

~~SECRET~~ HANDLING

NRO APPROVED FOR
RELEASE 1 JULY 2015

MANNED ORBITING LABORATORY (MOL)
EXPLOSIVE ORDNANCE SYSTEMS REQUIREMENTS

SAFSL EXHIBIT 30060

6 JUNE 1968

~~SECRET~~
SECRET

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page L of 29

- 1.0 SCOPE
- 2.0 APPLICABLE DOCUMENTS
- 3.0 REQUIREMENTS
 - 3.1 Design Requirements
 - 3.1.1 General
 - 3.1.2 Compatibility
 - 3.1.3 Standardization
 - 3.1.4 Interchangeability
 - 3.1.5 Materials
 - 3.1.5.1 Standard Parts and Materials
 - 3.1.5.2 Shelf Life
 - 3.1.6 Metals
 - 3.1.7 Explosive Materials
 - 3.1.7.1 Single Batch
 - 3.1.7.2 Temperature
 - 3.1.7.3 Specifications and Standards
 - 3.1.7.4 Explosive Compatibility
 - 3.1.7.5 Sensitive Explosives
 - 3.1.8 Electrical Characteristics
 - 3.1.8.1 Electromagnetic Compatibility
 - 3.1.8.2 Static Charge
 - 3.1.8.3 Firing Current
 - 3.1.9 Percussion Initiators
 - 3.1.9.1 Firing Probability
 - 3.1.9.2 Blown or Pierced Primers
 - 3.2 Performance Requirements
 - 3.2.1 Overcapability
 - 3.2.1.1 Severing Charges
 - 3.2.1.2 Cartridge Actuated Devices
 - 3.2.1.3 Detonation Transfer
 - 3.2.2 Reliability
 - 3.2.3 Redundancy
 - 3.2.3.1 Explosive Functions
 - 3.2.3.2 Cartridge Actuated Devices

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 2 of 29

- 3.2.4 Proof Pressure
- 3.2.5 Burst Pressure
- 3.2.6 Leakage
- 3.2.7 Fragmentation
- 3.2.8 Contamination
- 3.2.9 Environment
- 3.2.10 Shelf Life
- 3.3 Safety Requirements
 - 3.3.1 General
 - 3.3.2 System Safety Engineering
 - 3.3.2.1 Integration of Effort
 - 3.3.2.2 Safing Devices
 - 3.3.2.2.1 Safe-Arm Devices
 - 3.3.2.2.2 Electrical Arm-Disarm Devices
 - 3.3.2.2.3 Arming and Disarming
 - 3.3.2.2.4 Monitoring
 - 3.3.3 Safety
 - 3.3.4 Emergency/Backout Procedures
 - 3.3.5 Assignment of Lot Numbers and the Submission of Data Cards and Motor Log Books
 - 3.3.6 Color Coding
 - 3.3.7 Accident/Incident Reports
- 3.4 Installation and Checkout Requirements
- 3.5 Training Requirements
- 4.0 QUALITY ASSURANCE PROVISIONS
 - 4.1 Developmental Testing
 - 4.1.1 Testing Parameters
 - 4.1.2 New Materials
 - 4.1.3 RF Susceptibility
 - 4.2 Qualification Testing
 - 4.2.1 Environmental Conditions
 - 4.2.2 Functioning
 - 4.2.3 Firing Characteristics
 - 4.2.4 Number of Units

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 3 of 29

- 4.3 Acceptance Testing
 - 4.3.1 Non-Destructive Tests
 - 4.3.2 Lot Sample Test Firing
- 4.4 Verification Testing
 - 4.4.1 Test Program
 - 4.4.2 Test Site

5.0 PREPARATION FOR DELIVERY

6.0 DEFINITIONS

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 4 of 29

1.0 SCOPE

This document establishes and defines the minimum acceptable requirements for design, testing, safety and transportation of explosive ordnance systems used on the Manned Orbiting Laboratory System.

All deliverable data and/or documentation specified in this exhibit shall be in accordance with the respective contractor's CDRL (DD 1423) as detailed by Forms 9 or equivalent.

2.0 APPLICABLE DOCUMENTS

The following documents are applicable to the extent specified in this document. This document is to take precedence in the event of a conflict of requirements.

MIL-STD-709

Ammunition Color Coding dated 27 June 1960

MS 33586A

Metals, Definition of Dissimilar dated
16 December 1958

SAFSL Exhibit
30005

Electromagnetic Compatibility Requirements,
Orbiting Vehicle, General Specification for
the MOL Program dated 6 June 1968.

SAFSL Exhibit
30002

MOL Program Effectiveness Exhibit dated
6 June 1968

SAFSL Exhibit
30025

MOL Logistics Plan dated 6 June 1968

ICC Tariff #19

Agent T. C. George's Rules and Regulations
for Transportation of Explosives and Other
Dangerous Articles

AFSCM/AFLCM 310-1,
Volume II, Change J
dated 11-1-67

Management of Contractor Data and Reports
dated 3-14-64

SAFSL Exhibit
30020

System Test and Operations Plan, dated
6 June 1968.

AFPI 7-4047

Safety and Accident Prevention dated
March 1966

SSD-CR-65-275A,
Volume 6 (contractor
applicable document)

Environmental Test Plan dated 9-1-66

⁴
~~SECRET~~ SPECIAL HANDLING

L-6007
Copy 2 of 40
Page 5 of 29

NRO APPROVED FOR
RELEASE 1 JULY 2015

SSD-CR-65-334A
(contractor applicable
document)

Electromagnetic Control Plan dated
9-1-66

AGC SSD-CR-65-8180-150

EMC Control Plan

UTC-SSD-CR-4801-66-9

TIII/M Program Plan, Seven Segment,
120 Inch Diameter, Solid Rocket Motor
(EMC) Control Plan

~~SECRET~~
~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 2 of 40

Page 6 of 29

3.0 REQUIREMENTS

These provisions shall establish the minimum acceptable requirements for the design of explosive ordnance systems, subsystems and components.

3.1 Design Requirements

(R) 3.1.1 General

It shall be a prime objective to obtain maximum safety and reliability by designing the following into each explosive ordnance system:

- a) Simplicity
- b) Minimization of explosive charges consistent with reliability.
- c) Ruggedness of construction
- d) Minimization of opportunity for human errors
- e) Desensitization to initiation by spurious energy sources.

(R) 3.1.2 Compatibility

The design of all explosive ordnance systems shall be mutually compatible with other systems and subsystems. The functioning of any explosive system shall have no detrimental effect on components designed to function subsequent to the explosive operation.

(R) 3.1.3 Standardization

The design of all explosive ordnance systems shall incorporate the maximum use of existing qualified items.

(R) 3.1.4 Interchangeability

All lowest order assembly items installed on the vehicle having the same part number shall be interchangeable.

(R) 3.1.5 Materials

All materials used shall be of high quality, light weight, suitable for the purpose to which applied and shall be certified as conforming to applicable contractually identified specifications.

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 7 of 29

(R) 3.1.5.1 Standard Parts and Materials

Standard Parts and Materials as defined in paragraph 4.1.3 of SAFSL Exhibit 30002 shall be used in the design and construction of explosive ordnance devices to the extent that performance is not adversely affected.

(R) 3.1.5.2 Shelf Life

All materials used in the explosive ordnance systems shall be selected and controlled to insure a fabricated product consistent with paragraph 3.2.10 herein.

(R) 3.1.6 Metals

Dissimilar metals, as defined by MS-33586, shall not be used in intimate contact unless suitably protected against electrolytic corrosion. Any protective coating used shall not preclude provisions for obtaining electrical bonding.

3.1.7 Explosive Materials

All explosive materials shall conform to the following requirements:

(R) 3.1.7.1 Single Batch

All charges of the same design in a lot of explosive components shall be loaded from the same batch of material. The batch shall be handled, tested and stored so as to maintain its separate identity.

(R) 3.1.7.2 Temperature

Explosive ordnance devices shall be designed to perform satisfactorily during or after exposure to a temperature 50°F higher than the maximum predicted environmental temperature to which the material will be exposed during storage, handling, installation and operation.

(R) 3.1.7.3 Specifications and Standards

Where Military or Federal Specifications and/or Standards are applicable, explosive materials shall comply with such specifications or standards unless compliance with other material specifications will result in equal or superior performance. Attainment of qualification status shall constitute adequate demonstration of such performance.

7
~~SECRET~~
~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 8 of 29

(E)

3.1.7.4 Explosive Compatibility

Explosive materials in contact in an explosive train shall be compatible with each other and with the non-explosive components they contact.

(E)

3.1.7.5 Sensitive Explosives

The use of sensitive primary explosives shall be kept to a minimum consistent with achieving reliable performance.

3.1.8 Electrical Characteristics

(E)

3.1.8.1 Electromagnetic Compatibility

All electrically activated explosive ordnance systems shall comply with the requirements of paragraph 3.3.1.3 of SAFSL Exhibit 30005.

Deviations - MMC

(E)

3.1.8.2 Static Charge

Electric Initiators shall not fire, dud, or deteriorate in performance as a result of being subjected to an electrostatic discharge in the pin to case mode from a 500 picofarad capacitor charged to 25,000 volts. A 5000 ohm resistor shall be connected in series with the discharge path.

Deviations - GE and MAC

(E)

3.1.8.3 Firing Current

All electric initiators shall fire within the specified time upon application of 5.0 amperes DC with a probability of at least 0.999 at 95% confidence.

3.1.9 Percussion Initiators

All percussion initiators shall meet the following requirements:

(E)

3.1.9.1 Firing Probability

Percussion initiators shall fire with a probability of 0.999 at 95% confidence when 50% of the minimum specified input energy is applied.

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 9 of 29

(R)

3.1.9.2 Blown or Pierced Primers

There shall be no blown or pierced primers that adversely effect performance of the device when the primers are fired with the maximum input energy.

3.2 Performance Requirements

The following performance requirements shall be considered minimum for the MOL Program.

(R)

3.2.1 Overcapability

Unless safety or operational restrictions dictate otherwise the design of all explosive ordnance shall be such that the performance of the end function shall be accomplished with an established overcapability as follows:

(R)

3.2.1.1 Severing Charges

The overcapability of severing charges shall have:

(R)

a) The capability of severing or rupturing 1.3 times the required thickness of the specified material or

(R)

b) The capability of severing or rupturing the required thickness of the specified material with an explosive charge which is 75% by weight of the minimum specified charge.

Deviation - MAC

(R)

3.2.1.2 Cartridge Actuated Devices

Cartridge actuated devices shall perform their end functions satisfactorily when actuated by a single cartridge containing an output charge which is 80% by weight of the minimum specified charge, and with no decrease in the initial unoccupied burning chamber volume. Deviation - MAC, MMC

(R)

3.2.1.3 Detonation Transfer

Where detonation is required to propagate from one explosive component of an explosive train to the next explosive component, the detonation shall propagate across an in-line gap 1.5 times the maximum design tolerance with a probability of at least 0.995 at 90% confidence or shall propagate across an in-line gap that is 5 times the maximum design tolerance gap. Deviation - MAC, MMC

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 12 of 29

(R) 3.2.2 Reliability

All explosive ordnance components shall be classified as Reliability Critical Items as defined in paragraph 5.3.1 of SAFSL Exhibit 30002. The reliability of each explosive ordnance function shall be compatible with the MOL System Requirements Allocations.

(R) 3.2.3 Redundancy

All explosive ordnance functions required for mission success shall be redundant. Deviation - MAC

(R) 3.2.3.1 Explosive Functions

The explosive function redundancy shall be provided to the following extent:

- a) Preferable two (2) output charges or explosives trains independently initiated or
- b) One (1) output charge or explosive train redundantly initiated. Deviation - MAC

(R) 3.2.3.2 Cartridge Actuated Devices

In all instances where one cartridge actuated device is used to perform an end function, the device shall contain dual cartridges, either one of which will produce sufficient energy to operate the device. Where redundant cartridge actuated devices are used to perform an end function, the devices may use single cartridges.

(R) 3.2.4 Proof Pressure

Cartridge actuated devices shall perform their end functions satisfactorily when actuated by cartridges containing output charges which are 120 percent by weight of the maximum specified charges, and with no increase in the initial unoccupied burning chamber volume. Deviation - MAC, MMC

(R) 3.2.5 Burst Pressure

Cartridge actuated devices shall not rupture or fragment when actuated by cartridges containing output charges which are 150 percent by weight of the maximum specified charges, and with no increase in the initial unoccupied burning chamber volume. Deviation - MAC, MMC

~~SECRET~~

SPECIAL
HANDLING

L-6007

Copy 22 of 40

Page 11 of 29

3.2.6 Leakage

All initiators shall be sealed to withstand a pressure differential of at least 1/2 atmosphere. The leak rate at 1/2 atmosphere differential shall not exceed 1×10^{-5} standard cubic centimeters of helium per second.

3.2.7 Fragmentation

The design of all explosive ordnance systems shall be such that normal functioning produces no deleterious fragmentation.

3.2.8 Contamination

The design of all explosive ordnance systems shall be such that prior to, during or subsequent to functioning, any contamination produced shall not result in deleterious degradation of vehicle performance. Contamination levels and operational requirements of adjacent components shall be mutually compatible.

3.2.9 Environment

All explosive ordnance systems shall be designed to function within specification limits under their operating environments after exposure to the applicable environmental conditions defined in the appropriate document as follows:

- a) Douglas - SAFSL Exhibit 10003
- b) GE - SAFSL Exhibit 10003
- c) MAC - SAFSL Exhibit 12003
- d) MMC - SSD-CR-65-275, Volume No. 6
- e) SS-TIII/M - System Performance/Design Requirements

3.2.10 Shelf Life

All explosive ordnance components shall be designed for a minimum shelf life of 3 years from date of manufacture to date of firing, during which period they shall be capable of surviving applicable environmental conditions and thereafter of meeting their specified performance characteristics.

~~SECRET~~

SPECIAL
HANDLING

L-6007

Copy 22 of 40

Page 12 of 29

3.3 Safety Requirements

(R,P)

3.3.1 General

Safety requirements shall be in accordance with paragraph 5.3.10 of SAFSL Exhibit 30002. System safety features and procedures shall be developed to assure maximum freedom from hazard attributable to facilities, equipment or personnel.

3.3.2 System Safety Engineering

(T)

3.3.2.1 Integration of Effort

System safety requirements relating to facilities, equipment, procedures and personnel as detailed herein shall not result in duplicate effort performed in accordance with other specifications or exhibits but shall be integral and concurrent with such efforts.

3.3.2.2 Safing Devices

(R)

3.3.2.2.1 Safe-Arm Devices

Safe-Arm devices which effect the physical interruption of the explosive train plus electrical safing of the ordnance circuitry shall be mandatory on the following operations:

- a) Destruct Systems/Thrust Termination Systems.
- b) Large Solid Motor Ignition Systems weighing in excess of 100 pounds.

(R)

3.3.2.2.2 Electrical Arm-Disarm Devices

Electrical Arm-Disarm Switches or similar devices shall be used on all electrically initiated ordnance functions not using Safe-Arm devices.

(R)

3.3.2.2.3 Arming and Disarming

Electrical Safe-Arm and the Arm-Disarm devices shall provide means for remote arming and disarming as well as for manual disarming by ground personnel, prior to launch. In the safe condition (cont.)

~~SECRET~~

SPECIAL
HANDLING

L-6007

Copy 22 of 40

Page 13 of 29

these devices shall interrupt, short,
and ground the electric firing initiator
bridge circuits.

Deviation - MAC

(R)

3.3.2.2.4 Monitoring

The Safe Arm and Arm-Disarm devices shall
provide for remote electrical monitoring
of the status of the arming circuit. A
means shall be provided on the safe arm
devices to visually determine their status.

Deviation - MAC

(R,T)

3.3.3 Safety

Military hazard classifications for handling and storage
purposes shall be assigned to all explosive ordnance. The
contractor shall secure the ICC shipping hazard classification
for each individual explosive item/component or will be
allowed to ship MOL Program quantities of explosive ordnance
items with an ICC Class "A" hazard classification.

(R,T)

3.3.4 Emergency/Backout Procedures

Procedures shall be developed for VAFB emergency/backout for
disarming/safing actions and explosive ordnance disposal.

(R)

3.3.5 Assignment of Lot Numbers and the Submission of Data Cards
and Motor Log Books

Lot numbers shall be assigned to all lots of explosive
ordnance components. Data cards for explosive ordnance
components shall be maintained. Motor Log Books shall be
maintained for all solid propellant motors weighing in
excess of 100 pounds.

(R,T)

3.3.6 Color Coding

All explosive assemblies/subassemblies or parts shall be
color coded in accordance with MIL-STD-709 or a MOL Systems
Office approved document developed for a particular segment.

(T)

3.3.7 Accident/Incident Reports

The MOL Systems Office shall be promptly notified of any
ordnance accident/incident per AFPI 7-4047.

~~SECRET~~

SPECIAL
HANDLING

L-6007

Copy 22 of 40

Page 14 of 29

~~SECRET~~

HANDLING

(P,R)

3.4 Installation and Checkout Requirements

Explosive ordnance systems shall be designed to facilitate installation and checkout. Provisions shall be made for installing all explosive ordnance as late in the flight vehicle buildup as practical and consistent with operational and safety requirements. All explosive ordnance installation and checkout at VAFB shall be in accordance with approved procedures.

(P,T)

3.5 Training Requirements

All personnel involved in the installation of explosive ordnance shall be given a thorough training course by a qualified instructor and certified prior to handling any explosives. The training and certification shall be accomplished in accordance with SAFSL Exhibit 30020.

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 15 of 29

(J) 4.0 QUALITY ASSURANCE PROVISIONS

The following requirements shall be specifically implemented in appropriate CEI Specifications and contractor test plans. The testing of explosive ordnance shall be divided into four categories:

- a) Developmental
- b) Qualification
- c) Acceptance
- d) Verification

4.1 Developmental Testing

Developmental testing is defined as that testing performed on all preliminary experimental designs plus the testing necessary to demonstrate the capability of the final design to perform its function. This shall include, but not necessarily be limited to the following:

4.1.1 Testing Parameters

Design requirements as specified in the following paragraphs of Section 3.0 shall be demonstrated in Developmental Testing:
Deviation - MAC

3.1.2 Compatibility

3.1.9.1 Firing Probability
(except for the demonstration of Probability Levels)

3.1.9.2 Blown or Pierced Primers

3.2.1.1 Severing Charges

3.2.1.2 Cartridge Actuated Devices

3.2.1.3 Detonation Transfer
(Demonstration of reliability and confidence levels shall be in accordance with NAV ORD. #2101 BRUCETON TESTING).

3.2.4 Proof Pressure

3.2.5 Burst Pressure

3.2.7 Fragmentation

3.2.8 Contamination

~~SECRET~~

SPECIAL
HANDLING

L-6007

Copy 22 of 40

Page 16 of 29

(T) 4.1.2 New Materials

Developmental testing shall also include a determination that all new materials meet their environmental requirements.

(T) 4.1.3 RF Susceptibility

Tests shall be conducted on each type of electroexplosive initiator per requirements of SAFSL Exhibit 30005.

(T) 4.2 Qualification Testing

Qualification Testing is defined as that testing which is necessary to demonstrate that the device or system is capable of surviving specified non-operating environments and will function successfully under specified operating environments. The qualification test procedures shall be formulated to exceed the predicted environmental conditions which each device will encounter during its life. Qualification by similarity shall be permitted only with the concurrence of the MOL Systems Office. All qualification lots shall have passed the non-destructive acceptance tests.

(T) 4.2.1 Environmental Conditions

The explosive ordnance systems and/or components shall be tested under the appropriate environments and environmental conditions as specified in Paragraph 3.2.9 herein.

(T) 4.2.2 Functioning

All explosive ordnance systems shall function in the prescribed manner under their operating environments after exposure to environmental conditions as specified in Paragraph 3.2.9 herein. Only those conditions and sequences which the unit may normally encounter need be included in the testing. Safe-Arm devices shall be tested in the safe position for the transportation environment and in the applicable safe and/or armed positions for the flight environment.

(T) 4.2.3 Firing Characteristics

The qualification program shall include the following certification as applicable:

- (1) The DC all fire/no fire characteristics of all electric initiators have been determined by Bruceton Testing per NAV ORD 2101.
- (2) The all fire energy level of percussion initiators has been determined by statistical testing.

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 17 of 29

(T)

4.2.4 Number of Units

The qualification program for initiators shall include the environmental testing of at least 180 units. The qualification program of all other explosive ordnance devices and systems shall include the environmental testing of at least 20 items which shall include full assemblies or, on larger systems, partial assemblies. Partial assemblies shall include each type of explosive interface and shortened linear or main charges. Deviation - MAC

4.3. Acceptance Testing

Acceptance tests are those tests performed on each lot of explosive components to verify that the physical, electrical, and performance characteristics comply with the design specification requirements and that quality is maintained.

(T)

4.3.1 Non-Destructive Testing

The acceptance requirements shall include the following nondestructive tests on 100 percent of each manufactured lot:

a) Electric-Explosive Initiator

- Radiographic inspection
- Leak Test
- Bridge Circuit Resistance Measurement
- Insulation resistance and/or dielectric strength tests
- Electrostatic discharge test
Deviation - MAC

(T)

b) Other Explosive Components

- Radiographic Inspection:
all integral explosive interfaces, including relay fittings on linear charge and all explosive loadings except swaged or drawn linear charge.
- Leak Test (where applicable)

(T)

4.3.2 Lot Sample Test Firing

Lot-sample firing tests shall be conducted after subjecting the samples to vibration at the critical environmental temperature. Those portions of the samples used for the all

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 2 of 40

Page 18 of 29

fire/no fire tests shall not be subjected to environmental exposure prior to firing. All test firing shall include suitable verification of explosive output performance.

Deviation - MAC, MMC

(T)

a) Electric Initiators

Ten percent of each manufactured lot, but never less than 180 samples, shall be test fired. This sample number shall include 1/3 fired for verification (non-statistical) of all fire/no fire design levels, and 2/3 for tests subsequent to environment exposure.

b) Percussion Initiators

Manufactures test data will be considered to be acceptable for verification of design all fire energy levels.

(T)

c) Linear Charges

Total strand as manufactured: at least two samples, one from each end shall be test fired before the strand is used for lot fabrication.

(T)

4.4 Verification Testing

Verification testing shall be conducted within a period of three (3) months prior to each launch to insure that the explosive ordnance critical component has not deteriorated between the time of acceptance testing and launch. Deviation - MMC

(T)

4.4.1 Test Program

The verification test program shall include the firing and measurement of the output characteristics of at least one (1) sample of the following items selected from the lot planned for flight:

a) Initiators

b) Linear Explosive Components (short-length samples may used).

(T)

4.4.2 Test Site

Verification testing shall be conducted at the launch base or installation point using components which have been stored with flight hardware.

~~SECRET~~

SPECIAL HANDLING

L-6007

Copy 22 of 40

Page 19 of 29

(T) 5.0 PREPARATION FOR DELIVERY

Explosive ordnance assemblies and/or components shall be prepared for delivery in accordance with Section 6 of SAFSL Exhibit 30025.

6.0 DEFINITIONS

All-Fire Current

The minimum current which, when applied to an initiator for a given time, insures initiation.

All-Fire Energy

The minimum energy applied at a given rate to a percussion initiator which assures initiation of the explosive train.

Arm

To make explosive devices ready for firing.

Arm-Disarm Device

An electrical switch which interrupts the ordnance circuitry, thus rendering the system electrically safe.

Batch

A quantity of explosive material produced in one single manufacturing output cycle and controlled as a separate entity. A batch shall be identified by a separate explosive lot number.

Cartridge

An assemblage of components designed to yield gaseous energy from a chemical reaction (i.e. deflagration) which is used to perform mechanical work.

Cartridge - Actuated Device

A device which converts gaseous energy produced by a cartridge into mechanical work. Examples are ejection mechanisms, explosive valves, thrusters, guillotines, and pyroswitches. Excluded are linear charge systems.

Charge

The quantity of explosive used in a cartridge, shaped charge or other explosive item.

Deflagration

Rapid combustion at less than detonation rates.

~~SECRET~~

SPECIAL HANDLING

L-6007

Copy 22 of 40

Page 20 of 29

Destruct System

An explosive ordnance system capable of destroying a missile or system in the event of a malfunction during or after launch.

Detonation

An exothermic chemical explosive reaction that propagates with such rapidity that the rate of advance of the reaction zone into the unreacted material exceeds the velocity of sound in the unreacted material.

Detonator

A high explosive device, initiated by either electrical or mechanical means, which produces a shock front and/or shrapnel pattern capable of satisfactorily propagating detonation in the next high explosive element in the explosive train.

Disarm

The normal method of returning ordnance systems or components to a safe status.

Explosive

A substance or mixture of substances which can be made to undergo a rapid chemical change, without an outside supply of oxygen, with the liberation of large quantities of energy and generally accompanied by the evolution of hot gases.

Explosive Component

A separately packaged explosive assembly.

Explosive Ordnance

Components, devices and assemblies which contain explosives.

Explosive Train

An assembly of combustible and/or explosive charges in series.

Flexible Linear Shaped Charge (FLSC)

FLSC is a linear cutting charge. It consists of a high explosive contained in a metal casing which is formed into a chevron or "V" shape. FLSC is used to cut metal or other material to effect stage separation, hatch opening, vehicle destruct, etc.

Initiation

The process of starting an explosive chemical reaction.

Initiator

The first element in an explosive train which, upon receipt of the proper mechanical or electrical impulse, produces a deflagrating or detonating action.

SECRET

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 21 of 29

HANDLING

NRO APPROVED FOR
RELEASE 1 JULY 2015

Input Energy

The amount of externally applied energy to an explosive which will cause initiation.

Linear Charge

An explosive charge contained in a metal or plastic sheath. Examples are linear shaped charge, flexible linear shaped charge, and mild detonating fuse.

Lot

That collection of items produced in a continuous production run utilizing the same batch (explosive lot) of explosive materials. A continuous production run shall be defined as production of units utilizing the same procedures, tooling, processes, and controls without changes or interruptions other than normal shift operations.

Mild Detonating Fuse (MDF)

A small diameter column of explosive material contained in a metal sheath.

No-Fire Current

The maximum current which can be applied to an initiator for a given length of time without causing initiation of the explosive train. This is normally expressed at a reliability and confidence level.

Output Characteristics

The characteristics of an explosive component which describe the form and magnitude of the energy release when the component functions.

Percussions

The method of initiating an explosive-loaded item by impact or a sudden crushing or pinching of the explosive material as between a blunt firing pin and an anvil.

Relay, Explosive

An explosive-train component that provides the required explosive energy to reliably initiate the next element in the train.

Remote Arming & Disarming

Arming and disarming without physical accessibility to the device.

Safe

The condition of an explosive ordnance system where the explosive train and/or electrical circuitry is interrupted to prevent initiation.

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 22 of 29

Safe-Arm Device

A device which, in the safe condition, renders the ordnance system mechanically safe by interrupting the explosive train.

Sensitivity

The characteristic of an explosive component which expresses its susceptibility to initiation by externally applied energy.

Severing

The process of linear cutting or rupturing by the use of linear charges.

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 23 of 29

APPENDIX A
DAC DEVIATIONS

NONE

~~SECRET~~

SPECIAL HANDLING

L-6007

Copy 22 of 40

Page 24 of 29

APPENDIX B
GE DEVIATIONS

3.2.1.2 Cartridge Actuated Devices

The existing pyrotechnic initiators on the DRV shall be exempt from the requirements of this paragraph. Actual performance data shall be provided to the MOL System Office.

3.2.4 Proof Pressure

The existing pyrotechnic initiators on the DRV shall be exempt from the requirements of this paragraph. Actual performance data shall be provided to the MOL Systems Office.

3.2.5 Burst Pressure

The existing pyrotechnic initiators on the DRV shall be exempt from the requirements of this paragraph. Actual performance data shall be provided to the MOL Systems Office.

3.2.6 Leakage

The existing pyrotechnic initiators on the DRV shall be exempt from the requirements of this paragraph. Actual performance data shall be provided to the MOL Systems Office.

3.2.9 Environment

(f) GE-DRV (TBD)

3.3.2.2 Clarification

The safe and arm provisions contained in the present DRV design meets the requirement of this paragraph.

~~SECRET~~
SECRET

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 25 of 29

APPENDIX C

MAC DEVIATIONS

3.1.8.2 Static Charge

The Gemini B segment, explosive ordnance devices shall not be required to withstand the stated static charge requirement.

3.2.1.1 Severing Charges

The overcapability of severing charges shall provide:

- a. The capability of severing or rupturing at least 1.2 times the required thickness of the specified material.

3.2.1.2 Cartridge Actuated Devices

The Gemini "B" segment, devices which are operated by gas producing cartridges shall have the capability of performing their end function when actuated by a single cartridge containing an output charge which is 80% by weight of the nominal specified charge with no decrease in the initial unoccupied burning chamber volume. This requirement shall not apply where CAD output must be closely controlled as in an ejection seat catapult, parachute mortar or where CAD operation is not required for mission success (as in an auxiliary experiment).

3.2.1.3 Detonation Transfer

MACASTRO present testing methods will be accepted as meeting the requirements of this paragraph.

3.2.3 Redundancy

The Gemini B segment abort subsystem is not required to incorporate redundant features. Gemini B segment functions associated with experiments are not required to be redundant.

3.2.3.1 Does not apply to electrical switch.

3.2.4 Proof Pressure

Cartridge actuated devices shall be subjected to a proof pressure test per Table 3.7-1 of SAFSL 12004. CAD shall not yield or leak as a result of this test.

~~SECRET~~

SPECIAL HANDLING

L-6007

Copy 27 of 40

Page 26 of 29

3.2.5 Burst Pressure

Cartridge actuated devices shall be subjected to a burst pressure test per Table 3.7-1 of SAFSL 12004. CAD shall not rupture or fragment as a result of this test.

3.3.2.2.3 Arming and Disarming

MACASTRO not required to comply to the requirement.

3.3.2.2.4 Monitoring

MACASTRO not required comply to the requirement

4.1.1 Testing Parameters

NASA Gemini devices shall be exempt.

4.2.4 Number of Units

NASA Gemini devices shall be exempt from this requirement. MCASTRO has statistically tested 150 units to determine all-fire and no-fire characteristics. MCASTRO has environmentally tested at least 15 items where the design is similar to NASA qualified units.

4.3.1 Non-Destructive Testing

a) Electric-Explosive Initiator

The Gemini "B" segment is exempt from meeting the electro static discharge test requirement.

4.3.2 Lot Sample Test Firing

The below listed lot sampling procedure will be accepted for all lots procured prior to the effective date of this document. All lots of flight explosive ordnance devices other than the qualification test lot shall include lot sample firing tests. Tests shall demonstrate compliance with previously established performance parameters as applicable. Test quantities shall be in accordance with Table I. Prior to firing electric initiators, 1/2 of the samples shall be subjected to one (1) amp no-fire current for five (5) minutes and 1/2 of the samples shall be subjected to one (1) watt no-fire power for five (5) minutes. Prior to test firing, all ordnance device samples shall be subjected to their applicable elevated environmental temperature.

~~SECRET~~

SPECIAL
HANDLING

L-6007

Copy 22 of 40

Page 27 of 29

| LOT SIZE | SAMPLE SIZE |
|----------|-------------|
| 3-10 | 2 |
| 11-22 | 4 |
| 23-35 | 6 |
| 36-52 | 8 |
| 53-69 | 10 |
| 70-92 | 12 |
| 93-120 | 14 |
| 121-160 | 16 |
| 161 & up | 10% |

NOTE:

Lot sample quantities for MDF Interconnects shall be constant at 10% minimum. For large separation assemblies, shortened FLSL segments may be used.

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 28 of 29

APPENDIX D

T-IIIIM DEVIATIONS

3.1.8.1 Electromagnetic Compatibility

All electrically activated explosive ordnance systems shall comply with the requirements of:

- a) SSD-CR-334
- b) AGC - SSD-CR-65-8180-150
- c) UTC - SSD-CR-4801-66-9

Items procured prior to the effective date of this document are exempt from the requirements of the following paragraphs:

- 1) 3.2.1.2 Cartridge Actuated Devices
- 2) 3.2.1.3 Detonation Transfer
- 3) 3.2.4 Proof Pressure
- 4) 3.2.5 Burst Pressure
- 5) 4.3.2 Lot Sample Test Firing
- 6) 4.4 Verification Testing

~~SECRET~~

SPECIAL

HANDLING

L-6007

Copy 22 of 40

Page 29 of 29