National Aeronautics and
Space Administration

John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

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COMPLIANCE IS MANDATORY

John C. Stennis Space Center
Explosive Safety Program

Document History Log

Status/Change/ Revision	Change Date	Originator/Phone	Description
Basic	November 2013	R. Gargiulo 8-3842	Initial Release
Basic-1	December 2015	R. Gargiulo 8-3842	Administration Changes
Basic 2	September 2016	R. Gargiulo 8-3842	Change references to Facility Operating Services Contract (FOSC) to Synergy Achieving Consolidated Operations and Maintenance (SACOM); Added SACOM to acronyms list

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PREFACE

P.1 PURPOSE

a. This National Aeronautics and Space Administration (NASA) Stennis Space Center (SSC) Procedural Requirements (SPR) document defines the Center's Explosive Safety Program. NASA programs and SSC tenants may conduct activities on NASA property requiring the implementation of explosive safety policies, principles and techniques to protect the public, workforce and/or property from associated hazards. The management, storage and use of explosives, munitions and pyrotechnics are referenced throughout this SPR as "explosive operations." This SPR outlines the SSC safety policies, requirements and processes applicable to the Department of Defense (DoD), commercial and NASA direct activities using explosives, munitions and pyrotechnics and provides safety assurance requirements for the use of propellants in rocket engine testing.

> *Note: With respect to the DoD explosive operations, the DoD organization shall adhere to the standards and requirements of their branch of service and the DoD Explosive Safety Board. NASA/SSC's oversight of the DoD operations is to ensure their operations do not adversely affect NASA personnel, facilities and mission, as well as to ensure NASA's operations do not adversely affect the DoD.*

b. This document implements the NASA safety standards/procedures for operations involving explosives handling and processing. Safety of all explosive operations associated with NASA programs is an ongoing, primary concern and must continually be given high priority in all program direction and management. This document implements NASA's safety standards for explosives' storage, handling and processing, and complies with the cardinal principle for explosive safety: expose the minimum number of people to the smallest quantity of explosives for the shortest period consistent with the operation being conducted.

P.2 APPLICABILITY

This document is applicable to all programs/projects, Center personnel and activities, including contractors and resident agencies to the extent specified in their respective contracts or agreements. "Contractors," for the purposes of this paragraph include contractors, grantees, Space Act Agreement partners, host tenant support agreements and parties Enhanced Use Lease partners, etc.

P.3 AUTHORITY

a. NPD 8700.1, *NASA Policy for Safety and Mission Success*.
b. NPR 8715.3, *NASA General Safety Program Requirements*.
c. SPD 8715.4, *Stennis Space Center Safety and Health Policy*.

P.4 APPLICABLE DOCUMENTS

All references are assumed to be the latest version unless otherwise specified.

a. 29 CFR Part 1910, *Labor.*
b. 29 CFR Part 1926, *Construction.*
c. 49 CFR, *Transportation.*
d. NASA-STD-8719.12, *Safety Standard for Explosives, Propellants, and Pyrotechnics.*
e. SPR 8715.1, *Stennis Space Center Safety and Health Procedural Requirement.*
f. DoD 6055.9-STD, *Department of Defense Ammunition and Explosives Safety Standards.*

P.5 MEASUREMENT/VERIFICATION

Compliance with the requirements contained in this SPR will be verified through processes contained in NPR 8705.6, Safety and Mission Assurance Audits, Reviews, and Assessments.

P.6 CANCELLATION

NA

Signature on file

Richard J. Gilbrech, Ph.D.
Director

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CHAPTER 1. POLICY, ROLES AND RESPONSIBILITIES

1.1 SSC Explosive Safety Policy

a. It is SSC policy to mitigate and control hazards and risks associated with explosive operations in accordance with the Federal, NASA and state requirements.

b. The SSC explosive safety standards for the storage, handling and/or use of explosives shall follow the cardinal principle for explosive safety: expose the minimum number of people to the smallest quantity of explosives for the shortest period consistent with the operation being conducted.

1.2 Roles and Responsibilities

1.2.1 Center Director

The SSC Center Director (or NASA designee) shall:

a. Establish an SSC Explosive Safety Program within the Safety and Mission Assurance Directorate (SMA).

b. Appoint in writing an SSC Explosive Safety Officer (ESO).

1.2.2 Director, Safety and Mission Assurance (SMA) Directorate

The Director of SMA, shall:

a. Ensure an operational Explosive Safety program is established and executed to support NASA and tenant missions.

b. Ensure SMA identifies program/project data requirements, performs and evaluates explosive safety analyses in support of the SSC mission, and provides oversight of tenant explosive operations.

c. Establish processes and requirements for qualifying NASA personnel and NASA contractors to perform safety critical functions for explosive operations at SSC.

1.2.3 Center Operations Directorate

The Center Operations Directorate shall:

a. Ensure new host tenant support agreements with tenant organizations involving explosives are coordinated through SMA and the SSC ESO.

b. Ensure safety controls, security and infrastructure for facilities used to store, manage and/or use explosives are maintained and inspected per the requirements of NASA-STD-8719.12.

1.2.4 Engineering and Test Directorate

The Engineering and Test Directorate shall:

a. Ensure test project design and operations which use explosives, pyrotechnics and propellants include proper structural, thermal, mechanical, and electrical considerations and incorporate safety factors to protect the personnel, facilities and environment. Explosive design and operations shall be coordinated through SMA and the SSC ESO.

b. Ensure safety controls, security and infrastructure for facilities used to store, manage and/or use explosives are maintained and inspected per the requirements of NASA-STD-8719.12.

1.2.5 Synergy Achieving Consolidated Operations and Maintenance (SACOM)

In support of the Explosive Safety Program, SACOM shall:

a. Inspect the ground, surge and lightning protection system of explosive storage facilities semiannually. (Note: Tenant organizations have the option of performing this function in lieu of using SACOM).

b. Verify and test the continuity and adequacy of the lightning/surge protection system annually in accordance with NASA-STD-8719.12. (Note: Tenant organizations have the option of performing this function in lieu of using SACOM).

c. Provide the facility manager and the SSC ESO copies of the preventative maintenance and inspection results.

d. The SSC Fire Department shall coordinate on the facility explosive licenses (NASA Form 1791) and review/maintain the bi-monthly explosive inventories to ensure they are

postured to correctly respond to an incident at an explosive storage site or an explosive operation.

1.2.6 SSC Explosive Safety Officer (ESO)

The SSC ESO shall:

a. Develop, coordinate, and update SSC explosive safety policy, requirements, and procedures, including this SSC Procedural Requirement in compliance with NASA-STD-8719.12.

b. Serve as the Center's focal point for all matters involving explosive safety.

c. Perform an annual inspection of the SSC explosive safety program to include facilities, inventories, operations and procedures. The annual inventory inspection shall be an eyes/hands-on inventory of all assets for NASA, NASA direct and tenant organizations (excluding the DoD tenants).

d. Issue site and facility explosive licenses (NASA Form 1791) after reviewing the safety assessment of facilities, operations and documented operation procedures/processes. See Appendix B for a representative copy of the site/facility license.

e. Maintain a master file of the licenses, bi-monthly inventories, explosive safety assessments/analyses, annual inspections and all other related explosive safety data.

f. Ensure new programs/projects or initiatives intending to use propellants, explosives, pyrotechnics and/or ammunitions prepare a safety assessment of the operations, facilities and safe distances. The safety assessment shall evaluate the potential for adverse effects on the NASA mission, people, facilities, public and environment.

g. Review and provide concurrence/approval of SSC operations involving explosives. This includes the use of explosives/pyrotechnics and propellants for rocket engine testing, the use of explosives/pyrotechnics for studies or analyses, the use of ammunitions for security operations, and the use of pyrotechnics for SSC educational and outreach activities.

1.2.7 Explosive Safety Managers (ESMs)

"Explosive Safety Manager" is the collective term referring to the NASA, NASA direct contractor and tenant organization personnel responsible for adhering to the Federal, NASA, DoD, state and company explosive safety requirements, as well as, complying with the execution

of this SSC Procedural Requirement within their organizations/functional area. "Explosive Safety Manager" refers to explosive custodians, munitions supervisors, organizational explosive safety officers, etc.

The ESMs shall:

a. Be trained on the responsibilities of their assigned duties.

b. Coordinate any changes in their explosive operations, storage and handling with the SSC ESO.

c. Request a facility/site license (NASA Form 1791) for the storage of explosives, pyrotechnics and/or ammunitions.

   i. For NASA and NASA direct contractors, the facility/site license is also the NASA permit for explosive operations at SSC.
   ii. For commercial tenants, the tenant must have an Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) license to have/possess explosives, pyrotechnics and/or ammunition on SSC. In addition, the commercial tenant shall have an SSC explosive site license.
   iii. For Federal and DoD tenants, the Federal agency licensing/permitting is the applicable site license. The DoD tenants shall have a license coordinated through their parent service and approved by the DoD Explosive Safety Board.

d. Ensure their organizations and areas of responsibility adhere to the processes, procedures and guidelines established for their explosive operations.

e. Perform an assessment on the operations, facilities and safe distances associated with the handling, storage and management of explosives, pyrotechnics, and/or ammunitions for their organizations.

   i. The safety assessment shall assess the processes/procedures for the safe handling, transportation, storage and use of the explosives; assess the adequacy of the facilities and controls; evaluate the potential for adverse effects on the NASA mission, people, facilities, public and environment; and determine the Inhabited Building Distance (IBD) and Public Traffic Route (PTR) safe distances for the explosive operations.
   ii. The NASA, NASA direct contractor or tenant organization safety office shall be an integral party in completing the safety assessment.

f. Ensure accountability for all explosives, pyrotechnics, and/or ammunitions received and issued/used. The inventory log of explosives, pyrotechnics, and/or ammunitions shall include (if applicable/available):

i. Date of receipt and issue/use
ii. Manufacturer date
iii. Department of Transportation (DOT) nomenclature/hazard classification
iv. Lot number
v. Part/Model/Serial number and National Stock Number (NSN)
vi. Gross weight and Net Explosive Weight (NEW)
vii. Date of expiration (if applicable)

g. Submit a cumulative bi-monthly (January, March, May, July, September, and November) inventory of explosives, pyrotechnics, and/or ammunition to the SSC ESO and the SSC Fire Department. Bimonthly inventories are not required by the DoD tenants as inventory levels can be correlated to training and operations tempo. The bimonthly inventory shall include the following information (see Appendix C):

i. Organization (including program/project if applicable)
ii. Building/facility
iii. Type explosive, pyrotechnic and/or ammunition and the DOT explosive class
iv. Net Equivalent Weight (NEW) for each type.
v. The cumulative NEW for the storage site/magazine

h. Document grounding checks on Electrostatic Discharge (ESD) wrist/leg straps prior to handling, inspecting or working with ESD sensitive explosives/pyrotechnics. Maintain the grounding check documentation for one (1) year.

i. Ensure vehicle inspections are performed and documented prior to transporting any explosives and/or pyrotechnics. Maintain the vehicle inspections documentation for one (1) year.

1.2.8 Explosive Handlers

NASA, NASA direct contractors, contractors, and tenant organization personnel who handle explosives, pyrotechnics and/or ammunition shall be trained by their employer on the specific tasks, procedures, processes, safety controls and precautions for handling energetic/explosive materials. The employer shall ensure the employees are proficient in the explosive operations. If an employee requests additional training or is observed to be deficient in training on the proper handling of energetic materials/explosives, the employer shall remove the employee from the explosive operations until the employee is retrained and proficient.

With the exception of ammunition, handling energetic/explosive materials is considered a safety critical task and shall utilize the buddy system.

For the issue and return of ammunition, standard security and accountability controls shall be in place to include having the employee and shift supervisor signing for the ammunition.

CHAPTER 2.0 INSTRUCTIONS

2.1 General Instructions

a. Explosives operations shall be performed in accordance with the applicable requirements of NASA-STD-8719.12 and SSC operational and safety standards.

b. An SSC ESO shall be appointed by the SSC Center Director in accordance with NPR 8715.3.

c. All explosive operations shall be coordinated with the SSC ESO for review and approval.

d. Only the minimum quantities of explosives, pyrotechnics and ammunition shall be on hand in support of approved projects or activities.

e. Accountability of explosives, pyrotechnics and/or ammunition shall be maintained until they are expended in use, turned in as excess, or properly disposed of. Bi-monthly inventories shall be submitted to the SSC ESO and SSC Fire Department.

f. Explosive site plans/licenses shall be developed/obtained and approved by the SSC ESO. Guidance for the development of explosive site plans can be obtained from the ESO and NASA-STD-8719.12.

g. Explosive facility licenses shall be requested and obtained from the ESO through NASA Form 1791.

h. The SSC ESO shall perform an audit of the Explosive Safety Program and an inspection of all explosive operations and facilities annually. The audit shall include a complete inventory and accountability review of the explosives, pyrotechnics and ammunition.

i. Storage facilities for explosives, pyrotechnics and ammunition shall be properly placarded with the classification of highest hazard material and maximum occupancy per NASA-STD-8719.12.

j. Vehicles used to transport explosives from the area of storage to the area of use shall be inspected prior to use. The inspection shall be documented on the form in Appendix D or comparable. Inspection documentation shall be kept for one (1) year. (See Appendix D)

k. When transporting explosives on SSC, communication shall be maintained to ensure the destination site is ready and prepared for receipt of the explosives.

2.2 Safety Requirements for Explosives, Pyrotechnics and Ammunition

a. Explosives, pyrotechnics and ammunition shall be stored in compliance with the material compatibility requirements of NASA-STD-8719.12.

b. Detailed procedures, plans, drawings and other documentation to safely perform explosive operations shall be developed in accordance with NASA-STD-8719.12. At a minimum, the assessment shall assess the processes/procedures for the safe handling, transportation, storage and use of the explosives; assess the adequacy of the facilities and controls; evaluate the potential for adverse effects on the NASA mission, people, facilities, public and environment; and determine the IBD and PTR safe/quantity distances for the explosive and propellant operations.

c. User organizations shall provide explosive operations documentation to the SSC ESO for review and approval prior to commencing explosive operations.

d. NASA and NASA direct contractor personnel involved in transporting, storing, handling, using and inspecting explosives, propellants, and pyrotechnics shall be qualified/certified in accordance with the requirements established by the HQ-NASA Explosive Safety Working Group. Commercial tenants shall adhere to their company training requirements.

e. Control of ESD for explosive, propellant and pyrotechnics operations shall be in accordance with NASA-STD-8719.12.

f. When the relative humidity falls below 50%, the ESD potential shall be measured within ten (10) feet of ESD sensitive explosives, pyrotechnics and propellants operations per NASA-STD-8719.12. When the relative humidity is below 30%, and the SSC ESO approves ESD sensitive explosive operations, the ESD potential shall be monitored every ten (10) minutes.

g. Explosive operations shall stop and personnel shall evacuate to the safe distances when an electrical storm is within ten (10) miles (or greater depending on the electrical sensitivity of the explosive/pyrotechnic).

h. Explosive storage facilities shall be protected from lightning and electrical surge. The grounding system shall be inspected semiannually and tested at least annually per NASA-STD-8719.12, paragraph 5.11.5.

i. Explosive storage facilities shall be secured. Access shall be limited to authorized and trained personnel only. Escorts shall be provided for personnel on non-routine business (inspections, maintenance). The organization shall account for all personnel who enter an explosive storage facility.

j. Contractors/commercial tenants who perform explosive operations under a Space Act Agreement shall provide SSC a list of their employees who are trained/qualified to perform explosive operations.

Appendix A: Acronyms

ATF	Bureau of Alcohol, Tobacco, Firearms and Explosives
CFR	Code of Federal Regulations
DoD	Department of Defense
DOT	Department of Transportation
ESD	Electrostatic Discharge
ESO	Explosive Safety Officer
ESM	Explosive Safety Manager
FOSC	Facilities Operating Services Contractor
IBD	Inhabited Building Distance
NASA	National Aeronautics and Space Administration
NASA STD	NASA Technical Standard
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
PTR	Public Traffic Route
SACOM	Synergy Achieving Consolidated Operations and Maintenance
SMA	Safety and Mission Assurance Directorate
SSC	John C. Stennis Space Center
SPR	Stennis Space Center Procedural Requirements

Appendix B: NASA Form 1791 – Explosive Facility License (Notional)

National Aeronautics and Space Administration

Explosive Facility License

1. CENTER	2. ORGANIZATION	3. LICENSE NO.
Stennis Space Center	Engineering and Test Directorate	3300-12-002

I. FACILITY DATA

4. FACILITY IDENTIFICATION: Building 3300

5. PRIMARY USE: Storage of E-Test Complex Ordnances

6. APPLICABLE EOIs: TPS-E1-00503

7. ROOM NUMBER	8. ROOM USE	9. CONSTRUCTION
105 and outside	Storage of E-Test Complex Ordnances	Concrete

II. EXPLOSIVE LIMITS REQUESTED
(If more space is needed, use second page.)

CLASS/ DIVISION A	COMPATIBILITY GROUP(S) B	NOMENCLATURE C	QUANTITY D	EXPLOSIVE WEIGHT E	FIRE SYMBOL F
1.4	G	Start Cartridge Initiators	6	0.00238 lb	
1.4	C	Pyrovalve Initiators	18	0.01786 lb	
1.3	G	Main Chamber Igniters	18	1.1508 lb	
1.3	C	Start Cartridge Assembly	6	79.3656 lb	
1.4	C	Estes E or larger rocket motor	166	13.1015 lb	
1.4	C	J-2X Igniter Assembly	80	3.7037 lb	
1.4	B	Detonators/Pulse Gun Assembly	75	0.16125 lb	
4.2		TEAL/TEB Ampoule	6	1.86 liters	

III. CERTIFICATION

DATE	TYPED NAME, GRADE, AND TITLE OF CERTIFYING OFFICIAL	SIGNATURE
July 3, 2012	Rosa Obregon, GS-13, Lead Mechanical Engineer at E-1	Rosa Obregon

IV. APPROVING OFFICIAL

DATE	TYPED NAME, GRADE, AND TITLE OF APPROVING OFFICIAL	SIGNATURE
July 13, 2012	Robert F. Gargiulo, GS-13, SSC Explosive Safety Officer	

V. COORDINATION

NASA SECURITY	FIRE PROTECTION	NASA CENTER ESO
	G. Clyde Smith	

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Appendix C: Bi-Monthly Inventory (Notional)

STENNIS SPACE CENTER EXPLOSIVE INVENTORY WORKSHEET

Company/Agency: NASA/Stennis	Program: BIG ROCKET, E Test Complex Magazine
Date: 01-02-13	Duty Phone: 228-688-2XXX
Printed Name: Robin Rocket	Signature: on file

The inventory shall be prepared on a Bi-Monthly basis. A copy will be maintained at the site for two years, and copies of the inventory shall be delivered to the NASA Safety Office and the SSC Fire Chief.

Explosive Material Name	Quantity of Explosive Material	N.E.W. Each	Total N.E.W.	Explosive Storage Compatibility Group Identification	Storage Location
Start Cartridge Initiators P/N 12409018-001	1	0.18 grams	0.18 grams	1.4C	E-Test Complex Bldg. 3300
Pyrovalve Initiators P/N 12409017-001	6	0.45 grams	2.7 grams	1.4C	E-Test Complex Bldg. 3300
Main Chamber Igniters P/N 1241049-001-Test	3	29.0 grams	87.0 grams	1.3G	E-Test Complex Bldg. 3300
Start Cartridge Assembly Kits P/N 1239480-004	1	6 kg	6 kg	1.3C	E-Test Complex Bldg. 3300
Igniter Assembly P/N 829945-01	46	21.0 grams	966.0 grams	1.4C	E-Test Complex Bldg. 3300
Detonators/Blast Caps/Pulse Gun #8 caps #12 caps	50 25	0.744 grams 0.956 grams	37.2 grams 23.9 grams	1.4B	E-Test Complex Bldg. 3300
Estes E or Larger Rocket Motor P/Ns AT10-0 E9-4 E9-6	157 6 3	35.8 grams 35.8 grams 35.8 grams	5,620.6 grams 214.8 grams 107.4 grams	1.4C	E-Test Complex Bldg. 3300
TOTAL 1.3/1.4 N.E.W. IN MAGAZINE AS OF 01-02-13			13,059.78 grams (28.79 lbs)		
TEAL/TEB Ampoule P/N 1218916-003	1	0.31 L	0.31 L	4.2 (4.3)	E-Test Complex Bldg. 3300 Outdoor Magazine

Appendix D: Explosive Transport Vehicle Inspection

Explosive Transport Vehicle Inspection

Date/Time of Inspection: _____

Operator(s) Name(s): _____

_____

Type of Vehicle: _____

Vehicle Number: _____

TPS/DOP/Test Request #: _____

Inspected Item	Satisfactory	Unsatisfactory
Spare Electrical Fuses		
Horn Operative		
Vehicle fluids (steering, brake, oil)		
Windshield/Wipers (no cracks and functional)		
Mirrors (rear view and side mirrors)		
Warning Equipment (placards)		
Fire Extinguisher		
Lights and Reflectors (turn signals, hazards, head lights)		
Nonconductive material in cargo space/bed		
Tires/Wheels (pressure and condition)		
Tailgate/Doors (proper function and lockable)		
Verification of no electro emitting devices		

Inspection Results: Accepted _____ Rejected _____

Inspector Signature: _____