

## NASA Launch Vehicle Certification Requirements Matrix

Launch Vehicle Risk Category	Category 1 (High Risk)	Category 2 (Medium Risk)		Category 3 (Low Risk)		
<b>Vehicle Maturity</b>	No Flight History	Limited Flight History		Significant Flight History		
<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>	ISO 9001 Third Party Certification completed	ISO 9001 Third Party Certification completed	ISO 9001 Third Party Certification completed	ISO 9001 Third Party Certification completed	ISO 9001 Third Party Certification completed	ISO 9001 Third Party Certification completed
<b>Flight Experience</b> (See Notes)	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 Margin Verification Process	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	3 consecutive successful flights of a common launch vehicle configuration from an evolved vehicle family developed by an LSC with a previously certified launch vehicle for Risk Category 2 or 3, 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 at 50% confidence) 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 from an evolved vehicle family developed by an LSC with a previously certified launch vehicle for Risk Category 3, instrumented to provide design verification and flight performance data  Post Flight Operations/ Anomaly Resolution Process  NASA Flight Margin Verification	3 consecutive successful flights of a common launch vehicle configuration from an evolved vehicle family developed by an LSC with a previously certified launch vehicle for Risk Category 3, instrumented to provide design verification & flight performance data  Post Flight Operations/ Anomaly Resolution Process  NASA Flight Margin Verification
<b>Design</b>	95% predicted design reliability at 80% confidence  Space Qualified Hardware (for application)  Documented ICD Process	95% predicted design reliability at 80% confidence	95% predicted design reliability at 80% confidence		95% predicted design reliability at 80% confidence	95% predicted design reliability at 80% confidence
<b>Mfg &amp; Ops</b>	NASA Audit	NASA Audit				NASA Audit
<b>System Safety</b>	FMEA for all safety critical components  Preliminary & Final Hazard Analysis	Demonstrated Compliance with applicable Range Safety Requirements				Demonstrated compliance with applicable Range Safety Requirements”

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<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	No Additional Certification Requirements	NASA Design Certification Review	Comprehensive Acceptance Test results
<b>Quality Systems/Process</b>	NASA Audit	NASA Audit				NASA Audit
<b>Flight Hardware &amp; Software Qualification</b>	Qualification Testing completed	Series of NASA Engineering Review Boards on vehicle subsystems				Series of NASA Engineering Review Boards on vehicle subsystems
<b>LV Analysis</b>	None	None				Prudent NASA IV&V
<b>Risk Assessment</b>	None	None				Full vehicle fishbone
<b>Launch Complex</b>	None	NASA Engineering Review Board				NASA Engineering Review Board

- NOTES:**
- 1) 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.
  - 2) Major launch vehicle upgrades may require additional NASA technical penetration.
  - 3) Full NASA engineering insight per NPD 8610.23 applied to all risk categories, except for secondary payloads.

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