APPENDIX 3A
MISSILE SYSTEM PRELAUNCH SAFETY PACKAGE

3A.1 INTRODUCTION

3A.1.1 Purpose

The Missile System Prelaunch Safety Package (MSPSP) provides a detailed description of hazardous and safety critical ground support and flight hardware equipment, systems, and materials and their interfaces used in the launch of launch vehicles and payloads. It is one of the media through which missile system prelaunch safety approval is obtained.

3A.1.2 Content

This Appendix contains the content preparation instructions for the data generated by the requirements specified in Chapter 3.

3A.1.3 Applicability

The requirements in this Appendix are applicable to all launch vehicle, payloads, and ground support equipment contracts and facilities contracts, as necessary.

3A.1.4 Submittal Process

An MSPSP shall be submitted to Range Safety by the Range User with overall responsibility for the launch vehicle, payload, or ground support equipment. However, for commercial payloads, the payload MSPSP is normally submitted to Range Safety through the launch vehicle contractor.

3A.1.5 Final Approval

A final MSPSP that satisfies all Range Safety concerns addressed at the CDR shall be submitted to Range Safety at least 45 calendar days prior to the intended shipment of hardware to the Range.

3A.2 PREPARATION INSTRUCTIONS

3A.2.1 Content

a. The MSPSP contains technical information concerning hazardous and safety critical equipment, systems, and materials and their interfaces used in the launch of launch vehicles and payloads. Where applicable, previously approved documentation shall be referenced throughout the package.

b. The MSPSP is a detailed description of the design, test, and inspection requirements for all ground support equipment and flight hardware and materials and their interfaces used in the launch of launch vehicles and payloads. **NOTE:** All schematics, functional diagrams, and operational manuals shall have well defined, standard Institute of Electrical and Electronics Engineers (IEEE) or Military Specification (MIL-SPEC) terminology and symbols.

3A.2.2 Format

Range User format is acceptable provided the information described below is provided. Suggested formats are shown as applicable. The format presented in this Appendix provides two distinct sections: Flight Hardware Systems and Ground Support Equipment.

3A.2.2.1 Table of Contents and Glossary

The MSPSP shall contain a table of contents and a glossary.

3A.2.2.2 Introduction

The Introduction shall address the scope and purpose of the MSPSP.

3A.2.3 General Description

The General Description section provides an overview of the launch vehicle or payload as a prologue to the subsystem descriptions. The following information is included in this section:

a. Physical dimensions and weight
b. Nomenclature of major subsystems
c. Types of motors and propellants to be used
d. Sketches and/or photographs of the launch vehicle or payload
e. Synopsis of each hazardous and safety critical subsystem
f. A list of hazardous subsystems addressed in Chapter 3 of this Regulation that are not present in the launch vehicle or payload system

3A.2.4 Flight Hardware Subsystems

a. At a minimum, the Flight Hardware Subsystems Section shall include the following information and the specific data requirements listed in sections 3A.2.4.1 through 3A.2.4.13 below:

1. Subsystem overview
2. Nomenclature of major subsystems
3. Function of the subsystem
4. Types of motors and propellants to be used
5. Location of the subsystem

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6. Operation of the subsystem
7. Subsystem design parameters
8. Subsystem test requirements
9. Subsystem operating parameters
10. Summaries of any Range Safety required hazard analyses conducted

b. Supporting data shall be included or summarized and referenced as appropriate with availability to Range Safety upon request.

c. Tables, matrixes, and sketches are required for systems and component data. (See 3.A2.4.2.2 and 3A.2.4.2.3 below for suggestions.)

d. Required analyses, test plans, and test results may be included in the MSPSP as appendixes or submitted separately. At a minimum, analyses, test plans, and test reports shall be listed, referenced, and summarized in the MSPSP.

e. A list of all Range Safety approved noncompliances

3A.2.4.1 Flight Hardware Structures and Mechanisms

3A.2.4.1.1 Flight Hardware Structures and Mechanisms General Requirements. While there are no specific structure and mechanism design requirements for launch vehicles and payloads except for flight hardware used to lift critical loads in this Chapter, the following information concerning the main structures and mechanisms used on launch vehicles and payloads shall be included in the MSPSP:

a. Nomenclature of the structure or mechanism and deployables

b. Function of the structure or mechanism and deployables

c. Location of the structure or mechanism and deployables

d. Operation of the structure or mechanism and deployables

e. Structure or mechanism and deployables design parameters

f. Structure or mechanism and deployables test and operating parameters

g. Summaries of any Range Safety required hazard analyses conducted

h. Material properties of structures, mechanisms, and deployables.

3A.2.4.1.2 Flight Hardware Used in Lifting Critical Loads. At a minimum, the following documentation is required:

a. SFP analysis

b. NDE plan and test results for SFP components and SFP welds

c. Initial proof load test plan and test results

d. Stress analysis

3A.2.4.2 Flight Hardware Pressure, Propellant, and Propulsion Systems

3A.2.4.2.1 General Data. A detailed description of the pressure, propellant, and propulsion systems of the launch vehicle or payload shall be provided. The description shall include the following information:

a. Nomenclature of the system
b. Function of the system
c. Location of the system
d. Operation of the system
e. System design parameters
f. System test parameters
g. System operating parameters

h. Summaries of any Range Safety required hazard analyses conducted

i. Material compatibility analysis

j. Physical and chemical properties and general characteristics of the propellant, test fluid and gases

k. For hazardous propellants, fluids and gases, the following shall be submitted:

1. Specific health hazards such as toxicity and physiological effects

2. TLV and MAC for 8-h day, five-day week of continuous exposure

3. Emergency tolerance limits including length of time of exposure and authority for limits, (for example, Surgeon General, National Institute for Occupational Safety and Health (NIOSH), independent study)

4. Maximum credible spill size including volume and surface area and supporting analyses

5. Description of hazards other than toxicity such as flammability and reactivity

6. Personal protective equipment to be used in handling and using the propellants when this equipment will be used during and operation, and

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the manufacturer, model number, and other identifying data

7. Manufacturer, model number, specifications, operating limits, type of certification, and general description of vapor detecting equipment

8. Identification of material incompatibility problems in the event of a spill

9. Recommended methods and techniques for decontamination of areas affected by spills or vapor clouds and hazardous waste disposal procedures

3A.2.4.2.2 Flight Hardware Pressure, Propellant, and Propulsion System Data. The following information shall be submitted for all systems:

a. A schematic that presents the system in a clear and easily readable form with complete subsystems grouped and labeled accordingly. **NOTE:** Nomenclature of each element should be made adjacent to or in the vicinity of each element. The schematic or a corresponding data sheet shall provide the following information:

1. Identification (ID) of all pressure system components such as valves, regulator, tubes, hoses, vessels, and gauges using standard symbols. **NOTE:** A legend is recommended. The original mechanical drawings should be referenced.

2. Maximum operating pressure of all systems and subsystems at expected operating temperatures

3. Identification of expected source pressures and expected delivery pressures

4. All relief valve pressure settings and flow rates

5. System fluid and maximum expected temperature

6. Pressure ranges of all pressure transducers

7. Pressure settings of pressure regulators

8. Charging pressure of reservoirs and vessels, their nominal capacities, and wall thickness

9. Pressure setting of all pressure switches

10. The nominal outside diameter and wall thickness of all tubing and piping

11. Flow path through all components. **NOTE:** When the system is to be used in several operating modes, it is easier to provide a separate schematic that depicts flow paths for each operating mode.

12. Reference designations for each component so that a cross-reference between schematics and drawings and a pressure system component list or other documentation is possible

13. End-to-end electrical schematics of electrical and electronic components giving full functional data and current loads

14. Connections for testing or servicing

15. A narrative description of the system or subsystem and its operating modes, including a discussion of operational hazards and accessibility of components

16. A sketch or drawing of the system that shows physical layout and dimensions

17. System information shall be placed in tabular form. **NOTE:** Suggested format is shown below.

Systems

System ID Number	Number of Vessels
System Title	Recertification Date
Location	Recertification Period
MOP	Material(s)
Commodity	Inspection Results
Responsible Organization	ISI Requirements

3A.2.4.2.3 Flight Hardware Pressure, Propellant, and Propulsion Component Design Data. The following information shall be submitted for each component:

a. Identification of each component by a reference designation permitting cross reference with the system schematic

b. The MAWP for all pressure system components

c. The MOP component shall operate at when installed in the system

d. Safety factors or design burst pressure for all pressure system components

e. Actual burst pressures, if available

f. Pre-assembly hydrostatic test proof pressure for each system component

g. If applicable, the proof pressure the component will be tested to after installation in the system

h. Materials used in the fabrication of each element in the component, including soft goods and other internal elements

i. Cycle limits if fatigue is a factor of the component

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j. Temperature limits of each system component

k. Component information shall be placed in tabular form. **NOTE:** Suggested format is shown below.

Vessels

Vessel ID Number	Recertification MAWP
System ID Number	Recertification Date
Manufacturer Name	Recertification Period
Manufacturer Serial No.	Cyclic Limit
Manufacturer Drawing No.	Test Pressure
Commodity	Vessel Design
Orig. MAWP or Design Pressure	Material
	Temperature Limits
Burst Pressure	Maximum Stress
Volume	Inside Radius
Location	Thickness
DOT Specification	Dimensions
Year of Manufacture	ISI Information
National Board No.	ISI Results
Code Stamps	

Relief Devices

ID Number	Set or Burst Pressure
System Number	System MOP
Type	System Commodity
Manufacturer	Flow Capacity
Manufacturer Part No.	Material
Code Stamps	Temperature Limits
Inlet Size	Test Pressure
Manufacturer Date	ISI Requirements
Outlet Size	ISI Results

Pressure Gauges and Sensors

ID Number	System Commodity
System Number	MAWP
Manufacturer	Burst Pressure
Manufacturer Date	System MOP
Manufacturer Part No.	Inlet Size
Pressure Range	ISI Requirements
Material	ISI Results

Flex Hoses

ID Number	Size (diameter, length)
System Number	Burst Pressure
Manufacturer	Cyclic Limit
Manufacturer Part No	Test Pressure
Manufacturer Date	Shelf Life
Materials	ISI Requirements
Temperature Limits	ISI Results
MAWP/Manufacturer Rated Working Pressure	

3A.2.4.2.4 Flight Hardware Pressure, Propellant, and Propulsion Initial Test Plans and Procedures. A list and summary of all initial test plans,

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test procedures, and test results for all flight hardware pneumatic, hydraulic, hypergolic, and cryogenic systems, as applicable in accordance with section 3.12 of this Chapter

3A.2.4.3 Flight Hardware Electrical and Electronic Subsystems

3A.2.4.3.1 General Data. A detailed description of the electrical and electronic subsystems of the launch vehicle or payload shall be provided. The description shall include the following information:

a. Nomenclature of the system
b. Function of the system
c. Location of the system
d. Operation of the system
e. System design parameters
f. System test parameters
g. System operating parameters
h. Summaries of any Range Safety required hazard analyses conducted

3A.2.4.3.2 Flight Hardware Battery Design Data. The following information shall be submitted for flight hardware batteries:

a. Design versus actual operating parameters of cells and battery
b. Cell chemistry and physical construction
c. Cell vent parameters
d. Toxic chemical emission of cells and evaluation of hazards
e. EPA classification of battery
f. DOT classification of battery
g. Physical and electrical integration of cells to form the battery
h. Description of safety devices
i. Case design including vent operation and cell and battery case housing yield point
j. A description of all operations to include packing, transportation, and storage configuration; activation; installation; checkout; charging; usage; removal; and disposal
k. Identification of the hazards associated with each activity in *j* above and the safety controls that shall be in effect
l. Manufacturing qualification and acceptance testing results that are considered safety critical
m. Battery size and weight
n. Specification of the system that uses the battery
o. A description of the EGSE used for packing, transportation, and storage; activation; installation; checkout; charging; usage; removal; and disposal of the battery
p. A list and summary of test plans, test procedures, and test results in accordance with the **Test Requirements for Lithium Batteries** section of this Chapter.

3A.2.4.3.3 Flight Hardware Electrical and Electronic Subsystem Data. The following information shall be submitted for electrical and electronic subsystems operating in hazardous atmospheres:

a. A brief description of power sources and the power distribution network, including schematics and line drawings of the distribution network
b. A description of how faults in electrical circuitry are prevented from propagating into hazardous subsystems, including such information as dedicated power sources and buses, use of fuses, and wiring sizing
c. A description of how inadvertent commands that can cause a hazardous condition are prevented
d. Identification of potential shock hazards
e. A description of how the intent of hazard proofing is met for electrical and electronic systems
f. Complete grounding and bonding methodology
g. A bent pin analysis for all connectors for safety critical or hazardous systems that have spare pins

3A.2.4.4 Flight Hardware Ordnance Subsystems

3A.2.4.4.1 General Data. A detailed description of the ordnance subsystems of the launch vehicle or space craft shall be provided. The description shall include the following information:

a. Nomenclature of system
b. Function of the system
c. Location of the system
d. Operation of the system
e. System design parameters
f. System test parameters
g. System operating parameters
h. Summaries of any Range Safety required hazard analyses conducted

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3A.2.4.4.2 Flight Hardware Ordnance Hazard Classifications and Categories. The following ordnance hazard classification data shall be submitted:

a. DOD/UN hazard classifications, including class, division, and compatibility group, in accordance with DOD-STD-6055.9.

b. DOT classification

c. The 45 Space Wing ordnance device and system hazard category for each ordnance item and system; test results and/or analysis used to classify the ordnance devices and systems as Category A or B

3A.2.4.4.3 Flight Hardware Ordnance System Data. The following ordnance system data shall be submitted:

a. A block diagram of the entire ordnance system

b. A complete line schematic of the entire ordnance system from the power source to the receptor ordnance, including telemetry pick-off points and ground (umbilical) interfaces

c. Diagrams showing the location of all ordnance components on the vehicle

d. A description of wiring, ETS, and FOC routing

e. A description of electrical, ETS, and optical connections and connectors

f. Detailed, complete schematics of the entire ordnance system showing component values such as resistance and capacitance, tolerances, shields, grounds, connectors, and pin outs. **NOTE 1:** The schematics shall include all other vehicle components and elements that interface or share common usage with the ordnance system. **NOTE 2:** All pin assignments shall be accounted for.

g. Detailed narrative description of the operation of the ordnance system, including all possible scenarios

h. The FMECA for each ordnance system

i. An operational flow of the ordnance system processing and checkout, including timelines and summaries of each procedure to be used

j. A sketch showing the accessibility of manual arming and safing devices

k. Specification drawings and documents for all airborne and ground ordnance systems

3A.2.4.4.4 Ordnance Component Design Data. The following ordnance component design data shall be submitted:

a. A complete and detailed description of each ordnance system component and how it functions

b. Specification drawings and documents for all airborne and ground ordnance components

c. Illustrated breakdown of all mechanically operated ordnance components

d. Part number, manufacturer, and net explosive weight for each ordnance item

e. Temperature and humidity requirements for each ordnance item

f. Bridgewire resistance, maximum safe no-fire current, and minimum all-fire current for each low voltage EED

g. Maximum no-fire voltage and minimum all-fire voltage for each EBW

h. Maximum no-fire energy and minimum all-fire energy for each LID and PAD

i. A list and summary of test plans procedures, and results, as required

3A.2.4.5 Flight Hardware Non-Ionizing Radiation Sources

3A.2.4.5.1 General Data. A detailed description of the non-ionizing radiation sources shall be provided. The description shall include the following information:

a. Nomenclature of the system

b. Function of the system

c. Location of the system

d. Operation of the system

e. System design parameters

f. System test parameters

g. System operating parameters

h. Summaries of any Range Safety required hazard analyses conducted

3A.2.4.5.2 RF Emitter Data. The following information shall be submitted for RF emitters:

a. Site plans shall be submitted to Range Safety and the RPO for all RF generating equipment. The site plan shall include the following information:

1. Location of generating equipment

2. RF hazard areas

3. Description and use of nearby facilities and operating areas

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b. At a minimum, the following RF emitter design and test data shall be submitted:

1. Emitter peak and average power

2. Pulse widths

3. Pulse repetition frequencies

4. Pulse codes

5. Maximum rated duty cycle

6. Type and size of antenna

7. Antenna gain and illumination

8. Beam width and beam skew

9. Operating frequency in MHz

10. Insertion loss between transmitter and antenna

11. Polarization of transmitted wave hardware

12. An analysis of the RF hazard area with and without antenna hats/dummy load, and results of any testing

13. A table that lists all of the RF emitters aboard a launch vehicle, payload, and ground support equipment and their hazard areas (distances)

14. A description of interlocks, inhibits, and other safety features that prevent inadvertent exposures

15. A copy of the RPO approved Radiation Protection Program RF Use Request Authorization (ER only)

16. A copy of the Range Safety and RPO approved site plan

3A.2.4.5.3 Laser System Data. At a minimum, the following laser system data shall be submitted:

a. A general description of the systems and its operation including how, where, why, and by whom the laser will be used. **NOTE:** The laser system also includes calibration equipment.

b. Drawings of the system that identify and show the location and operation of all components, interfaces, safety interlocks, and stops

c. For lasers that generate or use hazardous or corrosive materials, the data required for hazardous materials as described in **Hazardous Materials Data** section of this Appendix

d. For lasers that use cryogenic fluids for cooling or operational enhancement, the data required for cryogenic systems and hazardous materials as described in the **Flight Hardware Pressure Systems Data** and **Hazardous Materials Data** section of this Appendix

e. For laser systems using high voltages and/or high capacitance, the data required for electrical ground support equipment as described in **Electrical and Electronic Ground Support Equipment Data** section of this Appendix

f. Laser System Performance Data

1. Type, class, nomenclature, manufacturer model number, general identification, and other pertinent information

2. General description of the test, pertinent drawing of the operation site, and associated equipment

3. Lasing material

4. Continuous wave (CW) or pulse identification

5. Wave length

6. Bandwidth

7. Average power and/or energy per pulse and/or maximum output energy

8. Pulse duration and pulse rate

9. Beamwidth at 1/e point for both axes

10. A Sketch of the beam pattern and location and energy density of hot spots and effects of weather and reflectivity

11. Beam divergence at 1/e point for both axes

12. Emergent beam diameter

13. Coolant

14. Amount of energy reflected back through the eyepiece or pointing device

15. Electrical voltage applied to the system

16. Any other pertinent laser parameter such as distribution of energy onbeam and scanrate as determined by the Range User or Range Safety

17. Composition, color, and specularly or diffusely reflected surface characteristics of intended targets

18. Maximum incident energy on targets

19. Target characteristics including secondary hazards that may be affected by the laser, including fuels and other flammables, sensitive electronic components, flight termination systems, and others

20. Intended method (such as binoculars or spotter scope) (of viewing the beam and/or its reflections)

21. Safety devices such as interlocks, filters, shutters, and aiming devices

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22. Azimuth and/or electrical and mechanical elevation stops

g. Hazard Evaluation Data. Analysis and supporting data outlining possible laser system failures for all phases of laser system uses shall be submitted . Such data includes the following:

1. All critical failure modes, failure mode effects, and failure probabilities including possible effects on secondary hazards and the subsequent results

2. Routine occupational hazard exposure that has been experienced in the past with the system or similar systems along with recommended methods for reducing or eliminating the hazards

h. Biophysiological Data

1. Safe eye and skin distances based on permissible exposure limits

2. Safety clearance and hazard zones

3. Personal protective equipment required for personnel remaining inside clearance zones

i. A copy of the RPO approved Radiation Protection Plan Laser Use Request Authorization

j. A list and summary of test plans, test procedures, and test results in accordance with the **Laser System Test Requirements** section of this Chapter

3A.2.4.6 Flight Hardware Ionizing Radiation Sources

3A.2.4.6.1 General Data. A detailed description of the ionizing radiation sources shall be provided. The description shall include the following information:

a. Nomenclature of the system

b. Function of the system

c. Location of the system

d. Operation of the system

e. System design parameters

f. System test parameters

g. System operating parameters

h. Summaries of any Range Safety required hazard analyses conducted

3A.2.4.6.2 Flight Hardware Ionizing Radiation Subsystem Data. The following data shall be submitted:

a. The final SAS as required by AFI 91-110 or equivalent document if non-Air Force Range User. **NOTE:** The SAS shall be referenced in the MSPSP and submitted as an accompanying document.

1. Status reports on the SAS approval and copy of the TNSE

2. Verification of approval for launch by separate correspondence in accordance with the requirements of AFI 91-110 or the equivalent

b. Manufacturer of the source

c. Date of source preparation

d. Source identification number

e. Cross-sectional sketch showing dimensions of the source

f. Source container or holder construction material

g. Physical source form such as powder or plate

h. Chemical source form such as metal or oxide

i. Strength in curies

j. Type of protective cover material over the source

k. Date and result of last wipe test

l. Method of sealing against leakage

m. Radionuclide solubility in sea water

n. Description, including diagrams, showing exact placement of source in vehicle or payload

o. A brief description of intended use

p. Radiation levels in millirem per hour for all modes of operation and all radiation container surfaces accessible to personnel

q. Description of potential accidents that would cause release of radioactive material including potential personnel exposure and ground contamination

r. A summary of the possible consequences of a release of radioactive material at the Ranges including the maximum credible release and recommendations for methods to reduce or eliminate the resulting hazards

s. Description of recovery plans for land and sea launch abort scenarios

t. Location and name of responsible organization and licensed individual assigned to supervise handling of this material

u. Detailed nuclear system design

v. Normal and potentially abnormal environments and failure modes that can affect the processing, launch, and flight of a nuclear system

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w. The predicted responses of the nuclear system to processing, launch, and flight environments and failures

x. The predicted resulting nuclear risk

y. Ground support equipment design data as required by the appropriate sections of this Regulation

z. Detailed ground processing flow

aa. A copy of the RPO approved 45 SWI 40-201 Radiation Protection Program (ER only)

ab. A copy of the AFI 91-110 30SW1 Radiation Protection Plan (WR only)

ac. A list and summary of test plans, test procedures, and test results in accordance with the **Radioactive Sources Carried on Launch Vehicles and Payload Test Requirements** section of this Chapter.

3A.2.4.6.3 Flight Hardware Ionizing Radiation Producing Equipment and Devices. The following data shall be submitted:

a. Manufacturer and model number

b. A description of the system and its operation

c. A description of the interlocks, inhibits and other safety features

d. If installed on a flight system, a diagram showing the location of the equipment or devices

e. A description of the radiation levels, in millirems per hour, accessible to personnel for all modes of operation and all surfaces accessible to personnel. Levels with doors and access panels removed shall be included.

f. A copy of the RPO approved 45 SWI 40-201 Radiation Protection Program Radiation Use Request Authorization to use these sources during ground processing (ER only).

g. A copy of the AFI 91-110 30SW1 Radiation Protection Plan (WR only)

3A.2.4.7 Flight Hardware Acoustical Subsystems

3A.2.4.7.1 General Data. A detailed description of acoustical hazard sources shall be provided. The description shall include the following information:

a. Nomenclature of the system

b. Function of the system

c. Location of the system

d. Operation of the system

e. System design parameters

f. System test parameters

g. System operating parameters

h. Summaries of any Range Safety required hazard analyses conducted

3A.2.4.7.2 Flight Hardware Acoustics Hazards Data. The following data requirements shall be submitted for acoustic hazards:

a. The location of all sources generating noise levels that may result in hazardous noise exposure for personnel and the sound level in decibels on the A scale (dBA) for that noise

b. The anticipated operating schedules of these noise sources

c. Methods of protection for personnel who may exposed to sound pressure levels above 85dBA (8-hr time weighted average)

d. A copy of the Bioenvironmental Engineering approval stating the equipment and controls used are satisfactory

3A.2.4.8 Flight Hardware Hazardous Materials Subsystems

3A.2.4.8.1 General Data. A detailed description of the ionizing radiation sources shall be provided. The description shall include the following information:

a. Nomenclature of the system

b. Function of the system

c. Location of the system

d. Operation of the system

e. System design parameters

f. System test parameters

g. System operating parameters

h. Summaries of any Range Safety required hazard analyses conducted

3A.2.4.8.2 Flight Hardware Hazardous Materials Data. At a minimum, the following hazardous materials data shall be submitted:

a. A list of all hazardous materials on the flight system and used in ground processing

b. A description of how each of these materials and liquids is used and in what quantity

c. A description of flammability and, if applicable, explosive characteristics

d. A description of toxicity including TLV and other exposure limits, if available

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e. A description of compatibility including a list of all materials that may come in contact with a hazardous liquid or vapor with test results provided or referenced

f. A description of electrostatic characteristics with test results provided or referenced

g. A description of personal protective equipment to be used with the hazardous material and liquid

h. A summary of decontamination, neutralization, and disposal procedures

i. An MSDS for each hazardous material and liquid on flight hardware or used in ground processing. **NOTE:** The MSDS shall be available for review at each location in which the material is stored or used.

j. Description of any detection equipment, location, and proposed use

k. Additional data for plastic materials:

1. Identification of the cleaning methods to be used to maintain surface cleanliness and conductivity, if applicable

2. Identification of the minimum acceptable voltage accumulation levels for the plastic materials or operations

3. Identification of the method for ensuring conductivity between adjoining pieces of the plastic materials

4. Assessment of the environmental effects on plastic materials such as humidity, ultraviolet light, and temperature that could cause degradation of conductivity flammability, or electostatic properties

l. A list and summary of test plans, test procedures, and test results in accordance with the **Hazardous Materials Test Requirements** section of this Chapter.

3A.2.4.9 Computing Systems Data

The Range User shall provide the following information to Range Safety in the MSPSP:

a. Hardware description including layout of operator console and displays

b. Flow charts or diagrams showing hardware, data buses, hardware or software interfaces, data flow, power systems, and any redundancy

c. Logic flow charts

d. Operator user manuals and documentation

e. List and description of all SCCSFs including interfaces

f. Software hazard analyses

g. Configuration management plan and procedures

h. Software test plan, test procedures, and test results

3A.2.5 Ground Support Equipment

a. At a minimum, the Ground Support Equipment Section shall include the following information and the specific data requirements listed in sections 3A.2.5.1 through 3A.2.5.13 below:

1. Subsystem overview

2. Nomenclature of major subsystems

3. Function of the subsystem

4. Location of the subsystem

5. Operation of the subsystem

6. Subsystem design parameters

7. Subsystem test requirements

8. Subsystem operating parameters

9. Summaries of any Range Safety required hazard analyses conducted

b. Supporting data shall be included or summarized and referenced as appropriate with availability to Range Safety upon request.

c. Tables, matrixes, and sketches are required for systems and component data. (See 3.A2.4.2.2 and 3A.2.4.2.3 for suggestions.)

d. Required analyses, test plans, and test results may be included in the MSPSP as appendixes or submitted separately. At a minimum, analyses, test plans, and test reports shall be listed, referenced, and summarized in the MSPSP.

e. A list of all Range Safety approved noncompliances

3A.2.5.1 Ground Support Material Handling Equipment

Design and test plan data for the following government and Range User furnished ground support MHE shall be provided:

3A.2.5.1.1 General Data. A detailed description of MHE shall be provided. The description shall include the following information:

a. Nomenclature of the system

b. Function of the system

c. Location of the system

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d. Operation of the system
e. System design parameters
f. System test parameters
g. System operating parameters
h. Summaries of any Range Safety required hazard analyses conducted

3A.2.5.1.2 Cranes and Hoists Used to Handle Critical Hardware. At a minimum, the following documentation is required:

a. SFP analysis
b. O&SHA
c. FMECA
d. NDE plan and test results for crane hooks and SFP components and SFP welds on crane support structures, overhead crane and hoist support structures, and 10 percent of non-SFP welds on overhead crane and hoist support structures
e. Software test plans and results if applicable
f. Initial crane and hoist test plans and test results
g. Stress analysis for crane and hoist support structures
h. Crane specifications
i. Certificate of conformance to specifications
j. CAD output data, if available

3A.2.5.1.3 Sling Assemblies Used to Handle Critical Hardware. At a minimum, the following data is required:

a. SFP analysis
b. NDE plan and test results for SFP components
c. Initial proof load test plan and test results
d. Stress analysis

3A.2.5.1.4 Hydrasets and Load Cells Used to Handle Critical Hardware. At a minimum, the following documentation is required:

a. SFP analysis
b. NDE plan and test results for SFP components and SFP welds
c. Initial proof load test plan and test results
d. Stress analysis

3A.2.5.1.5 Handling Structures Used to Handle Critical Hardware. At a minimum, the following documentation is required:

a. SFP analysis
b. NDE plan and test results for SFP and non-SFP components and SFP and non-SFP welds
c. Initial proof load test plan and test results
d. Stress analysis for structures
e. Safe-life analysis if Option 2 of Appendix 3B is chosen
f. O&SHA and FMECA analyses for structural mechanisms like spin tables, rotating structures, and portable launch support frames

3A.2.5.1.6 Removable, Extendible, and Hinged Personnel Work Platforms. At a minimum, the following documentation is required:

a. SFP analysis
b. NDE plan and test results for SFP and non-SFP components and SFP and non-SFP welds
c. Initial proof load test plan and test results
d. Stress analysis

3A.2.5.1.7 Cranes and Hoists Used to Handle Non-Critical Hardware. At a minimum, the following documentation is required:

a. NDE plan and test results for crane hooks
b. Initial crane and hoist test plans and test results
c. Crane specifications
d. Certification of conformance to specifications

3A.2.5.1.8 Sling Assemblies Used to Handle Non-Critical Hardware. At a minimum, the initial proof load test plan and results shall be documented and be made available upon request.

3A.2.5.1.9 Handling Structures Used to Handle Non-Critical Hardware. At a minimum, the initial proof load test plan and results shall be documented and available upon request.

3A.2.5.2 Ground Support Pressure and Propellant Systems

3A.2.5.2.1 General Data. A detailed description of the pressure and propellant systems shall be provided. The description shall include the following information:

a. Nomenclature of the system
b. Function of the system
c. Location of the system
d. Operation of the system
e. System design parameters
f. System test parameters
g. System operating parameters

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MISSILE SYSTEM PRELAUNCH SAFETY PACKAGE

h. Summaries of any Range Safety required hazard analyses conducted

i. A material compatibility analysis

j. Inservice operating, maintenance, and ISI plan

k. Physical and chemical properties and general characteristics of propellants, test fluids, and gases

l. For hazardous propellants, fluids, and gases, the following shall be submitted:

1. Specific health hazards such as toxicity and physiological effects

2. TLV and maximum allowable concentration for 8-h day, 5-day week of continuous exposure

3. Emergency tolerance limits including length of time of exposure and authority for limits, such as the Surgeon General, NIOSH, independent study

4. Volume and surface area of a maximum credible spill and supporting hazard analyses

5. Description of hazards other than toxicity, such as flammability and reactivity

6. Material incompatibility problems in the event of a spill

7. Recommended methods and techniques for decontamination of areas affected by spills or vapor clouds and hazardous waste disposal procedures

8. Personal protective equipment to be used in handling and using propellants when this equipment will be used during an operation, and manufacturer, model number, and other identifying data

9. Manufacturer, model number, specifications, operating limits, type of certification, and general description of vapor detecting equipment

3A.2.5.2.2 Ground Support Pressure and Propellant System Data. The following ground support pressure and propellant system data shall be submitted:

a. A copy of any DOT approved exemptions for mobile and portable hazardous pressure systems

b. A schematic presenting the system in a clear and easily readable form with complete subsystems grouped and labeled. The information listed below shall be provided on the schematic or on accompanying referenced data sheets. **NOTE:** Nomenclature of each element should be made adjacent to or in the vicinity of each element.

1. Identification of all pressure system components such as valves, regulator, tubes, hoses, vessels, and gauges using standard symbols. **NOTE 1:** A legend is recommended. **NOTE 2:** The original schematic should be referenced.

2. MOP of all systems and subsystems at expected operating temperatures

3. Identification of expected source pressures and expected delivery pressures

4. All relief valve pressure settings and flow rates

5. System fluid and maximum expected temperature

6. Pressure ranges of all pressure gauges

7. Pressure settings of pressure regulators

8. Charging pressure of reservoirs and vessels, their nominal capacities, and wall thickness

9. Pressure setting of all pressure switches

10. Nominal outside diameter and wall thickness of all tubing and piping

11. Flowpath through all system components. **NOTE:** When the system is to be used in several operating modes, it is easier to provide a separate schematic that shows flowpaths for each operating mode.

12. Identification of each component (reference designations) so that cross-referencing between schematics and drawings and a pressure system component list or other documentation is possible

13. End-to-end electrical schematics of electrical and electronic components giving full functional data and current loads

14. Connections for testing or servicing

15. A narrative describing the following information:

(a) System or subsystem and its operating modes

(b) Operational hazards

(c) Accessibility of components

16. A sketch or drawing of the system that shows physical layout and dimensions

17. System information shall be placed in tabular form. **NOTE:** See 3A.2.4.2.2 for suggested format.

APPENDIX 3A
MISSILE SYSTEM PRELAUNCH SAFETY PACKAGE

3A.2.5.2.3 Ground Support Pressure and Propellant System Component Design Data. At a minimum, the following information shall be submitted for ground support pressure system components:

a. Identification of each component with a reference designation permitting cross-referencing with the system schematic described above

b. MAWP for all pressure system components

c. MOP the component shall operate at when installed in the system

d. Safety factors or design burst pressure for all pressure system components, identifying actual burst pressures if available.

e. Hydrostatic test pressure for each system component

f. As applicable, the test pressure the component will be tested to after installation in the system

g. Materials used in the fabrication of each element in the component, including soft goods and other internal elements

h. Cycle limits if fatigue is a factor

i. Temperature limits

j. Manufacturer name, model number, and part number

k. Component information shall be placed in tabular form. **NOTE:** See 3A.2.4.2.3 for suggested format.

3A.2.5.3 Ground Support Electrical and Electronic Subsystems

3A.2.5.3.1 General Data. A detailed description of electrical and electronic subsystems shall be provided. The description shall include the following information:

a. Nomenclature of the system

b. Function of the system

c. Location of the system

d. Operation of the system

e. System design parameters

f. System test parameters

g. System operating parameters

h. Summaries of any Range Safety required hazard analyses conducted

3A.2.5.3.2 EGSE Battery Design Data. At a minimum, the following EGSE battery design data shall be provided:

a. Design versus actual operating parameters of cells and battery

b. Cell chemistry and physical construction

c. Cell vent parameters

d. Toxic chemical emission of cells and evaluation of hazards

e. EPA classification of battery

f. DOT classification of battery

g. Physical and electrical integration of cells to form the battery

h. Description of safety devices

i. Case design including vent operation and cell and battery case housing yield point

j. A description of all operations to include packing, transportation, and storage configuration; activation; installation; checkout; charging; usage; removal; and disposal

k. Identification of the hazards associated with each activity in *j* above and the safety controls that shall be in effect

l. Manufacturing qualification and acceptance testing results that are considered safety critical

m. Battery size and weight

n. Specification of the system that uses the battery

o. A description of the MHE and EGSE used for packing, transportation, and storage; activation; installation; checkout; charging; usage; removal; and disposal of the battery

p. A list and summary of test plans, test procedures, and test results in accordance with the **Test Requirements for Lithium Batteries** section of this Chapter.

3A.2.5.3.3 EGSE Design Data. The following EGSE design data is required:

a. Identification of EGSE and its use

b. A description of how faults in the EGSE circuitry that can create a hazardous condition are prevented from propagating into the flight system

c. A description of how inadvertent commands that can cause a hazardous condition are prevented

d. Identification of potential shock hazards

e. A description of how the intent of the NFPA is met with respect to hazardous atmospheres

f. Identification of all non-explosion proof equipment powered up during and after propellant loading

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MISSILE SYSTEM PRELAUNCH SAFETY PACKAGE

g. For explosion proof and intrinsically safe equipment approved by a nationally recognized testing laboratory, the following information shall be provided:

1. Manufacturer
2. Model number
3. Hazardous location class and group
4. Operating temperature

h. For any explosion proof equipment or components not having a fixed label from a nationally recognized testing laboratory, the data and certification shall be available for inspection in the facility of use.

i. Test data and certification on custom or modified equipment that can not be certified by a nationally recognized testing laboratory for explosion proof equipment

j. Test results for all Range User designed, built, or modified intrinsically safe apparatus as required by a nationally recognized testing laboratory in accordance with UL 913

k. A bent pin analysis for all connectors for safety critical or hazardous systems that have spare pins

3A.2.5.4 Ground Support Ordnance Subsystems

3A.2.5.4.1 General Data. A detailed description of ordnance subsystems shall be provided. The description shall include the following information:

a. Nomenclature of the system
b. Function of the system
c. Location of the system
d. Operation of the system
e. System design parameters
f. System test parameters
g. System operating parameters
h. Summaries of any Range Safety required hazard analyses conducted

3A.2.5.4.2 Ordnance Ground Systems Design Data. The following ordnance ground systems design data is required:

a. A complete description of the ground test equipment that will be used in the checkout of ordnance devices and systems, including general specifications and schematics for all test equipment

b. Specifications, schematics, and a complete functional description of the low voltage stray current monitor

c. Schematics of all ordnance system monitor circuits from the ordnance component pick-off points to the OSC termination

d. Calibration data for all monitor circuit terminations that will be provided to the OSC

e. A complete and detailed description of the airborne and ground ordnance telemetry system and how it functions, including general specifications and schematics

f. The following information is required for ordnance continuity and bridgewire resistance measurement devices:

1. Maximum safe no-fire energy of the ordnance being tested

2. A declaration of any certification currently in effect for the instrument along with the manufacturer specifications including:

(a) Range
(b) Accuracy
(c) Power supply and recharge capability
(d) Self-test features
(e) Schematics

3. Failure Analysis including the outcome of the energy analysis (open circuit or maximum terminal voltage) and current limit analysis (short circuit or maximum output current)

4. Instrument description including any modifications required for operational use and details of safety design features such as interlocks

5. Description of intended operations

g. A list and summary of test plans, test procedures, and test results, as required.

3A.2.5.6 Ground Support Non-Ionizing Radiation Source Data

3A.2.5.6.1 General Data. A detailed description of non-ionizing subsystems shall be provided. The description shall include the following information:

a. Nomenclature of system
b. Function of the system
c. Location of the system
d. Operation of the system
e. System design parameters
f. System test parameters

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MISSILE SYSTEM PRELAUNCH SAFETY PACKAGE

g. System operating parameters

h. Summaries of any Range Safety required hazard analyses conducted

3A.2.5.6.2 Ground Support RF Emitter Data.

a. Site plans shall be submitted to Range Safety and the RPO for all RF generating equipment. The site plan shall include the following information:

1. Location of generating equipment

2. RF hazard areas

3. Description and use of nearby facilities and operating areas

b. At a minimum, the following RF emitter design and test data shall be submitted:

1. Emitter peak and average power

2. Pulse widths

3. Pulse repetition frequencies

4. Pulse codes

5. Maximum rated duty cycle

6. Type and size of antenna

7. Antenna gain and illumination

8. Beam width and beam skew

9. Operating Frequency (MHz)

10. Insertion loss between transmitter and antenna

11. Polarization of transmitted wave

12. An analysis of the RF hazard area with and without antenna hats/dummy load

13. A table that lists all of the RF emitters aboard a launch vehicle, payload, and ground support equipment and their hazard areas (distances)

14. A description of interlocks, inhibits, and other safety features that prevent inadvertent exposures

15. A copy of the RPO approved Radiation Protection Program RF Use Request Authorization

16. A copy of the Range Safety and RPO approved site plan

17. A list and summary of test plans, test procedures, and test results in accordance with the **RF Emitter Initial Test Requirements** section of this Chapter.

3A.2.5.6.3 Ground Support Laser Systems. At a minimum, the following laser system data requirements shall be submitted:

a. A general description of the systems and its operation including how, where, why, and by whom the laser will be used. **NOTE:** The laser system also includes calibration equipment.

b. Drawings of the system that identify and show the location and operation of all components, interfaces, safety interlocks, and stops

c. For lasers that generate or use hazardous or corrosive materials, the data required for hazardous materials as described in the **Hazardous Materials Data** section of this Appendix

d. For lasers that use cryogenic fluids for cooling or operational enhancement, the data required for cryogenic systems and hazardous materials as described in the **Ground Support Pressure and Propulsion Systems Data** and **Hazardous Materials Data** sections of this Appendix

e. For laser systems using high voltages and/or high capacitance, the data required for electrical ground support equipment as described in **Electrical and Electronic Ground Support Equipment Data** section of this Appendix

f. Laser System Performance Data

1. Type, class, nomenclature, manufacturer model number, general identification, and other pertinent information

2. General description of the test, pertinent drawing of the operation site, and associated equipment

3. Lasing material

4. CW or pulse identification

5. Wave length

6. Bandwidth

7. Average power and/or energy per pulse and/or maximum output energy

8. Pulse duration and pulse rate

9. Beamwidth at 1/e point for both axes

10. *A* Sketch of the beam pattern and location and energy density of hot spots and effects of weather and reflectivity

11. Beam divergence at 1/e point for both axes

12. Emergent beam diameter

13. Coolant

14. Amount of energy reflected back through the eyepiece or pointing device

15. Electrical voltage applied to the system

16. Any other pertinent laser parameter such as distribution of energy onbeam and scanrate as determined by the Range User or Range Safety

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MISSILE SYSTEM PRELAUNCH SAFETY PACKAGE

17. Composition, color, and specularly or diffusely reflected surface characteristics of intended targets

18. Maximum incident energy on targets

19. Target characteristics including secondary hazards that may be affected by the laser, including fuels and other flammables, sensitive electronic components, flight termination systems, and others

20. Intended method (such as binoculars or spotter scope) of viewing the beam and/or its reflections

21. Safety devices such as interlocks, filters, shutters, and aiming devices

22. Azimuth and/or electrical and mechanical elevation stops

g. Hazard Evaluation Data. Analysis and supporting data outlining possible laser system failures for all phases of laser system uses shall be submitted. Such data includes the following:

1. All critical failure modes, failure mode effects, and failure probabilities including possible effects on secondary hazards and the subsequent results

2. Routine occupational hazard exposure that has been experienced in the past with the system or similar systems along with recommended methods for reducing or eliminating the hazards

h. Biophysiological Data

1. Safe eye and skin distances based on permissible exposure limits

2. Safety clearance and hazard zones

3. PPE required for personnel remaining inside clearance zones

i. A copy of the RPO approved Radiation Protection Plan Laser Use Request Authorization

j. A list and summary of test plans, test procedures, and test results in accordance with the **Laser System Test Requirements** section of this Chapter.

3A.2.5.7 Ground Support Ionizing Radiation Source Data

3A.2.5.7.1 General Data. A detailed description of ionizing subsystems shall be provided. The description shall include the following information:

a. Nomenclature of the system

b. Function of the system

c. Location of the system

d. Operation of the system

e. System design parameters

f. System test parameters

g. System operating parameters

h. Summaries of any Range Safety required hazard analyses conducted

3A.2.5.7.2 Ionizing Radiation Sources Data. At a minimum, the following data shall be provided for all ground radiation producing sources:

a. Manufacturer and model number

b. A description of the system and its operation

c. A description of the interlocks, inhibits and other safety features

d. If installed on a flight system, a diagram showing the location

e. A description of the radiation levels, in millirems per hour, accessible to personnel for all modes of operation and all surfaces accessible to personnel. Levels with doors and access panels removed shall be included.

f. A copy of the RPO approved 45 SWI 40-201 Radiation Protection Program Radiation Use Request Authorization to use these sources during ground processing

g. A copy of the AFI 91-110 30SW1 Radiation Protection Plan (WR only)

3A.2.5.8 Ground Support Acoustic Hazards

3A.2.5.8.1 General Data. A detailed description of acoustical hazards and subsystems shall be provided. The description shall include the following information:

a. Nomenclature of the system

b. Function of the system

c. Location of the system

d. Operation of the system

e. System design parameters

f. System test parameters

g. System operating parameters

h. Summaries of any Range Safety required hazard analyses conducted

3A.2.5.8.2 Acoustic Hazards Data. The following data shall be submitted for acoustic hazards:

a. The location of all sources generating noise levels that may result in hazardous noise exposure

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MISSILE SYSTEM PRELAUNCH SAFETY PACKAGE

for personnel and the sound level (in dBA) for that noise

b. The anticipated operating schedules of these noise sources

c. Methods of protection for personnel who may exposed to sound pressure levels above 85 dBA (8-h time weighted average)

d. A copy of the Bioenvironmental Engineering approval stating the equipment and controls used are satisfactory

3A.2.5.9 Ground Support Hazardous Materials

3A.2.5.9.1 General Data. A detailed description of hazardous materials and subsystems shall be provided. The description shall include the following information:

a. Nomenclature of the system
b. Function of the system
c. Location of the system
d. Operation of the system
e. System design parameters
f. System test parameters
g. System operating parameters
h. Summaries of any Range Safety required hazard analyses conducted

3A.2.5.9.2 Ground Support Hazardous Materials Data. The following hazardous materials data shall be submitted:

a. A list of all hazardous materials on the flight system and used in ground processing

b. A description of how each of these materials and liquids is used and in what quantity

c. A description of flammability and, if applicable, explosive characteristics

d. A description of toxicity including TLV and other exposure limits, if available

e. A description of compatibility including a list of all materials that may come in contact with a hazardous liquid or vapor with test results provided or referenced

f. A description of electrostatic characteristics with test results provided or referenced

g. A description of personal protective equipment to be used with the hazardous material and liquid

h. A summary of decontamination, neutralization, and disposal procedures

i. An MSDS for each hazardous material and liquid or used in ground processing. **NOTE:** The MSDS shall be available for review at each location in which the material is stored or used.

j. Description of any detection equipment, location, and proposed use

k. Additional data for plastic materials:

1. Identification of the cleaning methods to be used to maintain surface cleanliness and conductivity, if applicable

2. Identification of the minimum acceptable voltage accumulation levels for the plastic materials or operations

3. Identification of the method for ensuring conductivity between adjoining pieces of the plastic materials

4. Assessment of the environmental effects on plastic materials such as humidity, ultraviolet light, and temperature that could cause degradation of conductivity flammability, or electostatic properties

l. A list and summary of test plans, test procedures, and test results in accordance with the **Hazardous Materials Test Requirements** section of this Chapter.

3A.2.5.10 Operations Safety Console

3A.2.5.10.1 General Data. A detailed description of the OSC shall be provided. The description shall include the following information:

a. Nomenclature of system
b. Function of the system
c. Location of the system
d. Operation of the system
e. System design parameters
f. System test parameters
g. System operating parameters
h. Summaries of any Range Safety required hazard analyses conducted

3A.2.5.10.2 OSC Data. The following data shall be submitted for the OSC:

a. An overall schematic of the OSC and outside interfaces

b. A narrative of each of the features of the OSC, including the following:

1. Function
2. Operation
3. Outside interface

APPENDIX 3A
MISSILE SYSTEM PRELAUNCH SAFETY PACKAGE

4. Operating limits

c. A list and summary of test plans, test procedures, and test results in accordance with the **OSC Validation and Test Requirements** section of this Chapter.

3A.2.5.11 Vehicle Data

At a minimum, the following data shall be provided for vehicles:

3A.2.5.11.1 General Vehicle Data.

a. Documentation certifying that vehicles used to transport bulk hazardous material on the Range comply with DOT requirements or are formally exempted by DOT

b. If DOT certification or exemption documentation is not available, the following information is required:

1. Design, test, inspection requirements

2. Stress analysis

3. SFP analysis

4. FMECA

5. Comparison analysis with similar DOT approved vehicle

6. "Equivalent safety" (meets DOT intent) analysis

3A.2.5.11.2 Critical Flight Hardware Trailer Data.

a. Stress analysis

b. SFP analysis

c. Initial proof load test plan and test results

d. Initial road test plan and test results

e. NDE plan and test results for SFPs

3A.2.5.11.3 Forklift Data.

a. Certification that the forklift has been designed and tested in accordance with applicable national standards such as ANSI/ASME B36.1, UL 538, and UL 583

b. For personnel platforms on forklifts:

1. Stress analysis

2. SFP analysis

3. NDE plan and test results for SFP components and SFP welds

4. Proof load test plan and test results

c. For forklifts used to lift or move critical loads, maintenance plans shall be submitted for review and approval.

3A.2.5.12 Computing Systems Data

The Range User shall provide the following information to Range Safety in the MSPSP:

a. Hardware description including layout of operator console and displays

b. Flow charts or diagrams showing hardware, data buses, hardware or software interfaces, data flow, power systems, and any redundancy

c. Logic flow charts

d. Operator user manuals and documentation

e. List and description of all SCCSFs including interfaces

f. Software hazard analyses

g. Configuration management plan and procedures

h. Software test plan, test procedures, and test results

3A.2.5.13 WR Seismic Data Requirements

a. The Range User shall identify equipment that has the potential, directly or by propagation, to cause the following seismic hazards:

1. Severe personnel injury

2. A catastrophic event

3. Significant impact on space vehicle or missile processing and launch capability. **NOTE:** This criteria does not apply to commercial programs.

4. Damage to high value flight hardware. **NOTE:** This criteria does not apply to commercial programs.

b. For equipment that can present a seismic hazard, the Range User shall identify the expected G forces, the level of G forces the equipment can withstand, the magnitude of potential damage, and the method of restraint used.

3A.3 COMPLIANCE CHECKLIST

A compliance checklist of all design, test, analysis, and data submittal requirements in this Chapter shall be provided. The checklist shall indicate

APPENDIX 3A
MISSILE SYSTEM PRELAUNCH SAFETY PACKAGE

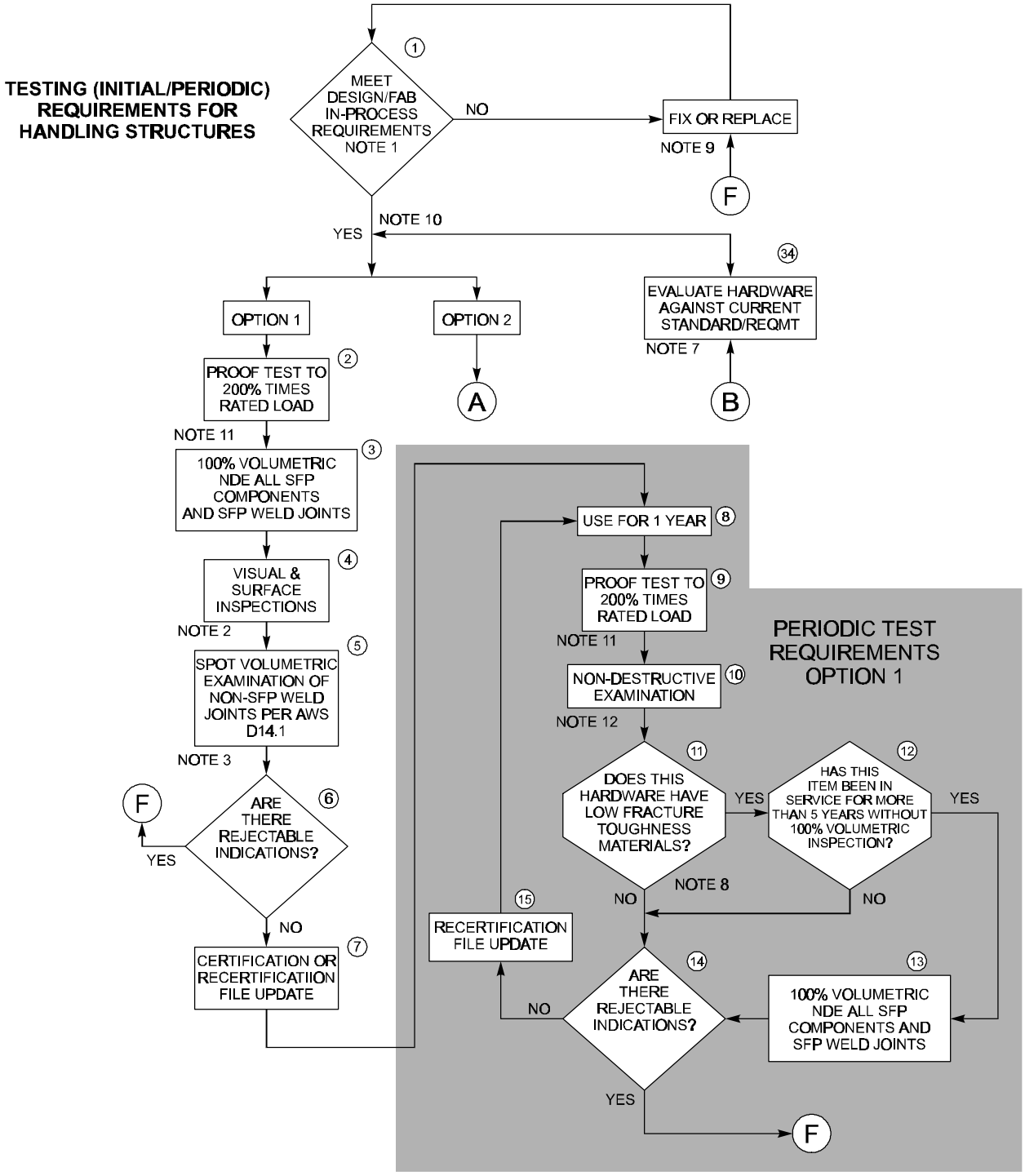
for each requirement if the proposed design is compliant, non-compliant but meets intent, non-compliant (waiver required) or non-applicable. An example of a compliance checklist can be found in Appendix E of the Ranger User Handbook. The following items are included in this section.

a. Criteria/requirement
b. System
c. Compliance
d. Noncompliance
e. Not applicable
f. Resolution
g. Reference
h. Copies of all Range Safety approved non-compliances including deviations, waivers, and formal meets intent certifications (MICs) shall be included.

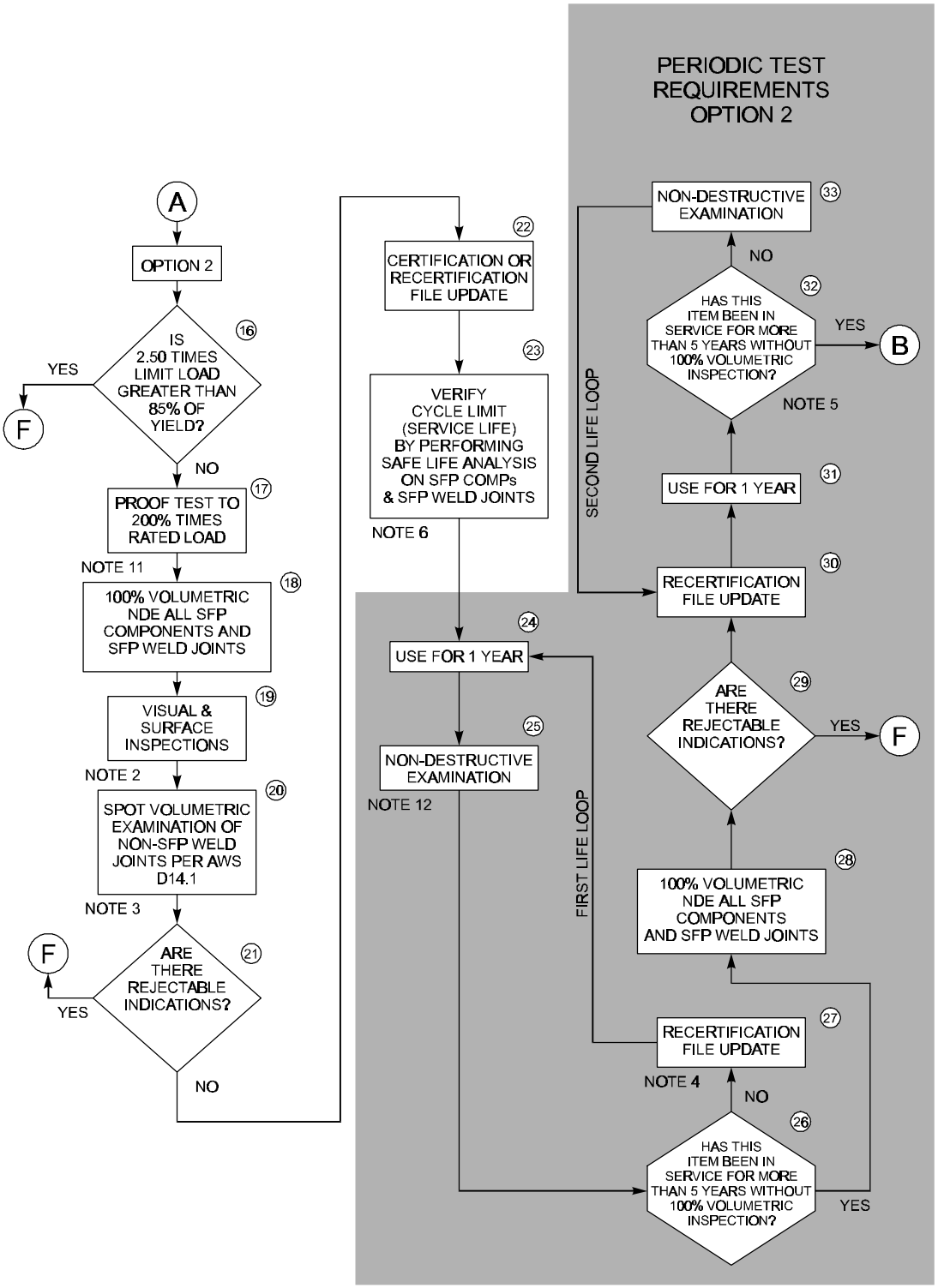
3A.4 MODIFICATIONS TO THE MSPSP

The change section contains a summary of all changes to the last edition of the MSPSP. All changes shall be highlighted using change bars or similar means of identification.

APPENDIX 3B
HANDLING STRUCTURES INITIAL AND PERIODIC TEST REQUIREMENT FLOWPATH



APPENDIX 3B
HANDLING STRUCTURES INITIAL AND PERIODIC TEST REQUIREMENT FLOWPATH



APPENDIX 3B
HANDLING STRUCTURES INITIAL AND PERIODIC TEST REQUIREMENT FLOWPATH

NOTES

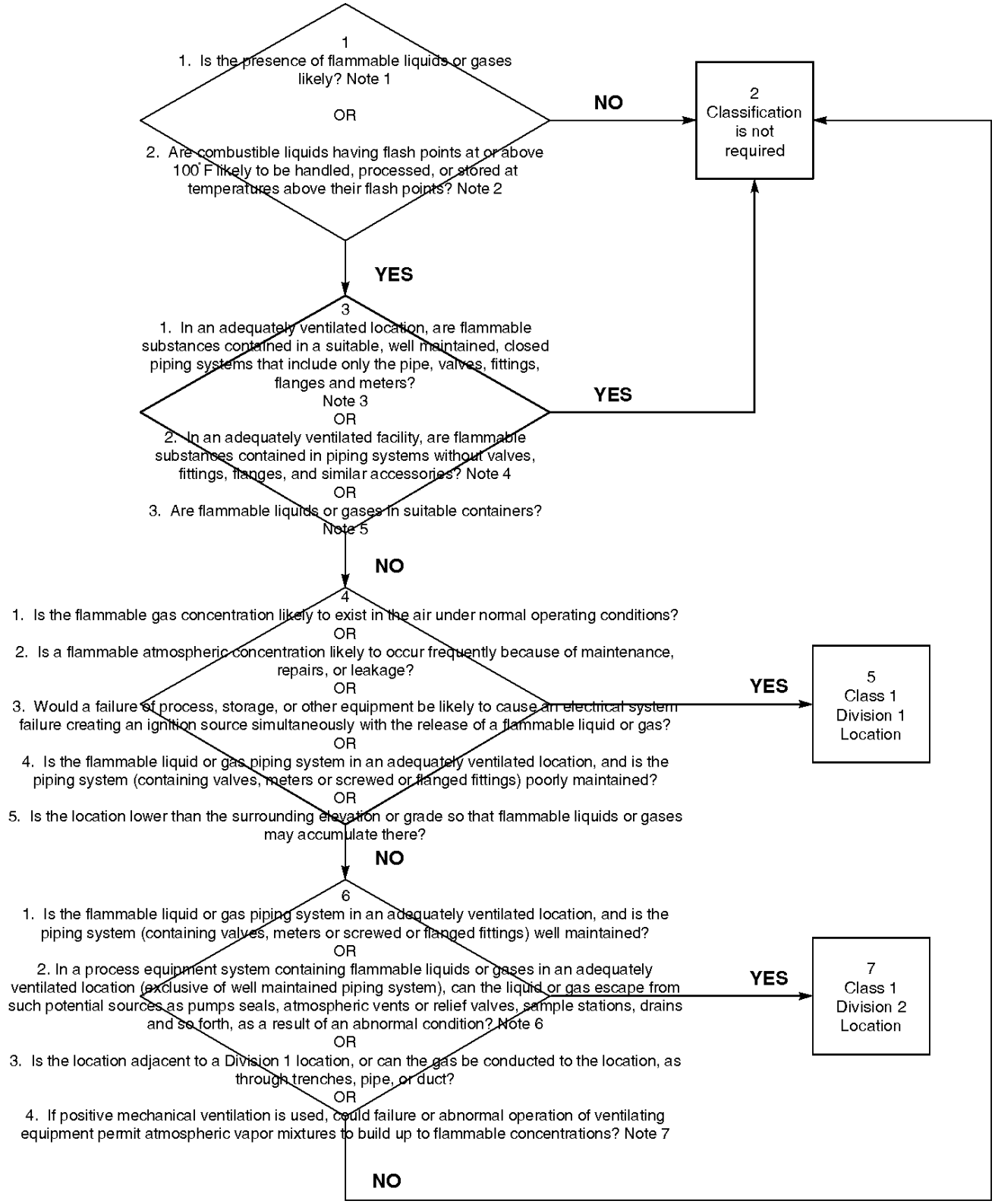
1. Design, Fabrication, and In-Process Requirements:
   a. Meet EWR 127-1 design requirements for handling structures.
   b. Identify SFP components and SFP welds
2. Perform 100 percent visual inspection of all components (including SFP) and weld joints (including SFP and non-SFP) and perform 100 percent surface NDE testing of all SFP components and SFP welds.
3. Perform volumetric NDE inspection on 4 in. or 10 percent (whichever is less) of every continuous non-SFP weld in accordance with AWS D14.1, paragraph 8.9.5.
4. Cycle count is required.
5. MHE and MHSE that has been in service for 10 years or 2500 cycles, whichever is less, shall be evaluated against current Range Safety standards and requirements.
6. Perform safe-life analysis assuming flaws to be in the worst location (transition areas, heat affected areas, weld joints, membrane sections, and highest stressed areas). Safe-life analysis shall be performed using fatigue crack growth computer programs such as NASA/FLAGRO (JSC-22267) or other Range Safety Approved computer programs or analysis methods.

   NOTE: Fracture Mechanics Analysis used to established cyclic limits may assume "crack like defects." This assumption does not imply that cracks or other rejectable indications are acceptable. The logic identified in this flow chart requires that cracks and rejectable indications be fixed.
7. Provide noncompliance issues, if any, to Range Safety for disposition.
8. All parts shall be considered to have a low-fracture toughness with a material property ratio $K_{ic}/F_{ty} < 0.33$ in $^{1/2}$. If the part is a steel bolt and the K_{ic} value is unknown, low fracture toughness shall be assumed when $F_{tu} > 180$ ksi.

   Where: K_{ic} = Plane strain fracture toughness.
   F_{ty} = Allowable tensile yield strength.
   F_{tu} = Allowable tensile ultimate strength.

   Reference: NASA NBH 8071.1
9. Fix hardware. This means either repair or an analytical solution is required as approved by Range Safety.
10. Periodic test and inspection requirements are identified within the gray areas of the flow chart. All other processes identified within the figure are considered initial test requirements.
11. Proof test shall be performed on fully assembled handling structures, unless otherwise approved by Range Safety. Do not proof test greater than 85 percent of yield.
12. Perform NDE in accordance with Range Safety approved NDE plan.

APPENDIX 3C
HAZARDOUS AREA CLASSIFICATION



APPENDIX 3C
HAZARDOUS AREA CLASSIFICATION

NOTES

1: The following are considered flammable liquids/gasses:
   a. Unsymmetrical dimethyl hydrazine (UDMH) - Flashpoint 34^0F
   b. Monomethyl hydrazine (MMH) - Flashpoint 62^0F

2: Hydrazine (N_2H_4) - is considered a combustible liquid.
   a. The surface temperature of potential spill areas must also be considered.
   b. Temperature in the area must be single fault tolerant to remain below 100^0F.
   c. Below grade locations may still accumulate enough N_2H_4 to become flammable at lower temperatures.

3: Adequate ventilation is defined by NFPA 30, *Flammable and Combustible Liquids Code*, as that which is sufficient to prevent the accumulation of significant quantities of vapor-air mixtures in concentrations over 25 percent of the lower flammability limit.
   a. An adequately ventilated location is one of the following:
      1. An outside location
      2. A building, room, or space that is substantially open and free of obstruction to the natural passage of air, either vertically or horizontally. Such locations may be roofed over with no walls, may be roofed over and closed on one side or may be provided with suitably designed wind breaks.
      3. An enclosed or partly enclosed space provided with mechanical ventilation equivalent to natural ventilation. The mechanical ventilation system must have adequate safeguards against failure.
   b. Lower flammability limits of specific commodities are as follows:
      1. N_2H_4 - 4.7 percent
      2. MMH - 2.5 percent
      3. UDMH - 2.0 percent
   c. Payload propellant systems cannot normally be considered closed piping systems that include only the pipe, valves, fittings, flanges, and meters; they normally also include a pressure vessel.

4: Payload propellant systems cannot normally be considered piping without valves, fitting, flanges, and similar accessories.

5: Payload propellant systems cannot be considered suitable containers unless they meet DOT or ASME requirements or meet EWR 127-1, section 3.12 and are also protected from outside damage.

6: A payload propellant system would normally be considered a process equipment system. In a dynamic mode, the answer to this question will almost always be *yes*; in a static mode, the answer may be *yes* or *no* depending on past history and adequacy of protection from outside damage.

7: An analysis must be provided. Consideration must be given to the size of the containment area, credible potential size of the spill, adequacy of the ventilation equipment and its potential failure modes, and the specific gravity of the commodity in question.