

Kennedy NASA Procedural Requirements

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Responsible Office: Safety and Mission Assurance

KSC Safety Procedural Requirements

Volume 3, Safety Procedural Requirements for Partners Operating in Exclusive-Use Facilities

National Aeronautics and
Space Administration

John F. Kennedy Space Center

**KNPR 8715.3-3, KSC Safety Procedural Requirements
Volume 3, Safety Procedural Requirements for Partners
Operating in Exclusive-Use Facilities
Rev. C**

Change Log

Date	Revision	Description
4/19/13	Basic	<p>KNPR 8715.3, KSC Safety Procedural Requirements has been divided into three volumes and a user's guide in accordance with applicability: KNPR 8715.3-1, KSC Safety Procedural Requirements, Volume 1: Safety Procedural Requirements for Civil Servants/NASA Contractors; KNPR 8715.3-2, Volume 2, Safety Procedural Requirements for Partner Organizations Operating in Joint-Use Facilities; and KNPR 8715.3-3, Volume 3, Safety Procedural Requirements for Partner Organizations Operating in Exclusive-Use Facilities.</p> <p>The applicability and wording of a given requirement can vary between the three volumes and the User's Guide, but to maintain consistency the sections of each are organized and numbered identically.</p>
5/19/14	A	<p>This document was revised to reflect actual language written into Kennedy Customer Agreements. Significant updates included changes to Chapter 4: Operational Requirements and the removal of the SA Director's Letter. Other updates based on tailored requirements included the Mishap, Personnel, and Institutional Safety sections.</p>
6/14/19	A-1	<p>Expiration date extended to allow for disposition of comments and processing of final signature package.</p>
8/15/19	B	<p>This document incorporates significant changes that reflect current S&MA requirements on agreements and KSC S&MA practices. Clarifying language was added throughout the document, and empty sections were deleted. Chapters related to Operational Requirements, Institutional Safety, Explosives, Ground Pressure Vessel Systems, Flight Pressure Vessel Systems, and Lifting Devices received major consolidation and updates.</p>
8/13/2021	C	<p>Document updated to better work in conjunction with commercial partner Agreements implementation and removal of duplicative requirements (e.g., applicability, requests for relief, personnel access, and mishap notification). Significant rewrite of what was 4.3.1 Hypergolic Propellant section and is now 4.3.1 Toxic Commodities to fill in safety requirement gaps identified.</p>

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PREFACE

P.1 PURPOSE

a. To keep NASA Kennedy Space Center (KSC) personnel, hardware, facilities, NASA visitors, and the public safe from Partner hazardous operations, this document establishes consolidated safety requirements for Partner operational activities at KSC. This document requires Partners to define hazardous areas and to identify and mitigate unique hazards involved with daily maintenance and processing operations at Partner facilities. This applies to existing facilities or property designated as exclusive-use, as well as facilities built by and for the Partner. It should be emphasized, however, that each employee has a responsibility for safety, both his/her own and that of others who may be impacted by the employee's actions.

b. Compliance with Federal, State and local safety requirements is mandatory, even though the requirement may not be referred to herein.

P.2 APPLICABILITY

a. This volume of Kennedy NASA Procedural Requirements (KNPR) 8715.3 is applicable to NASA KSC Partners (e.g., commercial partners, other Federal agencies, international parties, and tenants) operating in a facility where the Partner is primarily responsible for operations and maintenance of the facility, as specified and described in the applicable written Agreement(s).

b. In the event of a conflict between the requirements set forth in this document and:

(1) The written Agreement, the written Agreement takes precedence.

(2) Other documents at an equivalent level (e.g., other KNPR documents), the respective document Offices of Primary Responsibility will resolve the conflict on a case-by-case basis and provide appropriate guidance.

(3) Other NASA agreements or contracts held by the Partner, the owner of this KNPR will resolve conflicts with the respective document's Office of Primary Responsibility.

c. If disagreement exists over which of the aforementioned documents takes precedence, the NASA KSC Director of Safety and Mission Assurance (S&MA) will make the final determination.

d. In this KNPR, "shall" denotes a mandatory requirement, "may" or "can" denotes a discretionary privilege or permission, "should" denotes a good practice, and "will" denotes an expected outcome, and 'are/is' denoted descriptive material.

e. In this KNPR, document citations are assumed to be the latest version unless otherwise noted.

P.3 AUTHORITY

a. [Title 29 Code of Federal Regulations \(CFR\), Parts 1910 to 1990, Occupational Safety and Health Administration](#)

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- b. [Title 49 CFR, Parts 171 to 178, Transportation, Department of Transportation](#)
- c. [NASA Policy Directive \(NPD\) 8700.1, NASA Policy for Safety and Mission Success](#)
- d. [NASA Procedural Requirement \(NPR\) 8715.3, NASA General Safety Program Requirements](#)
- e. [KNPD 8700.1, Safety and Mission Assurance Policy Directive](#)
- f. [CPL 02-00-124 OSHA Multi-Employer Citation Policy](#)

P.4 APPLICABLE DOCUMENTS AND FORMS

- a. ANSI/American Institute of Aeronautics and Astronautics (AIAA) S-081B, Space Systems-Composite Overwrapped Pressure Vessels
- b. ANSI/AIAA S-080A, Space System Metallic Pressure Vessels, Pressurized Structures, and Pressure Components
- c. [NPR 8621.1, NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping](#)
- d. [NPR 8715.1, NASA Safety and Health Programs](#)
- e. [KNPR 2570.1, KSC Radio Frequency Spectrum Management Procedural Requirements](#)
- f. [KNPR 8715.3-1, KSC Safety Procedural Requirements, Volume 1: Safety Procedural Requirements for Civil Servants/NASA Contractors, Chapter 2: Requests for Relief from Safety and Mission Assurance Technical Authority Requirements](#)
- g. [KNPR 8715.2, Comprehensive Emergency Management Plan](#)
- h. [NASA-STD-8719.12, Safety Standard for Explosives, Propellants, and Pyrotechnics](#)
- i. [NASA-STD-8719.9, Lifting Standard](#)
- j. [NASA-STD-8719.17, NASA Requirements for Ground-Based Pressure Vessels and Pressurized Systems \(PVS\)](#)
- k. [KSC20-195, TAG, DANGER - LOCKOUT/TAGOUT - 29 CFR 1910.147](#)
- l. [KSC20-195A LABEL, DANGER LOCKOUT/TAGOUT \(4.5 X .75"\)](#)
- m. [KSC-PLN-8719 PVS Kennedy Space Center Pressure Systems Management Plan](#)
- n. [KSC-PLN-5000 SIMS, Spaceport Integrated Master Schedule \(SIMS\)](#)
- o. 45th Space Wing Instruction (SWI) 15-101, Weather Support

P.5 MEASUREMENT/VERIFICATION

Compliance with the requirements contained in this KNPR and the applicable written Agreement will be verified through surveillance activities performed by the NASA KSC S&MA organization.

P.6 CANCELLATION

This document cancels KNPR 8715.3-3, KSC Safety Procedural Requirements Volume 3, Safety Procedural Requirements for Partners Operating in Exclusive-Use Facilities, Rev. B.

/original digitally signed by/

Jennifer C. Kunz
Director, Safety and Mission Assurance

CHAPTER 1: GENERAL REQUIREMENTS

1.1 GOAL

The goal of this document is to provide Center safety requirements that ensure Partner hazardous operations on KSC are performed in a manner that minimizes risk to NASA KSC personnel, hardware, facilities, NASA visitors, and the public.

1.2 OBJECTIVE

This KNPR documents Center safety requirements, establishes procedural requirements unique to KSC, and provides Partners operating in exclusive-use facilities on KSC property with safety requirements that protect NASA KSC personnel, hardware, facilities, NASA visitors, and the public.

1.3 RESPONSIBILITY

a. The Partner acknowledges full responsibility for the safety and health of its own employees and that of others who may be impacted by the condition of the properties and the execution of operations within them. As such, the Partner shall:

(1) Perform operations in a manner that minimizes risk to personnel and property.

(2) Ensure those who may be impacted by their operation are made aware of hazards caused by the operation.

b. NASA is not responsible for ensuring the Partner's compliance with Occupational Safety and Health Administration (OSHA), Federal, State, or local laws.

c. Ownership of this KNPR resides with the KSC S&MA Institutional Division. The interpretation of the requirements in this KNPR is the responsibility of the KSC S&MA Institutional Division with the appropriate KSC organization that supports the Agreement. The NASA KSC Director of S&MA is the final authority for interpretation of these requirements.

d. When unsafe or unhealthful conditions/acts pose imminent danger to personnel or property, personnel have the right and obligation to stop and report the work posing the unsafe or unhealthful conditions/act.

1.4 SAFETY REQUIREMENT VIOLATIONS

Violations of safety requirements may result in a default as specified in the terms of the Agreement.

1.5 CHANGE RECOMMENDATIONS

a. S&MA change recommendations involving this document shall be submitted to the document point-of-contact (POC) identified in TechDoc.

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b. The completed change recommendation shall identify the exact language of the proposed change and the rationale for the change.

Note: S&MA will ensure proper review and disposition of change recommendations.

**CHAPTER 2: REQUESTS FOR RELIEF FROM SAFETY AND MISSION ASSURANCE
TECHNICAL AUTHORITY REQUIREMENTS**

- a. NASA KSC S&MA will work with the Partner(s) to tailor the S&MA requirements as appropriate for the Agreement(s).

- b. NASA KSC will be responsible for documenting and obtaining approval of Requests for Relief from any of its Agency or Center requirements per [KNPR 8715.3-1, KSC Safety Procedural Requirements, Volume 1: Safety Procedural Requirements for Civil Servants/NASA Contractors.](#)

- c. Relief from requirements listed in any Agreement will follow the resolution process within the Agreement.

CHAPTER 3: PERSONNEL

3.1 PERSONNEL CONTROLS

Personnel shall not enter a controlled area unless authorized to do so by the appropriate area access controlling authority.

3.2 PERSONNEL ACCESS TRAINING

a. Partner shall provide all badged personnel information on KSC emergency procedures and hazards on KSC property.

Note: Per KSC badging guidelines, personnel with access exceeding 30 days will obtain the appropriate badging (i.e., Personal Identity Verification Badge, Center Specific or Local Badge).

Note: This information should include, but is not limited to, information provided in KNPR 8715.2, Comprehensive Emergency Management Plan, hazard and weather warning methods, hazard signage, emergency phone numbers, and facility-specific information.

b. Personnel requiring entry to KSC access-controlled facilities/areas shall complete required area access training or be escorted by permanently badged personnel who have completed the required training.

c. Partner shall provide a means for NASA personnel to access the Partner's defined areas (as required in the applicable Agreement) via partner specific area access training or escorts.

CHAPTER 4: OPERATIONAL REQUIREMENTS

4.1 ASSESSMENT

For exclusive-use facilities, it is the responsibility of the Partner to provide hazard information, where NASA KSC personnel, hardware, facilities, NASA visitors, and the public may be exposed to hazards generated by the Partner's activities.

The assessment described in this section allows NASA KSC S&MA to verify that the controls/mitigations for hazards introduced to the Center by a Partner are appropriate to protect NASA KSC personnel, hardware, facilities, NASA visitors, and the public.

a. Prior to the start of operations at KSC, the Partner shall have hazards mitigated, controlled, and prepare the following information for review by NASA KSC S&MA through the appropriate NASA POC(s) as identified in the Agreement:

Note: Some of the following requirements may also be satisfied via a Ground Operations Plan, System Safety Program Plan, Safety Data Package, or Missile System Prelaunch Safety Package.

Note: Partner should communicate all planned on-Center operations and transportation with their NASA KSC Customer Advocate identified in the agreement who will coordinate with the appropriate NASA KSC POCs (e.g., Watch Commander, Radiation Safety Officer, and Protective Services).

(1) Concept of operations on KSC which includes details of planned events and construction activities along with an explanation of operations addressing location and hardware involved.

(2) Hazardous operating procedures associated with the Partner's operations, including a description of the hazards and procedures for safing and securing the hazards.

(3) List of bulk hazardous materials and associated Safety Data Sheets (as defined in 29 CFR 1910.1200), maximum quantities, and locations of bulk hazardous chemicals to be stored or used in the Partner's defined area.

(4) Detailed plans for controls and mitigation for the identified hazards addressing the Center-mandated hazard controls identified in Chapter 4 and any applicable hazard-specific controls identified in this document.

Note: These plans should address local weather and lightning induced hazards.

(5) A Site Specific Safety and Health Plan, or similar documentation, describing how the Partner intends to ensure the safety and health of personnel and protect property from damage.

Note: Typically, a Safety and Health Plan would include detailed descriptions of policies, procedures, and techniques for anticipated working conditions that will be encountered throughout the Agreement. NASA KSC S&MA will use this plan to help evaluate the organization's capability to control hazards.

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(6) An Emergency Action Plan or similar documentation (as defined by OSHA in 29 CFR 1910.38[a]) which describes how Partner personnel respond to emergencies within the facility and to emergencies in neighboring facilities.

(7) Contingency plans in the event of a mishap or a significant weather event (e.g., hurricanes).

(8) Any additional information NASA KSC S&MA requests for use in verifying hazard controls are appropriate to protect NASA KSC personnel, hardware, facilities, NASA visitors, and the public.

b. The Partner shall notify the appropriate NASA KSC S&MA POC(s) of any changes to the above information prior to implementing those changes.

Note: Changes that require NASA POC notification include, but are not limited to, the introduction of new operations, introduction of new hazards, and changing existing controls/mitigations.

c. If NASA determines that hazards resulting from Partner activities may affect NASA KSC personnel, hardware, facilities, NASA visitors, and the public because the hazard controls are not adequate, the Partner shall provide further clarification and implement additional controls as directed by NASA.

d. Upon request, Partner shall allow NASA KSC S&MA to review Partner operations and associated hazards to ensure the safety of NASA KSC personnel, hardware, facilities, NASA visitors, and the public.

e. The Partner shall implement the Safety and Health Plan, all hazard controls, and mitigations as documented.

4.1.1 Surveillance

a. When a Partner has identified hazardous operations and commodities as part of operations, KSC S&MA performs NASA's assessment referenced in Section 4.1 via a surveillance plan.

b. NASA KSC S&MA limits the scope of their surveillance plans to verifying the Partner's compliance to the safety requirements contained in the Agreement and the requirements of KSC S&MA documents referenced within the Agreement.

Note: Selected requirements for surveillance should focus on operational hazards that have the potential to expose NASA KSC personnel, hardware, facilities, NASA visitors, and the public to additional risk.

c. NASA KSC S&MA maintains records of surveillance plans and evidence records, and shall make these records available to the Partner upon request.

d. NASA KSC S&MA personnel or their designees have the right to enter any facility on KSC or request information as specified in the written Agreement to assess a Partner's ability to control hazards that pose a risk to NASA KSC personnel, hardware, facilities, NASA visitors, and the public.

4.2 CENTER-MANDATED HAZARD CONTROLS

All of the Center-Mandated Hazard Controls shall be included in the assessment required by Section 4.1 of this document.

4.2.1 Control Areas

a. Partner shall determine the control area for hazardous operations, re-evaluate the control area when there is a change to the hazardous operation, and inform the appropriate NASA POC(s) (as identified in the Partner's agreement) if a control area extends outside the Partner's defined area.

b. If the control area extends outside the Partner's defined area, it shall:

(1) Be clearly marked to indicate the control boundary.

(2) Not overlap with another organization's control area if there are concurrent operations.

(3) Be established to allow facility ingress and egress of personnel not involved with the operation.

(4) Allow emergency responders to access an emergency within the facility without requiring them to proceed through the Partner control area.

c. Only the organization that installed safety signs or barriers outside the Partner's defined area shall remove or alter those signs/barriers.

d. The organization reopening the control area shall verify the hazards are appropriately removed before the area is reopened.

4.2.2 Safety Warnings

The Partner shall maintain flashing safety warning lights, warning signs, and a public address system at the facility control points where hazardous conditions exist as a part of routine work.

4.2.2.1 Warning Lights

Warning light designations at KSC shall be:

a. Flashing red: A danger period exists and personnel shall be cleared from the control area immediately and entry to the area prohibited.

b. Flashing amber: A hazard period exists and entry to the control area shall be limited to essential personnel.

4.2.2.2 Warning Signs

Warning signs will be used in conjunction with and adjacent to warning lights as follows:

a. Warning signs adjacent to red lights shall read as follows and may contain more specific response instructions:

EMERGENCY SITUATION EXISTS
CLEAR AREA IMMEDIATELY

b. Warning signs adjacent to amber lights shall read as follows and may contain more specific response instructions:

HAZARDOUS MATERIALS/OPERATIONS PRESENT
ENTRY ON CONTROLLED BASIS
ESSENTIAL PERSONNEL ONLY

4.2.3 Public Address Announcements

a. If there is the potential for personnel outside the Partner's defined area to be exposed to a hazard, the Partner shall provide appropriate information to the Agreement Technical POC to employ a public address system to alert those potentially exposed to hazards of danger and to provide information associated with hazardous operations.

b. Partners shall have in place a system to receive area warning announcements made by NASA KSC.

4.2.4 Hazardous Operations Support Requirements

a. In accordance with Partner's Agreement and this document, the Partner shall participate in the Center's overall integrated scheduling process to coordinate hazardous operations.

Note: This coordination will include notification to NASA of any fire and emergency support needed for the operation. Integrated scheduling at KSC is managed through [KSC-PLN-5000 SIMS, Spaceport Integrated Master Schedule \(SIMS\)](#).

b. The Partner shall establish and maintain continuous communication between the NASA operation's control point and the Partner operation when NASA determines that a Partner's hazardous operation may affect personnel or property outside of the Partner's defined area.

c. If continuous communication is required for a Partner's hazardous operation, and continuous communication is lost, the Partner shall stop and safe the operation.

Note: Loss of electrical power needs to be considered when implementing this requirement. If the operation uses electrical power for safing or securing, there will need to be back up power capable of safing the system. Partners should consider back-up communication methods.

4.2.5 Pretest and Pretask Briefings

In the event that KSC personnel/contractors need to enter the Partner's defined area for any reason, KSC personnel/contractors shall be specifically informed of any ongoing operations and hazards present in the facility.

4.3 HAZARD-SPECIFIC MANDATED CONTROLS

4.3.1 Toxic Commodities

In exclusive-use facilities, the Partner shall perform the following with respect to toxic commodities:

a. Facilities/areas used for the storage of or operations involving toxic commodities shall be equipped to manage the containment of toxic releases.

Note: Toxic commodities are inclusive of hypergolic propellants.

b. The release-management capabilities of storage and operational facilities/areas for toxic commodities shall be based on the:

(1) Worst-case credible release

(2) Quantities of water or other neutralizers that may be used to wash release area

(3) Exhaust needs of the facility to minimize the hazards caused by the release

c. Bonding and grounding shall be provided between ground points and the ground and flight propellant systems during operations involving toxic commodities.

d. Wind data shall be monitored outside facilities/areas prior to and continuously during operations involving toxic commodities.

e. Clear areas shall be adjusted outside facilities/areas where toxic commodity operations are conducted when required based on wind data.

f. Illuminated wind-socks shall be installed for facilities/areas where toxic commodities are stored or used.

g. Operating organizations shall:

(1) Establish a control area using an analysis that takes into account the acceptable exposure limit for the specific toxic commodity being used and the current meteorological conditions to ensure the protection of personnel and neighboring workforce that are not wearing personal protective equipment.

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(2) Base the control area on a NASA KSC accepted Permissible Exposure Level (PEL) for a short term exposure.

Note: As of the publication date of this document, NASA/KSC would consider a control area based on a parts-per-million concentration of ½ the listed National Institute of Occupational Safety and Health Immediately Dangerous to Life and Health (IDLH) value as acceptable. Other values may be acceptable based on the commodity, the operation and the hazard controls. NASA/KSC would consider the standard 200ft radial and 700ft downwind control area as typically acceptable, as 700ft encompasses the ½ IDLH values for most Florida weather conditions for most common toxic effluents (e.g., nitrogen dioxide gas from a nitrogen tetroxide spill). This is valid as long as the thermal lapse rate, or the change in temperature from ground (about 6ft) to typical weather tower height (about 56ft), is less than +2 (positive when air is warmer than the ground) and the wind direction standard deviation is greater than 7° - this covers most days in Florida but not all. For more hazardous substances or out-of-scope weather conditions, pre-approved clear areas need to be determined.

(3) Expand the clear in the event of a leak or spill to a full downwind clear distance that protects uninvolved personnel from a defined health threatening exposure level based on an accepted PEL.

Note: As of the publication date of this document, NASA/KSC would consider a downwind clear for uninvolved personnel to an Environmental Protection Agency Acute Exposure Guideline Level - 1 for Nitrogen Tetroxide fuel (NO₂ gas) as acceptable. Other values may be acceptable based on the commodity, the proposed PEL, the operation and the hazard controls in place.

(4) Evacuate clear areas prior to the operation when it will not be possible to clear the area to a full downwind clear distance and placard such clear areas to account for weather conditions that might change the size or direction of the clear area.

Note 1: Utilizing the Ocean Breeze / Dry Gulch cold spill model, distance would be a function of thermal lapse rate, which is the change in temperature from ground to altitude.

Note 2: Direction is predominantly based on wind speed and consistency of direction.

(5) Provide NASA/KSC first responders with knowledge of the hazards involved and the control areas and downwind clear distances and areas for the operation.

(6) Provide NASA KSC with the information necessary to model the downwind clear area in the Meteorological and Range Safety Support (MARSS)/Eastern Range Dispersion Assessment System (ERDAS) system. In the case that MARSS/ERDAS is unavailable, provide the first responders with a hard-copy set of clear distance vs. commodity tables for their use.

(7) Use other appropriate engineering and administrative controls made available in a systems safety hazard analysis that can effectively manage or minimize the risks.

CHAPTER 5: INSTITUTIONAL SAFETY

OSHA regulates worker safety in the United States and its territories. OSHA health and safety standards that are applicable by law across the Center are contained in [29 CFR](#). The requirements in this KNPR may be more stringent than and are applicable in addition to the 29 CFR requirements. However, these KNPR requirements do not supersede 29 CFR.

5.1 EMERGENCY EVACUATION REQUIREMENTS

The Partner shall maintain current emergency evacuation/egress plans for its facilities.

5.2 LOCKOUT/TAGOUT PROGRAM

a. The entity shutting down and locking out a system (whether Partner or NASA KSC) shall notify affected third parties prior to shutting down and locking out a system that may affect those parties.

b. Partners performing Lockout/Tagout (LOTO) procedures on a NASA-shared asset (facility or equipment) shall:

(1) Use [KSC Form 20-195a, Lockout Identifiers](#), or an equivalent form (as documented in the Partner's Site-Specific Safety and Health Plan) compliant to an OSHA-approved LOTO Program to identify locks.

(2) Use [KSC Form 20-195, LOTO Tag](#), or an equivalent tag compliant to an OSHA-approved LOTO Program (as documented in the Partner's Site-Specific Safety and Health Plan), as the LOTO tag.

Note: Refer to Agreement for "demarcation" points. The above requirement is intended to enable a clear and consistent hazard communication for shared assets/common areas.

CHAPTER 6: MISHAPS AND CLOSE CALLS

KSC-Reportable Mishaps are unplanned events arising from the acts or omissions of a Partner or its employees, agents, contractors, tenants, or invited guests that result in at least one of the following:

- (1) The death of an individual.
- (2) Injury or illness to a NASA employee/NASA contractor or any individual that is not employed by the Partner or its agents, contractors, tenants, or invited guests.
- (3) Damage to NASA real or personal property inside the Partner's defined area that has not been "loaned/leased" to the Partner.
- (4) Damage to property outside the Partner's defined area.
- (5) High visibility or high public interest event.

a. The Partner shall report any KSC-Reportable Mishaps to NASA KSC by notifying the appropriate NASA POC(s) identified in the Agreement within one hour of becoming aware of the event (after appropriate emergency/medical response is notified).

Note: In addition to contacting the appropriate NASA POC(s) identified in the Agreement by telephone, also contact the NASA KSC Center Safety Office at 321-867-7233 (321-867-SAFE).

b. The Partner shall report any unsafe activity, condition, event, or source of danger they observe outside the Partner's defined area to the appropriate NASA POC(s) identified in the Agreement.

c. The partner shall cooperate in and permit a NASA KSC S&MA investigation (which may include an interim investigation response, data and artifact impoundment, and control of the scene) of any KSC-Reportable Mishap in accordance with Agency and Center policies and procedures.

d. If the Partner conducts an independent mishap investigation, the Partner shall provide a copy of the final mishap report to the appropriate NASA POC(s) as identified in the Agreement.

e. The Partner shall report any close call ("near miss") that could have led to a KSC-Reportable Mishap to the appropriate NASA POC(s) as identified in the Agreement.

CHAPTER 7: KSC GROUND-BASED PRESSURE VESSELS AND PRESSURIZED SYSTEMS

If PVS built, owned, or maintained by the Partner are determined by the KSC Pressure Systems Manager (PSM) to pose a risk to NASA KSC personnel, hardware, facilities, NASA visitors, and the public, the following requirements apply. With the concurrence of the KSC PSM, the Partner may institute alternate requirements/mitigations to satisfy the following requirements:

- a. Partner-owned ground-based PVS at KSC shall be designed, maintained, and tested in accordance with the applicable standards listed in [NASA-STD-8719.17, NASA Requirements for Ground-Based PVS](#), Chapter 5, Table 6: Application of National Consensus Codes, Standards and Laws to PVS.
- b. Partner shall provide PVS drawings, analysis, and testing information for review, as requested, by the KSC PSM.

Note: The PSM will coordinate with Partners to determine the appropriate scope for deliverables.

CHAPTER 8: FLIGHT HARDWARE PRESSURE VESSEL SAFETY REQUIREMENTS

In addition to the requirements contained in [NPR 8715.1, NASA Safety and Health Programs](#) the requirements in this chapter are applicable to NASA or non-NASA (including Partner) owned or operated flight hardware operated on NASA KSC Property.

- a. Prior to the pressurization of flight and prototype-flight PVS, flight hardware owners shall provide a hazard analysis, based on pressure vessel blast, fragmentation, and appropriate Quantity-Distance siting, to NASA KSC S&MA personnel for determination of appropriate hazard controls per ANSI/American Institute of Aeronautics and Astronautics (AIAA) S-081B, "Space Systems-Composite Overwrapped Pressure Vessels" Section 11; or ANSI/AIAA S-080A, "Space System Metallic Pressure Vessels, Pressurized Structures, and Pressure Components" Section 11 as applicable.
- b. Flight Hardware Composite Overwrapped Pressure Vessels pressurized to greater than 1/3 of the design burst pressure shall be transported along approved routes approved by the Watch Commander that minimize exposure to personnel and facilities, be accompanied by an authorized escort vehicle, and take place during "off-shift" time periods.

CHAPTER 9: EXPLOSIVES, PROPELLANTS, AND PYROTECHNICS

If the Partner's explosives, propellants, and pyrotechnics are determined by the KSC Explosive Safety Officer (ESO) to pose a risk to NASA KSC personnel, hardware, facilities, NASA visitors, and the public, the following requirements apply. With the approval of the KSC ESO, the Partner may institute alternate requirements/mitigations which provide an equivalent level of safety.

a. Partners shall meet the requirements of [NASA-STD-8719.12, Safety Standard for Explosives, Propellants, and Pyrotechnics](#).

b. Partner shall provide propellant and explosive commodity data with appropriate information to NASA KSC S&MA for the creation of an Explosive Site Plan in accordance with [NASA-STD-8719.12, Safety Standard for Explosives, Propellants, and Pyrotechnics](#), a supplemental standard to OSHA Regulation 29 CFR 1910.109. The completed site plan will be documented in the KSC Facilities Master Plan.

CHAPTER 10: LIFTING DEVICES AND EQUIPMENT

If the Partner's lifting operations are determined by the KSC Lifting Devices and Equipment Manager (LDEM) to pose a risk to NASA KSC personnel, hardware, facilities, NASA visitors, and the public, the following requirements apply. With the approval of the KSC LDEM, the Partner may institute alternate requirements/mitigations which provide an equivalent level of safety.

- a. Partner's shall provide evidence as part of Chapter 4.1 Assessment that lifting and suspended load hazards to NASA personnel and property are mitigated, based on equivalent controls listed in [NASA-STD-8719.9, Lifting Standard](#).
- b. The Partner is responsible for coordinating any suspended load operations directly with OSHA. The NASA Alternate Standard for Suspended Load Operations is not applicable to Partner lifting operations.

CHAPTER 11: LIGHTNING HAZARD INFORMATION

Lightning hazards should be assessed and mitigations established as part of the operational assessment required in Chapter 4. KSC notification of lightning activities is a two-phased process and is based upon bulletins issued specifically for KSC by the Air Force 45th Weather Squadron (45 WS), based at Cape Canaveral Air Force Station. Weather watches, warnings, and advisories, including those for lightning, are defined in 45th Space Wing Instruction (SWI) 15-101, Weather Support. The Phase I Lightning Watch and Phase II Lightning Warning are designed and intended to notify personnel in specific high-density operational areas when a lightning hazard is approaching and when a lightning hazard is present. A Phase I Lightning Watch indicates conditions are favorable for lightning to occur within a specified distance of a lightning hazard notification area (LHNA) within 30 minutes. A Phase II Lightning Warning indicates lightning is imminent or occurring within a specified distance of a LHNA. The specified distance is 5 nautical miles of a single facility or within 6 nautical miles of a center point between multiple facilities. Upon notification from 45WS, Phase I and Phase II announcements will be made on the KSC Paging and Area Warning System and select KSC radio system voice nets.

Note: Lightning Watches and Warnings are announced in order to implement pre-planned lightning safety procedures for personnel and hardware.

Note: Phase I and Phase II lightning notifications are intended to notify personnel working within a LHNA of the lightning hazard in order to implement pre-planned lightning safety plans or procedures for personnel and hardware. For work locations outside of the LHNAs, other methods of identifying and communicating the lightning hazard must be developed by the respective organization.

APPENDIX A: DEFINITIONS

Agreement: Any legal agreement entered into between NASA KSC and another entity under authority of the National Aeronautics Space Act of 1958, the Commercial Space Launch Act (CSLA), or NASA's Enhanced Use Lease Authority. This term is used to assume any KSC partnership agreement, including but not limited to, Space Act Agreements, reimbursable and non-reimbursable service agreements under the Space Act or CSLA, property out-grants and loans, and data sharing agreements.

Approval: (*Request for Relief*) Decision by the S&MA Technical Authority that the request for relief is for relief from NASA policy and may be implemented after the appropriate person accepts the risk.

Cleared Area: An area where a hazardous condition exists or a hazardous operation is in progress; personnel are prohibited from entering.

Close Call: An occurrence or a condition of employee concern in which there is no injury or only minor injury requiring first aid and no significant NASA equipment/property damage/mission failure (less than \$20,000), but which possesses a potential to cause a mishap.

Contingency Plan: A written document that includes procedures to notify, report, investigate, and record mishaps and close calls as defined by [NPR 8621.1, NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping](#).

Control Area: A designated, limited-access area where a hazardous condition exists or a hazardous operation is in progress; nonessential personnel are prohibited from entering.

Control Point: The area or place where the task leader and any other support groups direct and monitor the operation.

Defined Area: The facility/area specifically identified in the approved agreement between NASA KSC and the Partner.

Essential Personnel: The number of personnel required within the control area for a particular operation as documented in the procedure.

Event: A real-time occurrence describing one discrete action, typically an error, failure, or malfunction (e.g., pipe broke, power lost, lightning struck, person opened valve).

Exclusive-Use Facility: A facility within KSC property that is managed by a Partner. The Partner is responsible for integration and maintenance within the facility. This facility may be owned by the Partner, or owned by NASA and utilized by the Partner through a lease or other property Agreement.

Explosive: Any chemical compound or mechanical mixture that, when subjected to heat, impact, friction, detonation, or other suitable initiation, undergoes a very rapid chemical change with the evolution of large volumes of highly heated gases that exert pressures in the surrounding medium. The term applies to materials that either detonate or deflagrate.

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Facility: Buildings, structures, and other real property improvements including utilities and collateral equipment.

Flight Hardware: Hardware designed and fabricated with the intent to fly.

Ground-based PVS: PVS, including PVS based on barges, ships, or other transport vehicles, not specifically excluded in this document. Flight PVS used for their intended purpose aboard active air or space craft, even though on the ground, are not included in this definition, but flight PVS converted to ground use are included.

Ground Support Equipment (GSE): Ground-based equipment used to store, transport, handle, test, check-out, service, and control aircraft, launch vehicles, spacecraft, or payloads.

Hazard: A condition that has the potential to result in or contribute to injury, death, or equipment damage.

Hazardous Material: Any solid, liquid, or gaseous material, which meets the hazard reporting requirements of 29 CFR 1910.1200. This includes commodities that, under foreseeable conditions, are toxic, carcinogenic, cryogenic, explosive, flammable, pyrophoric, water-reactive, corrosive, an oxidizer, a compressed gas, a combustible liquid, or are chemically unstable.

Hazardous Operation (Hazardous Tasks): Any operation or other work activity that, without implementation of proper mitigations, has a potential to result in loss of life, serious injury to personnel or public, or damage to property due to the material or equipment involved or the nature of the operation/activity itself.

Joint-Use Facility: Any NASA owned facility that contains Partner-managed operations within the facility boundaries, where NASA is responsible for the overall integration and maintenance of the facility.

Lightning Hazard Notification Area (LHNA): Designated areas in which the 45th Weather Squadron monitors for KSC lightning watches and warnings. These areas include Haulover, Shuttle Landing Facility, Launch Complex 39 Area, and Industrial Area.

Lockout/Tagout: The process of configuring equipment in a temporary condition in which the release of energy is prevented from endangering personnel performing servicing and/or maintenance. The placement of a lock/tag on the energy isolating device in accordance with the established procedure, indicating that the energy isolating device shall not be operated until removal of the lock/tag in the accordance with the established procedure.

Mishap: An unplanned (undesired, unexpected) event that results in injury requiring more than first aid, occupational illness to personnel, and/or damage to property of at least \$20,000. Mishaps also include: Injury to non-NASA personnel, caused by NASA operations; damage to public or private property (including foreign property), caused by NASA operations or NASA-funded development or research projects; occupational injury or occupational illness to personnel or exposures over a prolonged period of time; NASA mission failure before the scheduled completion of the planned primary mission; destruction of, or damage to, NASA property except for a malfunction or failure of component parts that are normally subject to fair wear and tear and have a fixed useful life that is less than the fixed useful life of the complete

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system or unit of equipment, provided that the following are true: 1) there was adequate preventative maintenance; and 2) the malfunction or failure was the only damage and the sole action is to replace or repair that component; mishaps resulting in damage to aircraft, space hardware, or GSE that meet these criteria are included, as are test failures in which the damage was unexpected or unplanned. For purposes of investigation and reporting, mishaps are categorized as: Type A, B, C, and D Mishaps and Close Calls (refer to [NPR 8621.1, NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping](#)).

NASA Personnel and Property: As used in this document, NASA employees (Civil Servants and Contractor), NASA hardware, NASA KSC facilities, visitors, and the public.

National Consensus Standard: (PVS) Any standard, or modification thereof: (1) adopted or promulgated by a nationally recognized standards-producing organization using procedures that demonstrate to the Secretary of Labor for Occupational Safety and Health that those persons interested in or affected by the standard have reached substantial agreement on its adoption; (2) formulated so that an opportunity existed for diverse views to be considered; and (3) designated by the Secretary or the Assistant Secretary, after consultation with other appropriate Federal agencies.

Note: A standard, as defined, requires appropriate conditions or activities to provide a safe and healthful employment environment.

Near Miss: An incident where no property was damaged and no personal injury sustained, but where, given a slight shift in time or position, damage and/or injury easily could have occurred.

Partner: A non-NASA KSC organization who has a formal agreement with NASA KSC for use of NASA KSC property/facilities to conduct operations. This includes, and is not limited to, commercial partners, international partners, and tenants.

Phase I Lightning Watch: Conditions are favorable for lightning to occur within a specified distance of a LHNA within 30 minutes. The specified distance is 5 nautical miles of a single facility or within 6 nautical miles of a center point between multiple facilities.

Phase II Lightning Warning: Lightning is imminent or occurring within a specified distance of a LHNA. The specified distance is 5 nautical miles of a single facility or within 6 nautical miles of a center point between multiple facilities.

Pressure System: An assembly of components under pressure, including vessels, piping, valves, relief devices, pumps, expansion joints, gauges, etc. This includes systems containing hazardous or lethal fluids at any pressure above 0 MPa (gauge) (0 lb/in² (gauge)) and systems containing nonhazardous or nonlethal fluids above 0.1 MPa (gauge) (15 lb/in² (gauge)), unless otherwise specifically excluded.

Pressure Systems Manager (PSM): The individual designated by the KSC Center Director who is responsible for the overall management of the KSC Pressure Vessel/Systems (PVS) Certification Program. The KSC PSM resides in the Institutional S&MA Division.

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Pressure Vessel: Any vessel used for the storage or handling of gas or liquid under positive pressure. Included in this definition are components of systems (e.g., heat exchanger shells and drying towers, and other shell structures) for which the rules of the American Society of Mechanical Engineers Code, Section VIII, would apply. Vessels containing hazardous or lethal fluids at any pressure positive or gauge (0 lb/in² (gauge)), and vessels containing nonhazardous or nonlethal fluids above 0.1 MPa (gauge) (15 lb/in² (gauge)) are included unless otherwise specifically excluded.

Pretask Briefing: A briefing held immediately prior to the start of (a) hazardous sequence(s), which details the hazard(s) and objective(s) associated with that particular sequence.

Pretest Briefing: A briefing held prior to the start of a hazardous operation with a major control area, which details the hazard(s) and objective(s) of the operation and confirms that operational and support elements are ready.

Request for Relief: A waiver, deviation, or request for determination of non-applicability to modify or eliminate a stated requirement and usually not meet the full intent and letter of the requirement as stated.

Risk: The combination of the likelihood (qualitative or quantitative) that an activity will experience an undesirable event and the consequence/severity of the undesired event were it to occur.

Risk Assessment (Safety): Process of qualitative risk categorization or quantitative risk (safety) estimation, followed by the evaluation of risk significance.

Safety or Safety Representative: The term "safety" is used without context to contractor or NASA personnel. The phrase "NASA S&MA" is used to mean a Government Safety representative only.

Tag: Lockout/tagout device that alerts workers regarding equipment/machinery status.

Tagout Device: A prominent warning means such as a tag and a means of attachment, which can be securely fastened to an energy isolating device and the equipment being controlled.

Warning: A notation which if not adhered to or observed could result in loss of life, personal injury, or exposure.

Weather Advisory: A special notice that nonsevere weather conditions, which could affect operations, are occurring or are expected to occur.

Weather Warning: Notification of weather conditions of sufficient intensity to pose a hazard to life or property.

Weather Watch: Notification of weather conditions that are favorable for future development that may pose a hazard to life or property. Watches may be superseded by a warning if conditions warrant.

APPENDIX B: ACRONYMS AND ABBREVIATIONS

45WS	Air Force 45 th Weather Squadron
AIAA	American Institute of Aeronautics & Astronautics
CFR	Code of Federal Regulations
CSLA	Commercial Space Launch Act
ERDAS	Eastern Range Dispersion Assessment System
ESO	Explosive Safety Officer
GSE	Ground Support Equipment
IDLH	Immediately Dangerous to Life or Health
KNPD	Kennedy NASA Procedural Document
KNPR	Kennedy NASA Procedural Requirements
KSC	Kennedy Space Center (NASA, KSC, Florida)
LDEM	Lifting Devices and Equipment Manager
LHNA	Lightning Hazard Notification Area
LOTO	Lockout/Tagout
MARSS	Meteorological and Range Safety Support
NASA	National Aeronautics and Space Administration
NPD	NASA Policy Directive
NPR	NASA Procedural Requirement (document)
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Level
POC	Point-of-Contact
PSM	Pressure Systems Manager
PVS	Pressure Vessels and Pressurized Systems
S&MA	Safety and Mission Assurance
SIMS	Spaceport Integrated Master Schedule
STD	Standard
SWI	Space Wing Instruction

APPENDIX C: REFERENCE DOCUMENTS

In preparing the Assessments required by Chapter 4 of this document, you may find it useful to identify NASA concerns and controls in the following documents:

- a. [KNPR 8715.3-1, KSC Safety Procedural Requirements, Volume 1: Safety Procedural Requirements for Civil Servants/NASA Contractors](#)