

**COORDINATED STRATEGY
AMONG
THE UNITED STATES AIR FORCE,
THE NATIONAL RECONNAISSANCE OFFICE,
AND
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
FOR
NEW ENTRANT LAUNCH VEHICLE CERTIFICATION**

A. PURPOSE

This document defines the coordinated certification strategy for commercial new entrant launch vehicles. This strategy implements the action directed in the Memorandum of Understanding (MOU) among the United States Air Force (USAF), the National Reconnaissance Office (NRO), and the National Aeronautics and Space Administration (NASA), on Evolved Expendable Launch Vehicles, in which the three agencies agreed to develop a coordinated strategy for new entrant launch vehicle certification (Reference 1). This strategy is intended to further enable competition and provide a consistent path for new entrants to compete for USG missions.

B. REFERENCES

1. *Memorandum of Understanding Among the United States Air Force, the National Reconnaissance Office and the National Aeronautics and Space Administration on Evolved Expendable Launch Vehicles (EELVs)* (10 March 2011)
2. National Security Presidential Directive 40 (NSPD-40), *U.S. Space Transportation Policy* (21 December 2004)
3. NASA Policy Directive (NPD) 8610.7D, *Launch Services Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Missions* (31 January 2008)
4. NASA Procedural Requirements (NPR) 8705.4, *Risk Classification for NASA Payloads, Revalidated 9 July 2008* (14 June 2004)

C. BACKGROUND

In accordance with the U.S. Space Transportation Policy (Reference 2), the USAF, NRO, and NASA (collectively “the Parties”) signed the MOU (Reference 1) on 10 March 2011, agreeing that U.S. commercial space transportation capabilities that demonstrate the ability to reliably launch payloads, to include EELV-class, will be allowed to compete for Government missions. The Parties also agreed to develop a coordinated strategy for certification of new entrants that leverages the Government’s work done to date and recognizes mission-unique requirements across the Parties. The MOU stated the execution of the actions outlined in the MOU is the responsibility of the Space and Missile Systems Center Launch and Range Systems Directorate (SMC/LR), the NRO Office of Space Launch (OSL) Director, and the NASA Launch Services Program (LSP) Manager (collectively “the Launch Organizations”).

D. SCOPE

This coordinated strategy addresses non-recurring vehicle certification. This strategy does not encompass the recurring mission assurance activities to be performed by the Launch Organizations for individual missions. This joint strategy is consistent with each Launch Organization's directives and allows them to comply with their published directives for flight worthiness certification.

E. CERTIFICATION

The Launch Organizations agree to adopt a certification policy framework consistent with NPD 8610.7D (Reference 3). This framework (Table 1) provides a methodology for certification of launch vehicles based on risk classifications for individual payloads (Table 2). Payloads with higher risk tolerance can be flown on launch vehicles with a higher risk category rating, thus providing an opportunity for new entrant providers to gain experience launching Government payloads. This framework provides multiple paths to certify a potential new entrant based on the maturity of their launch vehicle system and the level of detailed technical evaluation by the Government. The selection of the "alternatives" contained in Table 1 that could comprise an Agency's certification approach is at the discretion of each Agency informed by technical interactions with potential new entrants. For example, if new entrants have launch vehicles that have a more robust, demonstrated successful flight history, then the Government may require less technical evaluation for certification.

The Launch Organizations, to the maximum extent practical, agree to share data and results concerning their respective certification efforts for potential new entrants to help facilitate the certification process and avoid unnecessary duplication.

The Launch Organizations will use a common risk evaluation approach consistent with NPR8705.4, *Risk Classification for NASA Payloads* (Reference 4), as summarized in Table 2. The risk tolerance of each payload is based on a standard payload risk classification definition. The importance weighting assigned to each consideration is at the discretion of the responsible Agency.

Risk mitigation for a new launch service capability will be based upon a baseline risk assessment developed through a structured launch vehicle certification process, as described in Table 1. This risk mitigation strategy requires a certification process for each "common launch vehicle configuration" commensurate with the risk classification of each payload. A "common launch vehicle configuration" is defined as a unique combination of core propulsive stages, excluding strap-on rocket motors and stages utilized explicitly for orbit escape or trim. This risk-based certification approach allows the Launch Organizations to balance payload mission criticality with launch vehicle flight history, flight anomaly, mission failure resolution, and the technical insight into the new entrant's design, qualification, testing, systems engineering, manufacturing, and processing.

F. STRATEGY

The Parties will promote the certification of new entrant launch providers by undertaking the following actions:

United States Air Force

The USAF is in the process of identifying near-term missions to provide new entrant on-ramp opportunities. These launches will be used to collect technical data needed for certification of new entrants. To provide further clarity on implementation of the certification strategy, the USAF will publish a New Entrant Certification Guide.

National Reconnaissance Office

The NRO has initiated study contracts with new entrant providers to begin addressing the security, integration and processing requirements of classified payloads. The NRO plans to compete launch services for appropriate missions, consistent with the certification strategy.

National Aeronautics and Space Administration

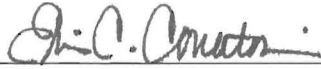
NASA has successfully used and evolved NPD 8610.7 since 1999 to balance mission risk tolerance with launch vehicle demonstrated reliability. The NASA Launch Services (NLS) contract has historically used NPD 8610.7 as its framework to guide launch vehicle risk tolerance categorization. The NLS contract also includes an innovative annual “on-ramp” provision that enables NASA to consider new launch service capabilities as they mature and allows new entrants to compete for NASA missions, consistent with the terms and conditions of the NLS contract. In addition, NPD 8610.7 provided the framework for enabling award of the Commercial Resupply Services (CRS) launch service contract awards in 2008. NASA will continue to use NPD 8610.7 as its implementation document to facilitate the certification of new launch capabilities.

G. IMPLEMENTATION

Execution of the new entrant launch vehicle certification strategy will be the responsibility of each Launch Organization to satisfy their individual requirements. The Launch Organizations agree to use the Launch Vehicle Certification Requirements Matrix (Table 1) and Payload Risk Classification System (Table 2) to define their individual certification efforts while retaining the right to tailor the certification elements. The tailored elements and execution approach for specific new common launch vehicle configurations will be communicated to each of the Launch Organizations at the Government Expendable Launch Vehicle (ELV) Executive Board.

The Launch Organizations will establish a process to share data and results from their individual execution of the new entrant certification strategy.

The Government ELV Executive Board shall review the New Entrant Launch Vehicle Certification Strategy every two years concurrent with the review of the EELV MOU (Reference 1) to determine its continued applicability.



Erin C. Conaton
Under Secretary of the Air Force

12 October 2011

Date



Lori B. Garver
Deputy Administrator
National Aeronautics and Space Administration

12 October 2011

Date



Betty J. Sapp
Principal Deputy Director
National Reconnaissance Office

12 October 2011

Date

APPENDIX

Table 1: Launch Vehicle Certification Requirements Matrix*

Launch Vehicle Risk Category	Category 1 (High Risk)	Category 2 (Medium Risk)			Category 3 (Low Risk)			
Payload Class	D	C and D, Sometimes B			A, B, C and D			
		Alternative 1	Alternative 2	Alternative 3	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Management Systems	AS9100 or ISO 9001 Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant
Flight Experience	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 of a common launch vehicle configuration, instrumented to provide design verification and flight performance data Post Flight Operations/Anomaly Resolution Process Agency Flight Margin Verification	3 (minimum 2 consecutive) successful flights of a common launch vehicle configuration, instrumented to provide design verification and flight performance data Post Flight Operations/Anomaly Resolution Process Agency 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 Agency Flight Margin Verification	14 consecutive successful flights (95% demonstrated reliability at 50% confidence) of a common launch vehicle configuration, instrumented to provide design verification and flight performance data Post Flight Operations/Anomaly Resolution Process Agency Flight Margin Verification	6 (minimum 3 consecutive) successful flights of a common launch vehicle configuration, instrumented to provide design verification and flight performance data Post Flight Operations/Anomaly Resolution Process Agency Flight Margin Verification	3 (minimum 2 consecutive) successful flights of a common launch vehicle configuration, instrumented to provide design verification and flight performance data Post Flight Operations/Anomaly Resolution Process Agency Flight Margin Verification	2 consecutive successful flights of a common launch vehicle configuration, instrumented to provide design verification and flight performance data Post Flight Operations/Anomaly Resolution Process Agency Flight Margin Verification
System Design								Agency Acceptance of: System Requirements Review (SRR) System Functional Review (SFR) Preliminary Design Review (PDR) Critical Design Review (CDR) Functional Configuration Audit (FCA)

Launch Vehicle Risk Category	Category 1 (High Risk)	Category 2 (Medium Risk)			Category 3 (Low Risk)			
Payload Class	D	C and D, Sometimes B			A, B, C and D			
		Alternative 1	Alternative 2	Alternative 3	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Launch Service Contractor (LSC) Design Reliability	Agency evaluation of LSC Design Reliability	Agency evaluation of LSC Design Reliability	Agency evaluation of LSC Design Reliability	Agency evaluation of LSC Design Reliability	Agency evaluation of LSC Design Reliability	Agency evaluation of LSC Design Reliability	Agency evaluation of LSC Design Reliability	Agency evaluation of LSC Design Reliability
Mfg & Ops and Systems Engineering	Agency Audits Documented ICD Process	None	Agency Audits	Agency Audits	None	Agency Audits	Agency Audits	Agency Audits
System Safety	Failure Mode & Effects Analysis (FMEA) for all safety critical components Prelim and Final Hazards Analysis 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	Demonstrated Compliance with Applicable Range Safety Requirements	Demonstrated Compliance with Applicable Range Safety Requirements
Test and Verification	Acceptance Test Plan in Place Ground Test, End-to-End Tests Complete	None	Agency Design Certification Review	Comprehensive Acceptance Test Results	None	Agency Design Certification Review	Comprehensive Acceptance Test results	Comprehensive Acceptance Test results verification Physical Configuration Audit (PCA)
Quality Systems/Process	Agency Audit	None	Agency Audit	Agency Audit	None	Agency Audit	Agency Audit	Agency Audit
Flight Hardware & Software Qualification	Qualified Hardware (for space application) Testing Complete	None	Agency Design Certification Review	Series of Engineering Review Boards on Vehicle Subsystems	None	Agency Design Certification Review	Series of Engineering Review Boards on Vehicle Subsystems	System Verification Review (SVR) or Design Equivalency Review (DER)
Launch Vehicle Analysis	Analysis Plan/Definition	None	Agency IV&V	Analysis Plan/Definition Agency Coupled Loads IV&V	None	Agency IV&V	Agency IV&V	Agency IV&V

Launch Vehicle Risk Category	Category 1 (High Risk)	Category 2 (Medium Risk)			Category 3 (Low Risk)			
Payload Class	D	C and D, Sometimes B			A, B, C and D			
		Alternative 1	Alternative 2	Alternative 3	Alternative 1	Alternative 2	Alternative 3	Alternative 4
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	None
Launch Complex	None	None	Agency Design Certification Review	Agency Engineering Review Board	None	Agency Design Certification Review	Agency Engineering Review Board	Facility Design Reviews Site Activation Verification

* Sufficiency of the data used to complete the activities will be determined by each Agency.

Table 2: Payload Risk Classification System

Payload Risk Classification (Payload Class)				
Characterization	<u>Class-A</u>	<u>Class-B</u>	<u>Class-C</u>	<u>Class-D</u>
Acceptable Risk Tolerance Level	Very Low (Minimized)	Low	Medium	High
National Significance	Very High	High	Medium	Low to Medium
Complexity	Very High to High	High to Medium	Medium to Low	Low
Mission Lifetime or Constellation Health	Long, >5 years, one-of-a-kind, or fragile constellation health	Medium, 2-5 years, or robust constellation health	Short, <2 years	Short, <2 years
Cost	High	High to Medium	Medium to Low	Low
Launch Constraints	Critical	Medium	Few	Few to none
In-Flight Maintenance	N/A	Not feasible or difficult	May be feasible	May be feasible and planned
Alternative Research Opportunities or Re-flight Opportunities	No alternative or re-flight opportunities	Few or no alternative or re-flight opportunities	Some or few alternative or re-flight opportunities	Significant alternative or re-flight opportunities
Achievement of Mission Success Criteria	All practical measures are taken to achieve minimum risk to mission success. The highest assurance standards are used.	Stringent assurance standards with only minor compromises in application to maintain a low risk to mission success.	Medium risk of not achieving mission success may be acceptable. Reduced assurance standards are permitted.	Medium or significant risk of not achieving mission success is permitted. Minimal assurance standards are permitted.