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NASA KSC
Safety and Mission Assurance
Launch Services Division
Payload Safety Implementation Plan

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Document Approval

/Original Signed by/
Raoul Caimi, Chief, Safety and Mission Assurance
Launch Services Division

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### Document Revision History

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Acronyms

AFSPCMAN  Air Force Space Command Manual
AT        Agency Team
BOSS      Business Operating Success Strategies
CCAFS     Cape Canaveral Air Force Station
CDR       Critical Design Review
ELS       Equivalent Level of Safety
ELV       Expendable Launch Vehicle
GOP       Ground Operations Plan
GOR       Ground Operations Review
GSE       Ground Support Equipment
GSFC      Goddard Space Flight Center
IE        Integration Engineer
JPL       Jet Propulsion Laboratory
KDP       Key Decision Point
KSC       Kennedy Space Center
LSIM      Launch Site Integration Manager
LS        Launch Services
LSP       Launch Services Program
MAM       Mission Assurance Manager
MiM       Mission Manager
MSE       NASA KSC SMA LS Division Mission Safety Engineer
MSPSP     Missile System Prelaunch Safety Plan
NASA      National Aeronautics and Space Administration
NPR       NASA Procedural Requirements
OSMA      Office of Safety and Mission Assurance
PDR       Preliminary Design Review
PFA       Plastic Films, Foams, Adhesive Tapes
PPF       Payload Processing Facility
PSIB      Payload Safety Introduction Briefing
PSM       Payload Safety Manager
PSWG      Payload Safety Working Group
SATL      Safety Action Tracking Log
SMA       Safety and Mission Assurance
SMSR      Safety and Mission Success Review
SDP       Safety Data Package
SSP       System Safety Plan
SSPP      System Safety Program Plan
SSTP      System Safety Technical Plan
SVTL      Safety Verification Tracking Log
SW        Space Wing
TA        Technical Authority
USAF      United States Air Force
VAFB      Vandenberg Air Force Base
WFF       Wallops Flight Facility
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1 Introduction

This Plan provides the implementation of NPR 8715.7 Expendable Launch Vehicle Payload Safety Program for the Kennedy Space Center (KSC) Safety and Mission Assurance Launch Services Division (SMA LS Division) with regard to safety associated with Expendable Launch Vehicle (ELV) payload projects. This Plan implements the SMA LS Division roles, responsibilities and safety review process associated with payloads that will fly on ELVs.

1.1 Purpose and Scope

This Plan identifies the roles, responsibilities and processes that are required of the KSC SMA LS Division Mission Safety Engineer (MSE) and Payload Safety Working Group (PSWG) Chairperson to ensure that NPR 8715.7 is implemented for NASA payloads.. The MSE will serve as the PSWG Chairperson for all NASA payloads with launch services procured through the Launch Services Program (LSP).

1.2 Plan Applicability

This Implementation plan applies to the KSC SMA LS Division Safety & Quality Engineering Branch and commences with notification of a payload’s intent to schedule a Payload Safety Introduction Briefing (PSIB) and the forming of the project’s PSWG. The application of this Implementation Plan concludes with the signature of the Certificate of ELV Payload Safety Compliance, however the PSWG Chairperson may help the payload project in tracking closure of the safety verifications and in making this information available. This Implementation Plan applies to NASA payloads with launch services procured through LSP. The signature of the PSWG Chairperson on the Certificate of ELV Payload Safety Compliance signifies that the requirements in NPR 8715.7 have been met and that the ELV Payload Safety process has been accomplished.

This Implementation Plan addresses requirements from NPR 8715.7 that apply to each ELV payload and its design, fabrication, testing, and spacecraft shipment; payload-provided upper stages flown on ELVs; interface hardware that is flown as part of a payload; and Ground Support Equipment (GSE) used to support payload-related operations.

1.3 Authority

NPR 8715.7 Expendable Launch Vehicle Payload Safety Program

1.4 Information Documents

KTI-3643 SMA LS Division Operating Plan


AFSPCMAN 91-710 Range Safety User Requirements

1.5 Payload Organization Relationships

The Safety/Quality Engineering and Assurance Branch of the KSC SMA LS Division plays an important role in the process that develops, reviews, and concurs on safety requirements for each NASA ELV payload mission. NASA ELV payload missions require the coordination of efforts among a diverse group of participants who have varying responsibilities and authorities. The MSEs assist ELV payload projects in achieving safe design objectives and ensuring that NPR 8715.7 NASA ELV safety policy is satisfied for LS ELV payload missions. The relationships and interfaces involved in the ELV Payload Safety Review Process are depicted in Figure 1 Payload Safety Organizational Relationships.
Figure 1 - Payload Safety Organizational Relationships

Note 1: Solid lines indicate communications that take place during a nominal safety review process. The lack of lines in this figure is not to imply that communications among the various authorities can not take place.

Note 2: Other Authorities typically include the Air Force (for launches from an Air Force Range) and may include other government agencies, international partners, or commercial payload processing facilities where applicable.

Note 3: Dashed lines indicate lines of communication that may be exercised when the safety review process identifies an issue that requires a Headquarters-level decision.

Note 4: The PSWG is the primary payload safety review interface for the project, where all initial submittals and safety concerns or issues start.
2 Payload Safety Review and Approval Process Summary

2.1 Process Flow

The NASA KSC SMA LS Division MSEs facilitate the ELV Payload Safety process based on the safety deliverables and associated reviews defined in the NPR 8715.7 and NASA-STD 8719.24.

Upon notification from the NASA ELV Payload Safety Manager (PSM), the payload project, or the LSP Mission Manager, the NASA KSC SMA LS Division Safety & Quality Engineering and Assurance Branch Chief will select an MSE for the project (mission) to work with in establishing the mission’s PSWG membership and scheduling the PSIB and the three safety reviews. Figure 2 is a graphical representation of this basic ELV Payload Safety process flow for the PSIB and safety reviews.

![Figure 2 - ELV Payload Safety Flow](image)

2.2 Safety Reviews

The major reviews in this Safety Review and Approval Process are shown in Figure 3 Timeline of ELV Payload Safety Reviews and are defined in NPR 8715.7.
Figure 3 - Timeline of ELV Payload Safety Reviews

Additional PSWG meetings may be added and scheduled as needed to ensure safety review milestones are met. Similarly, safety deliverables and PSWG meeting schedules may be altered through documented formal agreement between the Payload Project Office and the PSWG provided that safe processing, project schedule, and safety review input to KDPs are not impacted. The MSE, serving as the PSWG Chairperson, will pre-coordinate with the NASA KSC SMA LS Division Safety & Quality Engineering Branch Chief.

2.3 Tailoring Process and Non-Compliances

The ELV payload safety tailoring process is defined as the process of assessing the applicability of safety requirements relevant to a payload project and evaluating the project’s potential implementation of those safety requirements in order to generate safety requirements for that project. NASA-STD-8719.24 NASA Expendable Launch Vehicle Payload Safety Requirements apply to all NASA ELV payload projects and will be utilized for tailoring. The NASA ELV payload safety requirements are the result of a joint effort by NASA and US Air Force Range Safety representatives (30th and 45th Space Wings) to establish an approved baseline from AFSPCMAN 91-710 Range Safety User...
Requirements, and applicable NASA safety requirements, as well as address unique issues associated with NASA payload safety design and operations.

Prior to the PSIB, the Payload Project and Project Safety Engineer will determine the initial set of applicable safety requirement documents and identify previously approved non-compliances and known non-compliances. A list of non-applicable chapters and sections using NASA-STD 8719.24 Volumes 3 and 6, as they relate to payload systems, instruments, operations and hazards known to date, as well as a list of any known tailoring issues, previously approved waivers, and previously approved alternative approaches, will be submitted by the Payload Project to the PSWG Chairperson at the PSIB. Applicable safety requirement documents and previously approved non-compliances will be briefed during the PSIB. Any additional applicable safety requirement documents will be identified by PSWG members during the PSIB and subsequent PSWG meetings.

A mission-specific NASA-STD-8719.24 document will be included in the Safety Review deliverables and is meant to include tailored requirement text and to identify non-compliances. Non-compliances are further broken into two categories per NPR 8715.7: Equivalent Level of Safety (ELS) and waiver.

Tailoring is a requirement change, addition, or deletion that does not present an increase in risk. Tailoring is performed by the Payload Project throughout the course of Safety Review I and Safety Review II. Tailoring can occur directly within the NASA-STD-8719.24 safety requirements document.

An ELS is also a requirement change, addition, or deletion that does not present an increase in risk; however it is reserved for post-tailoring and requires additional levels of review. To facilitate the additional review, an ELS Request Form must be submitted by the Payload Project and approved by the cognizant Technical Authorities, Range Authority, and other impacted organizations.

Note: The SMA Launch Services Division has determined that additional levels of review, beyond the PSWG, are not necessary for items that do not present an increase in risk. Three options exist for the PSWG Chairperson to facilitate this position. Option 1 (Preferred): While NPR 8715.7 requires that the final mission-specific NASA-STD-8719.24 be submitted at Safety Review II, it does not require signed approval at Safety Review II closure. Therefore tailoring changes may still be made to the document without additional levels of review outside of the PSWG. Option 2: If the mission-specific NASA-STD-8719.24 has been signed by the approving authorities, it may be updated to reflect the necessary tailoring and re-signed by the approving authorities. Option 3: If the mission specific NASA-STD-8719.24 has been signed by the approving authorities, a Change Page may be submitted against the mission-specific NASA-STD-8719.24 and signed by the approving authorities.

A waiver is utilized to represent a requirement relief that presents an increase in risk. A waiver should be identified in the mission-specific NASA-STD-8719.24 and captured on
a Waiver Request form by the Payload Project. The PSWG and PSWG Chairperson do not have sole authority to waive requirements because of the increase in risk. Therefore a Waiver Request form also requires signed approval by applicable Program/Project Management, SMA Directors, Technical Authorities, Center Directors, and Range Authorities.

Upon notification of a potential waiver, the PSWG Chairperson coordinates with the NASA KSC SMA LS Division Safety and Quality Engineering Branch Chief and the ELV PSM such that:
1. Agency Team (AT) assessments may be provided to SMA Technical Authorities (TAs) when necessary
2. Coordination takes place with other affected projects
3. Requirements can be modified when needed (per NASA-STD-8719.24 Volume 1 Chapter 7)

The PSWG Chairperson is responsible for coordinating discussion and resolution of all tailoring and non-compliance requests within the PSWG. It is the responsibility of the PSWG Chairperson to post the tailored payload safety requirements document to the LSP Portal ELV Payload Safety Mission Documentation section. The posted document will serve as the official copy for PSWG review. The PSWG Chairperson is also responsible for signing and obtaining NASA-STD-8719.24 approval signatures from the LSP SMA Technical Authority and the Range Safety Organization. A final, approved copy of all tailoring and non-compliances is posted to the LSP Portal ELV Payload Safety Mission Documentation section for availability to the PSWG.

The PSWG Chairperson works with the PSWG to ensure that authorities involved in the mission or having responsibility for issues addressed by the tailoring, approve (sign) each tailored requirements document or provide equivalent written approval. The final tailored Payload Safety Requirements will be signed by the PSWG Chairperson after concurrence from the PSWG members indicating PSWG approval. The PSWG Chairperson will obtain a signature from the AF Range Safety member for the final tailored Payload Safety Requirements.

After approval, any further changes to the tailored requirements document must be documented and distributed as a “change page” by the Payload Project Office for coordination and approval/concurrence by the original authorities per NPR 8715.7.

For changes to the final, signed tailoring, the Payload Project Office prepares an ELV Payload Safety post-tailoring ELS Request, or for changes resulting in increased risk, prepare an ELV Payload Safety Waiver Request.

The non-compliance is discussed within the PSWG and agreed to by all PSWG members. The PSWG Chairperson will first bring it to the attention of the NASA KSC SMA LS Division Safety & Quality Branch Chief. The PSWG Chairperson works with the appropriate PSWG members to ensure that all waiver requests and ELS proposals have sufficient rationale, that any risk is properly characterized and identified, and that appropriate signatures are listed. Signature by the PSWG Chairperson indicates
concurrency from PSWG members and a recommendation for the SMA TA’s signature. For ELV payload safety waivers, the LSP SMA Technical Authority is the Chief Safety Officer for the LSP. USAF non-compliances impacting Air Force Range Safety will be submitted by the Payload Project to the PSWG for appropriate action by the Range Authority (30th SW/45th SW) and then returned by the Range back to the PSWG and forwarded to the Project Manager and the Payload Project Safety Engineer.

In the event that a PSWG member does not concur with a tailoring request or non-compliance against a safety requirement, resolution will be sought within the PSWG. For issues that cannot be resolved within the PSWG, the PSWG Chairperson should inform the NASA SMA LS Division Safety & Quality Branch Chief prior to informing the ELV PSM. The PSM will coordinate Agency Team efforts with the PSWG in an attempt to resolve the issue. If agreement cannot be reached, the SMA Technical Authorities will be informed of the issue. Issues that continue to be problematic will be raised to the Chief, OSMA to identify the best approach to achieve resolution, as shown in Figure 4.
After the Certificate of ELV Payload Safety Compliance has been signed by the PSWG Chairperson, the PSWG Chairperson is responsible for facilitating major safety issues relating to flight rules, safety issues, or any non-compliance related concerns up until launch. The PSWG Chairperson posts all payload non-compliances on the LSP Portal in the ELV Payload Safety Mission Documentation section.
3 Payload Safety Working Group and Safety Deliverables

3.1 Payload Safety Working Group Chairperson Responsibilities

The PSWG is a working group formed for each NASA ELV payload with a primary purpose to ensure (1) a project’s compliance with applicable safety requirements and (2) that the safety risks are identified, understood, and adequately controlled.

Upon notification of a new payload project (mission), the NASA KSC SMA LS Division Safety & Quality Branch Chief selects an MSE to chair the project’s PSWG. This PSWG Chairperson will contact and coordinate with the Payload Project Manager or the Payload Project Safety Engineer, and others to establish the PSWG membership.

The PSWG Chairperson will:

A. Schedule and conduct PSWG meetings. This includes coordination with the Launch Site Integration Manager (LSIM) and all PSWG members to determine the schedule and agenda for the PSWG meetings as well as preparation of minutes for the PSWG meetings. The PSWG Chairperson is responsible for capturing and tracking action items to conclusion on the Safety Action Tracking Log (SATL). SATL Forms are maintained on the LSP Portal in the ELV Payload Safety Mission Documentation. Meetings may be in the form of telephone conferences, video conference calls, face-to-face, or a mixture of the aforementioned. The PSWG Chairperson coordinates with the LSIM for LSP participation, but should also include the LSP Integration Engineer (IE) and Mission Manager (MiM). The Mission Assurance Manager (MAM) and back-up MSE should also be on all PSWG meeting notifications.

B. Ensure that the PSWG activities and decisions include the collective input and participation from all PSWG members. The PSWG Chairperson will prepare minutes during PSWG discussions and distribute them to PSWG members for review following each meeting to ensure that decisions are properly recorded and disseminated. The PSWG Chairperson will post the minutes on the LSP Portal in the ELV Payload Safety Mission Documentation section and notify the PSWG about the posting.

C. Provide official PSWG signature (indicating concurrence from all PSWG members) for all safety review deliverables and any PSWG correspondence. The method of documenting PSWG Chairperson’s signature is left to the PSWG, but will be available in electronic form for ease of distribution. In the event that concurrence from all PSWG members is not reached, the PSWG Chairperson will first notify the NASA KSC SMA LS Division Safety & Quality Branch Chief of the issue. The issue will then be brought forward to the ELV PSM for assistance from the AT, or SMA TAs, to identify the best approach to achieve resolution.

D. Notify the Payload Project Manager, and the NASA KSC SMA LS Division Safety & Quality Branch Chief, in a letter that each of the safety review milestones (PSIB, Safety Review I, II and III) has been successfully completed. Successful completion requires concurrence from all PSWG members. Successful completion letters should
also provide a short status summary of where the PSWG is and what is next in the safety review process. Specifically for Safety Review III, the completion letter is followed by the Certificate of ELV Payload Safety Compliance, which is signed by the PSWG Chairperson and others defined by NPR 8715.7. All letters are maintained on the LSP Portal.

E. Ensure all required safety deliverables are made available to the project distribution list via the LSP Portal in the ELV Payload Safety Mission Documentation section. The PSWG Chairperson will post the documents for review and notify the project distribution list announcing the posting. The safety documents posted on the LSP Portal ELV Payload Safety Mission Documentation section by the PSWG chairperson are the official copies used for review.

F. Post all safety deliverable comments to the LSP Portal for all PSWG members to review. Ensures all comments to safety deliverables are consolidated, coordinated, and furnished to the Payload Project Safety Engineer per NPR 8715.7. The PSWG Chairperson will also consolidate comments and post them to the LSP Portal in the ELV Payload Safety Mission Documentation section. The PSWG Chairperson will schedule a table top review of the comments, in the form of a PSWG.

G. Ensure that documentation of actions to the SATL from each PSWG meeting are reviewed at the end of each PSWG meeting. Minutes will be posted on the LSP Portal in the ELV Payload Safety Mission Documentation section after comments are incorporated.

H. Ensure availability, distribution, timely notification of the project safety schedule, and any changes involved in the safety review and approval process. Safety milestones are also carried over to the LSP Business Operating Success Strategies (BOSS) schedule.

I. Schedules and conducts PSWG meetings following major project reviews (e.g., system-level PDR and CDR), and as required to meet the safety milestones in NPR 8715.7.

J. Ensures the NASA KSC SMA LS Division Safety & Quality Branch Chief and the ELV PSM are informed of any important safety issues to include potential risk issues that may impede the safety review process (these safety issues will have already been discussed by the PSWG members). The LSP informs the PSWG Chairperson/MSE of any payload/launch vehicle interface safety concerns. The PSWG Chairperson must coordinate with the NASA KSC SMA LS Division Safety & Quality Branch Chief prior to raising issues to the AT. 

Note: The PSWG Chairperson will coordinate with the NASA KSC SMA LS Division Safety & Quality Branch Chief prior to raising an issue to NASA ELV PSM.

K. Coordinates with the PSWG and the project to ensure implementation of recommendations, interpretations, and resolutions of any safety concern provided by the AT.
3.2 Safety Deliverables

All safety deliverables, responses to safety deliverables, safety comments, safety related concerns and issues will be passed through and coordinated with the PSWG via the PSWG Chairperson unless otherwise agreed to by the PSWG. During the review process, all reviewing safety organizations send comments directly to the PSWG Chairperson only. No safety related comments will be sent directly to the Payload Project by anyone other than the PSWG Chairperson. This will allow for compilation and coordination of comments prior to discussing them with Payload Project. The PSWG Chairperson and the Payload Project will work together to consolidate and disposition all comments and set up a tabletop review meeting with the PSWG and others who submitted comments to discuss these comments as needed. The PSWG Chairperson will notify all PSWG members persons who provided comments upon posting the comments received onto the LSP Portal for review prior to a PSWG meeting. The PSWG Chairperson works with the LSIM, IE, and MiM to ensure that all engineering disciplines are included in the Safety Review as needed to ensure their comments are properly dispositioned and/or included.

Comments accepted by the PSWG will be incorporated by the author and the revised document will be submitted to the PSWG Chairperson. The PSWG Chairperson will once again inform the PSWG members, the ELV PSM, LSIM, IE, MiM, MAM, and back-up MSE of the LSP Portal location where the revised safety documentation will be available and when it will be available for review.

The PSWG Chairperson notifies and provides a brief safety review status in a letter to the Payload Project Manager, with a copy to the NASA KSC SMA LS Division Safety & Quality Branch Chief and the ELV PSM, upon concurrence by all PSWG members that the respective Safety Review (I, II, or III) has been satisfactorily completed. If the required safety review activities or deliverables schedules are not met (or product quality is inadequate for that phase of the project lifecycle) and fail to fulfill the required safety gate products prior to the project’s KDPs, the PSWG Chairperson notifies the NASA KSC SMA LS Division Safety & Quality Branch Chief and the ELV PSM. The PSWG Chairperson notifies the Payload Project Manager and other authorities of failure to meet safety gate products. The PSWG Chairperson ensures that the PSWG members, LSIM, IE, MiM, MAM, and back-up MSE are included on three Safety Review letters to the Payload Project Manager.

The final Safety Review III is completed at a PSWG meeting held at least five business days prior to the LSP Ground Operations Review (GOR). The completed Certificate of ELV Payload Safety Compliance is provided by the Payload Project Manager and signed by the PSWG Chairperson and others as defined in NPR 8715.7. The PSWG Chairperson notifies the NASA KSC SMA LS Division Safety & Quality Branch Chief of the completed Certificate of ELV Payload Safety Compliance.

The flow of safety deliverables is shown in Figure 5 PSWG Document Flow.
3.3 PSWG Conclusion

The conclusion of the PSWG will culminate with the PSWG Chairperson and the ELV PSM signing the Certificate of ELV Payload Safety Compliance indicating that the project has completed the PSWG safety review process. Once the Certificate of ELV Payload Safety Compliance has been signed, the PSWG function is complete. Unless the SATL or SVTL require PSWG coordination, all other safety reviews and processes will be performed in line by the appropriate safety authority. Hazardous procedures will be reviewed by different safety entities as applicable to the operations (Air Force Range Safety, NASA LS Division Safety, etc.), but are not required to be reviewed as a group.

After transportation of the payload to the launch area processing facility, the project updates the SVTL at least weekly (more frequently if the open items must be closed to remove operational constraints) and makes the current SVTL available to all officials involved in the mission. The PSWG Chairperson assists the project in this effort through the use of the LSP Portal. The MSE ensures proper closure of the SVTL and notifies the NASA KSC SMA LS Division Safety & Quality Branch Chief and ELV PSM of open items and any payload processing issues that could impact launch processes. Potential impacts of high importance are reported to appropriate management and in appropriate reviews.