710 Milestone Volume Office of Primary Responsibility (OPR). Refers to the primary volume in which the Range Safety Milestone is addressed and identifies the Range Safety Office with primary responsibility for the Range Safety Milestone.

A8.1.3. Required Technical Interchange Meeting (TIM) or Activity. Refers to the TIMs or activities required to achieve the Range Safety Milestone.

A8.1.4. Primary Document. Refers to the primary documents or data the Range User must submit to Range Safety for review and approval to achieve the Range Safety Milestone.

A8.1.5. Approval Required Prior To. Refers to the activity that cannot be accomplished without accomplishment of the Range Safety Milestone.

A8.1.6. Typical Timeframes. Refers to typical timeframes in which the Range 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.

