

**NPD 8610.7D, Launch Services Risk Mitigation Policy for NASA-Owned and/or NASA-Sponsored Payloads/Missions  
Attachment**

**NASA Launch Vehicle Certification Requirements Matrix**

<b>Launch Vehicle Risk Category</b>	<b>Category 1 (High Risk)</b>	<b>Category 2 (Medium Risk)</b>		<b>Category 3 (Low Risk)</b>		
<b>Payload Class</b> (per NPR 8705.4)	D	C & D, sometimes B		A, B, C & D		
		Alternative 1	Alternative 2	Alternative 1	Alternative 2	Alternative 3
<b>Management Systems</b>	AS9100 or ISO 9001 Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant	AS9100 Compliant
<b>Flight Experience</b>	<p>No previous flights required, can use the first flight of a common launch vehicle configuration, instrumented to provide design verification &amp; flight performance data</p> <p>Post-Flight Operations/ Anomaly Resolution Process</p> <p>Flight Data Assessment Process</p>	<p>1 successful flight of a common launch vehicle configuration, instrumented to provide design verification &amp; flight performance data</p> <p>Post-Flight Operations/ Anomaly Resolution Process</p> <p>NASA Flight Margin Verification</p>	<p>3 (minimum 2 consecutive) successful flights of a common launch vehicle configuration, instrumented to provide design verification &amp; flight performance data</p> <p>Post-Flight Operations/ Anomaly Resolution Process</p> <p>NASA Flight Margin Verification</p>	<p>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</p> <p>Post-Flight Operations/ Anomaly Resolution Process</p> <p>NASA Flight Margin Verification</p>	<p>6 successful flights (minimum 3 consecutive) of a common launch vehicle configuration, instrumented to provide design verification and flight performance data</p> <p>Post-Flight Operations/ Anomaly Resolution Process</p> <p>NASA Flight Margin Verification</p>	<p>3 (minimum 2 consecutive) successful flights of a common launch vehicle configuration, instrumented to provide design verification &amp; flight performance data</p> <p>Post-Flight Operations/ Anomaly Resolution Process</p> <p>NASA Flight Margin Verification</p>

<b>Design</b>	NASA assessment of LSC design reliability	NASA assessment of LSC design reliability	NASA assessment of LSC design reliability	NASA assessment of LSC design reliability	NASA assessment of LSC design reliability	NASA assessment of LSC design reliability
<b>Mfg &amp; Ops and Systems Engineering</b>	NASA Audits  Documented ICD Process	NASA Audits	NASA Audits	None	NASA Audits	NASA Audits
<b>System Safety</b>	FMEA for all safety critical components  Preliminary & Final Hazard 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
<b>Test &amp; Verification</b>	Acceptance Test Plan in place  Ground Test, End-to-End Tests complete	Comprehensive Acceptance Test results	NASA Design Certification Review	None	NASA Design Certification Review	Comprehensive Acceptance Test results
<b>Quality Systems/Process</b>	NASA Audit	NASA Audit	NASA Audit	None	NASA Audit	NASA Audit
<b>Flight Hardware &amp; Software Qualification</b>	Qualified Hardware (for space application) Testing completed	Series of NASA Engineering Review Boards on vehicle subsystems	NASA Design Certification Review	None	NASA Design Certification Review	Series of NASA Engineering Review Boards on vehicle subsystems
<b>LV Analysis</b>	Analysis Plan/Definition	Analysis Plan/Definition	NASA IV&V	None	NASA IV&V	NASA IV&V

		NASA Coupled Loads Analysis IV&V				
<b>Risk Management</b>	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
<b>Integrated Analysis</b>	None	None	None	None	None	Full Vehicle Fishbone
<b>Launch Complex</b>	None	NASA Engineering Review Board	NASA Design Certification Review	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.
- Full NASA engineering 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"