NASA Policy Directive

NPD 8610.7D
Effective Date: January 31, 2008
Expiration Date: January 31, 2023

COMPLIANCE IS MANDATORY

Printable Format (PDF)

Request Notification of Change (NASA Only)

Subject: Launch Services Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Missions - Revalidated w/Change 2 (03/29/2018)

Responsible Office: Human Exploration and Operations Mission Directorate

CHANGE LOG

Chg #	Date	Description/Comments
1	08/27/2012	Policy and responsibilities updated to clarify launch vehicles certification requirements in order to comply with the Agency's direction. NPD 8610.7D also updated to comply with content and structure requirements for agency-level directives.
2	03/29/2018	Revalidated to incorporate Flight Planning Board approved changes for Categoy 1 Certification, and 1400 compliances.

1. POLICY

a. It is NASA's policy to have a mixed-fleet launch strategy to utilize both existing and emerging domestic launch capability to assure access to space for NASA payloads and their related missions. This directive addresses the process that enables NASA to take advantage of the full range of available launch capability while ensuring that the risks associated with access to space are consistent with the risk classification approved for individual payloads and missions. This directive complies with the requirement for program risk management documented in NASA Procedural Requirements (NPR) 7120.5.

b. It is also NASA's policy, consistent with the National Space Transportation Policy (NSTP), that U.S. Government payloads are launched on launch vehicles manufactured in the U.S., unless exempted by the Assistant to the President and National Security Advisor and the Assistant to the President for Science and Technology and the Director of the Office of Science and Technology Policy through an interagency process, and/or as part of an approved international cooperative mission with launch contributed on a no-funds exchanged basis.

c. NASA's launch vehicle assignment and acquisition policy seek to balance launch risk for individual missions with demonstrated launch vehicle history; flight anomaly, and/or mission failure resolution, if any; and NASA technical evaluation consistent with overall mission risk.

d. This policy addresses three levels of launch vehicle risk for launches to earth orbit or beyond: high, medium, and low. NASA's approach to determine a launch vehicle risk category and to mitigate the risks is through a launch vehicle certification process described in Attachment A. Launch vehicle mission risk classification and launch vehicle certification strategy, including determination of the certification alternative, are reviewed and documented for each NASA mission launch contract award using an uncertified launch vehicle, through the NASA Flight Planning Board (FPB).

e. Nothing contained within this policy directive precludes or restricts a source selection authority from selecting, or the FPB from recommending for selection the utilization of a lower risk launch vehicle for any payload. A payload defined as a Class D payload, pursuant to NPR 8705.4, may utilize a common launch vehicle configuration certified to a Risk Category 2 or 3. A payload defined as a Class C or D payload, pursuant to NPR 8705.4, may utilize a common launch vehicle configuration certified to Risk Category 3.

2. APPLICABILITY

a. This directive is applicable to NASA Headquarters and NASA Centers, including Component Facilities and Technical and Service Support Centers. This language applies to the Jet Propulsion Laboratory, a Federal Funded Research and Development Center, other contractors, grant recipients or parties to agreements only to the extent specified or referenced in the appropriate contracts, grants or agreements.

b. This policy applies to all NASA-owned or NASA-sponsored non-crewed payloads/missions designed for launch into Earth orbit and beyond and/or for other Government-sponsored payloads for which NASA is responsible for launch service acquisition and management.

c. This policy is not applicable to sub-orbital launches or payloads launched on the Space Launch System.

d. In this directive, all mandatory actions (i.e. requirements) are denoted by statements containing the term "shall." The terms; "may" or "can" denote discretionary privilege or permission, "should" denotes a good practice and is recommended, but not required, "will" denotes expected outcome, and "are/is" denotes descriptive material.

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

3. AUTHORITY

a. National Aeronautics and Space Act of 1958, 51 U.S.C. 20113(a), Section 203(c)(1), as amended.

4. APPLICABLE DOCUMENTS AND FORMS

a. NPR 7120.5, NASA Space Flight Program and Project Management Requirements.

b. NPD 8610.23, Launch Vehicle Technical Oversight Policy.

c. NPR 8705.4, Risk Classification for NASA Payloads.

d. U.S. Space Transportation Policy, December 21, 2004.

e. LSP-PLN-324.01, Expendable Launch Vehicle Certification Plan.

f. NC 1000-15A, Expendable Launch Vehicle (ELV) Flight Planning Board (FPB) Charter

5. RESPONSIBILITY

a. The Director for Launch Services, as delegated by the Associate Administrator for HEOMD shall:

(1) Ensure the enforcement of this policy directive.

(2) Conduct special FPB meetings, as required, to review and approve launch vehicle risk assignments to ensure compliance with this directive with regard to identification of launch vehicle risk category and sponsoring Mission Directorate payload classification, proposed vehicle certification strategy for High to Medium Priority Class A, B and C payloads as classfiied by NPR 8705.4, and vehicle flight assignment for individual missions.

(3) Approve and tailor, launch vehicle certification requirements consistent with this policy for High to Medium Priority Class A, B and C individual missions, prior to award of a launch contract, consistent with this policy for individual missions, prior to award of a launch contract, in coordination with the Chief Engineer, the Office of Safety and Mission Assurance, and the sponsoring Mission Directorate at mission-specific FPBs.

(3) Ensure the enforcement of this policy directive.

(4) Coordinate any requisite exemption request to the U.S. Space Transportation Policy requiring U.S. Government payloads to be flown on launch vehicles manufactured in the U.S.

(5) Develop alternative risk mitigation strategies, as required, for unique missions on a case-by-case basis, which are reviewed and approved by the FPB.

(i.) All on-orbit payload delivery services contracts will be considered on a case-by-case basis by the payload Mission Directorate and the Human Exploration and Operations Mission Directorate (HEOMD). A similar risk assessment strategy whereby the vehicle's demonstrated flight history is consistent with the overall mission risk willbe pursued. FPB review and concurrence is required prior to initiation of any "delivery on-orbit" service acquisition.

(ii.) In considering whether to enter into a particular cooperative mission involving the launch of a NASA-owned or NASA-sponsored payload on a foreign partner provided launch vehicle, the payload Mission Directorate and HEOMD will pursue a similar risk assessment strategy, balancing payload mission criticality with launch vehicle flight history and the level of technical evaluation performed by the cooperative partner. FPB review and concurrence are required prior to initiation of the formal interagency coordination process required under the NSTP. HEOMD will coordinate any proposed international cooperative on a foreign launch system with the sponsoring Mission Directorate and the Office of International and Interagency Relations.

(iii.) In considering use of a Department of Defense (DoD)-provided launch of a NASA-owned or NASA-sponsored payload, the payload Mission Directorate and HEOMD will evaluate the risk using a similar assessment strategy, balancing payload mission criticality with launch vehicle flight history and the level of technical evaluation performed by the DoD. FPB review and concurrence are required prior to initiation of the formal interagency coordination process.

b. Each Mission Directorate Associate Administrator shall:

(1) Ensure that all respective spacecraft Announcements of Opportunity and Requests for Proposal are coordinated with HEOMD prior to publication.

(2) Determine and coordinate payload mission classification consistent with NPR 8705.4, Risk Classification for NASA Payloads.

(3) Serve as a member of the FPB responsible for coordination and concurrence on launch vehicle risk assignment and certification requirements for individual missions.

c. The LSP Manager shall:

(1) Define and implement launch vehicle certification requirements in accordance with this policy.

(2) Identify to the FPB any major modifications to a certified launch vehicle configuration that does not require recertification, but may warrant additional review, technical evaluation, and/or flight demonstration.

(3) Ensure that all launch services solicitations for NASA-owned or NASA-sponsored payloads are consistent with this policy and coordinated with HEOMD prior to release.

Ensure each awarded NASA launch services contract or NASA Launch Services (NLS) task order for "High to Medium Priority" Class A, B & C missions includes a provision requiring the Launch Service Contractor (LSC) to support the launch vehicle certification requirements set forth in this policy and enables NASA insight, consistent with NPD 8610.23, into the LSC and the LSC's subcontractors' systems engineering, processes, and process control to ensure the quality and reliability of the launch services consistent with this policy. The FPB can approve alternate approaches.

(4) Implement changes to the launch vehicle certification requirements, as approved and directed by the FPB.

(5) Provide, in accordance with NPR 7120.5, for the safety and mission success of the launch portion of any payload mission utilizing launch services acquired and managed by LSP and governed by this policy.

(6) Approve and tailor, launch vehicle certification requirements consistent with this policy for Class D individual missions that only require Category 1 (or less) Certified Launch Vehicles including approval of the launch vehicle certification strategy for Class D payloads as classified by NPR 8704.5.

d. Mission Directorates, Center Directors, and the Director of JPL shall ensure that all NASA-owned or NASA-sponsored payloads under their control obtain launch services provided by LSP, are consistent with this policy and are coordinated with HEOMD.

6. DELEGATION OF AUTHORITY

None.

7. MEASUREMENT/VERIFICATION

a. HEOMD shall maintain a record of launch vehicle flight history and reliability statistics for all U.S. and foreign launch vehicle suppliers in accordance with NC 1000-15A, Expendable Launch Vehicle (ELV) FPB Charter.

8. CANCELLATION

NPD 8610.7C, Launch Services Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Mission, dated April 5, 2005.

Revalidated on March 29, 2018, w/Change 2

Original signed by:

/s/ Michael D. Griffin
Administrator

ATTACHMENT A: NASA LAUNCH VEHICLE CERTIFICATION

A.1 NASA's approach to determine launch vehicle risk category and to mitigate the risks across category alternatives are through a launch vehicle certification process, summarized below, identifies the requirements to obtain certification as outlined in the matrix provided at the end of the attachment.

A.2 A "common launch vehicle configuration" is a unique combination of core propulsive stages, excluding strap-on rocket motors and stages utilized explicitly for orbit escape or trim. A "successful flight" is a flight which met the primary mission requirements.

A.3 Payloads classified as Class D payloads, pursuant to NPR 8705.4, may be launched on Risk Category 1 launch vehicles (i.e., a new common launch vehicle configuration with no prior demonstrated flight history and completion of NASA audits and evaluation of documentation specified in the matrix at the end of Attachment A). Other high-risk payload launch service options may be pursued through the FPB.

A.4 Payloads classified as Class C payloads and, in some cases, Class B payloads, pursuant to NPR 8705.4, may be launched on Risk Category 2 launch vehicles that have demonstrated a limited history of successful flights. Accordingly, Class C payloads, and, in some cases, Class B payloads, may launch on a common launch vehicle configuration that has been certified by any one of the three following alternative methods:

A.4.1 Certification Alternative 1 provides for certification of a common launch vehicle configuration with a demonstrated flight record of a series of 6 consecutive successful flights of a common launch vehicle configuration (i.e., 89 percent demonstrated reliability at 50 percent confidence using the binomial distribution without considering the other specific certification assurances, which makes the confidence level appreciably higher) and completion of NASA's evaluation of the limited additional documentation specified in the matrix at the end of Attachment A, or;

A.4.2 Certification Alternative 2 provides for certification after three successful flights (that include a minimum of two consecutive successful flights) of a common launch vehicle configuration, and completion of a NASA Design Certification Review, NASA-conducted Independent Verification and Validation (IV&V) of launch vehicle analyses, and audits and evaluation of documentation specified in the matrix at the end of Attachment A.

A.4.3 Certification Alternative 3 provides for certification after one successful flight of a common launch vehicle configuration and completion of the NASA Engineering Review Boards, audits, and the evaluation of documentation specified in the matrix at the end of Attachment A.

A.5 Payloads which are classified as Class A, and, in some cases, Class B payloads pursuant to NPR 8705.4, will be launched on Risk Category 3 launch vehicles that have a more robust demonstrated successful flight history. Accordingly, payloads classified as Class A, and, in some cases, Class B payloads, may launch on a common launch vehicle configuration that has been certified by any one of the three following alternative methods:

A.5.1 Certification Alternative 1 provides for certification of a common launch vehicle configuration with a demonstrated flight record of a series of 14 consecutive successful flights of a common launch vehicle configuration (i.e., 95 percent demonstrated reliability at 50 percent confidence level using the binomial distribution without considering the other specific certification assurances, which makes the confidence level appreciably higher), and completion of a NASA evaluation of the limited additional documentation specified in the matrix at the end of Attachment A.,or;

A.5.2 Certification Alternative 2 provides for certification after six successful flights (that include a minimum of three consecutive successful flights) of a common launch vehicle configuration, and completion of a NASA Design Certification Review, NASA-conducted IV&V of launch vehicle analyses, and audits and evaluation of documentation specified in the matrix at the end of Attachment A.

A.5.3 Certification Alternative 3 provides for certification after three successful flights (that include a minimum of two consecutive successful flights) of a common launch vehicle configuration, and completion of extensive NASA technical evaluation, audits, and evaluation of the documentation specified in the matrix at the end of Attachment A.

A.6 NASA Flight Margin Verification (FMV) is required for all flight histories used to support Risk Category 2 and 3 certification of a common launch vehicle configuration. FMV is a verification by NASA that the common launch vehicle configuration met the predicted vehicle and performance parameters (e.g., within family and/or within three-sigma criteria). Resolution of all flight anomalies and mission failures is required by the launch service contractor with Launch Services Program (LSP) technical evaluation and disposition. A common launch vehicle configuration failure caused by a part or subsystem that has sufficient previous flight history, as determined by the engineering technical authority for LSP, does not automatically invalidate the consecutive success requirement. LSP-PLN-324.01, Expendable Launch Vehicle Certification Plan, will identify criteria/process for review of this condition.

A.7 NASA IV&V is a comprehensive assessment of the common launch vehicle analyses conducted by the launch service contractor. It will be based on the complexities and heritage of the vehicle. The LSP will propose the appropriate level of technical assessment (LSP independent modeling, launch service contractor model evaluation, and/or launch service contractor analytical review) at a FPB used to assess the certification strategy for a specified common launch vehicle configuration.

NASA Launch Vehicle Certification Requirements Matrix

Launch Vehicle Risk Category	**Category 1 (High Risk**		**Category 2 (Medium Risk)**			**Category 3 (Low Risk)**		
Payload Class (per NPR 8705.4)	D		C & D, sometimes B			A, B, C & D		
	Alternative 1	Alternative 2	Alternative 1	Alternative 2	Alternative 3	Alternative 1	Alternative 2	Alternative 3
Management Systems	AS9100 or ISQ 9001 Compliant	AS9100 or ISO 9001 Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant

Flight Experience	1 successful flight of a common launch vehicle configuration, instrumented to prove design verification and flight performance data Post Flight Operations/Ano-maly Resolution Process NASA Post Flight Data Review	No previous flights required, can use the first flight of a common launch vehicle configuration, instrumented to provide design verification & flight performance data Post-Flight Operations/ Anomaly Resolution Process Flight Data Assessment Process	6 consecutive successful flights (89% demonstrated reliability) of a common launch vehicle configuration, instrumented to provide design verification and flight performance data Post Flight Operations/ Anomaly Resolution Process NASA Flight Margin Verification	3 (minimum 2 consecutive) successful flights of a common launch vehicle configuration, instrumented to provide design verification & flight performance data Post Flight Operations/ Anomaly Resolution Process NASA Flight Margin Verification	1 successful flight of a common launch vehicle configuration, instrumented to provide design verification & flight performance data Post Flight Operations/ Anomaly Resolution Process NASA Flight Margin Verification	14 consecutive successful flights (95% demonstrated reliability) of a common launch vehicle configuration, instrumented to provide design verification and flight performance data Post Flight Operations/ Anomaly Resolution Process NASA Flight Margin Verification	6 successful flights (minimum 3 consecutive) of a common launch vehicle configuration, instrumented to provide design verification and flight performance data Post Flight Operations/ Anomaly Resolution Process NASA Flight Margin Verification	3 (minimum 2 consecutive) successful flights of a common launch vehicle configuration, instrumented to provide design verification & flight performance data Post Flight Operations/ Anomaly Resolution Process NASA Flight Margin Verification
Design	None	None	NASA assessment of LSC design reliability	NASA assessment of LSC design reliability	NASA assessment of design LSC reliability	NASA assessment of LSC design reliability	NASA assessment of LSC design reliability	NASA assessment of LSC design reliability
Mfg & Ops and Systems Engineering	None	NASA Audits Documented ICD Process	None	NASA Audits	NASA Audits	None	NASA Audits	NASA Audits
System Safety	Demonstrated Compliance with Applicable Range Safety Requirements	Compliance w/ applicable Range Safety Requirements	Demonstrated compliance with applicable Range Safety Requirements	Demonstrated compliance with applicable Range Safety Requirements	Demonstrated Compliance with applicable Range Safety Requirements	Demonstrated compliance with applicable Range Safety Requirements	Demonstrated compliance with applicable Range Safety Requirements	Demonstrated compliance with applicable Range Safety Requirements
Test & Verification	None	Acceptance Test Plan in place Ground Test, End-to-End Tests complete	None	NASA Design Certification Review	Comprehensive Acceptance Test results	None	NASA Design Certification Review	Comprehensive Acceptance Test results
Quality Systems/Process	NASA Audits, and Documented ICD Process	NASA Audit	None	NASA Audit	NASA Audit	None	NASA Audit	NASA Audit
Flight Hardware & Software Qualification	None	Qualified Hardware (for application) Testing complete	None	NASA Design Certification Review	Series of NASA Engineering Review Boards on vehicle subsystems	None	NASA Design Certification Review	Series of NASA Engineering Review Boards on vehicle subsystems
LV Analysis	None	Analysis Plan/Definition	None	NASA IV&V	Analysis Plan/Definition NASA Coupled Loads Analysis IV&V	None	NASA IV&V	NASA IV&V
Risk Management	Risk Plan, Mitigated and Accepted Technical and Safety Risks	Risk Plan, Mitigated and Accepted Technical and Safety Risks	Risk Plan, Mitigated and Accepted Technical and Safety Risks	Risk Plan, Mitigated and Accepted Technical and Safety Risks	Risk Plan, Mitigated and Accepted Technical and Safety Risks	Risk Plan, Mitigated and Accepted Technical and Safety Risks	Risk Plan, Mitigated and Accepted Technical and Safety Risks	Risk Plan, Mitigated and Accepted Technical and Safety Risks
Integrated Analysis		None	None	None	None	None	None	Full Vehicle Fishbone
Launch Complex		None	None	NASA Design Certification Review	NASA Engineering Review Board	None	NASA Design Certification Review	NASA Engineering Review Board

NOTES:

Launch failures do not invalidate previous launch vehicle certification if NASA Engineering Review Board concurs with cause and corrective action. Risk Category 3 certification requires NASA participation in Launch Service Contractor's failure review process.

Major launch vehicle upgrades may require additional NASA technical penetration and/or flight demonstration

Full NASA Engineering and SMA insight per NPD 8610.23 applied to all risk categories, except for secondary payloads.

Matrix terms are defined in LSP-PLN-324.01, Expendable Launch Vehicle Certification Plan.

Using the binomial distribution, the confidence level associated with the listed reliability values is 50 percent. However, the binomial assumes no information from the flights other than success or failure. Because of the other specific certification assurances, the confidence level is appreciably higher than 50 percent, which applies to all the alternatives (columns) in the table.

ATTACHMENT B: REFERENCES

B.1 NASA Authorization Act of 1989 (P.L. 100-147), 51 U.S.C. 20142 et seq., Section 311, as amended.

B.2 Commercial Space Act of 1998 (P.L. 105-303), 51 U.S.C. 50131 et seq., Section 201, as amended.

B.3 Commercial Space Act of 1998 (P.L. 105-303), 51 U.S.C. 50131 et seq., Section 202, as amended.

B.4 National Space Policy, June 28, 2010.

(URL for Graphic)

None.

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