



AIAA Joint Propulsion Conference

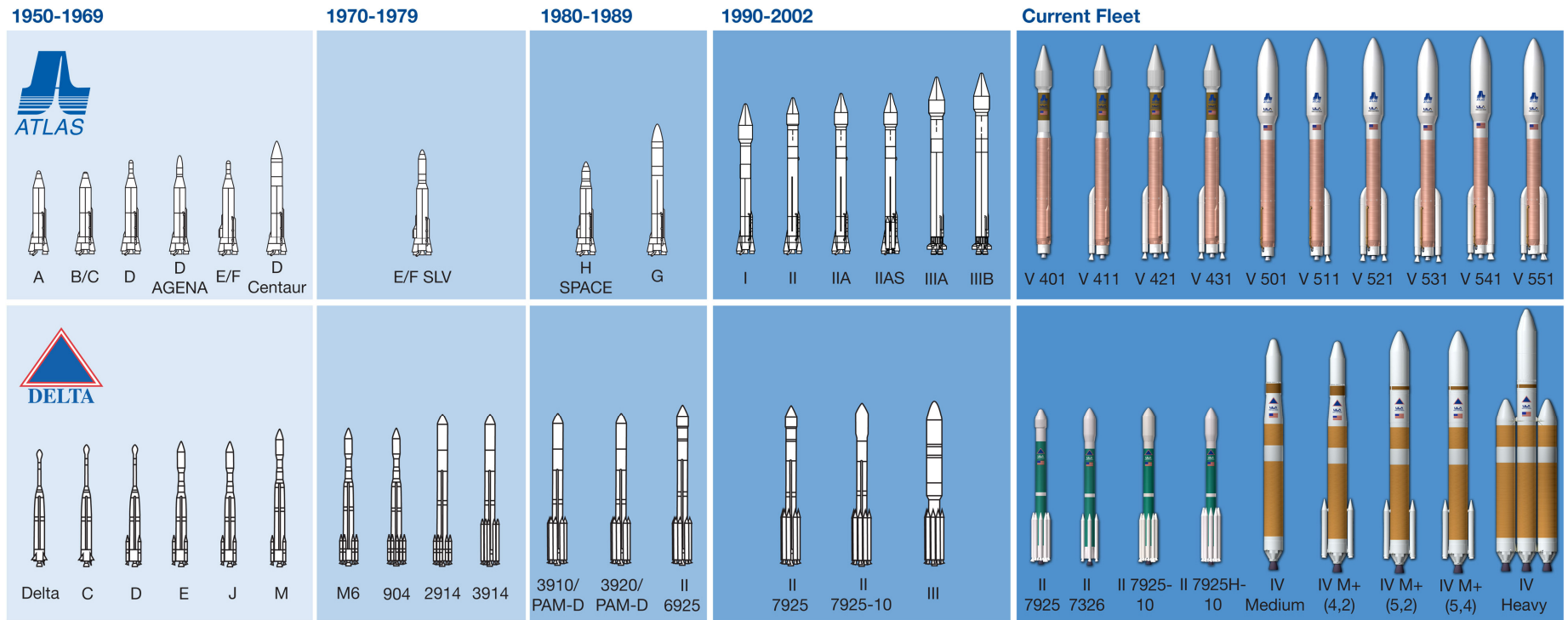
Booster Innovation Panel

**Jim Sponnick
United Launch Alliance, LLC
3 August 2009**



EELV: Innovation and Sustained Reliability Through Evolution

- ❑ Incremental Evolution, Demonstrated Reliability, Flight Experience
- ❑ Strong Systems Engineering Heritage of Disciplined Innovation

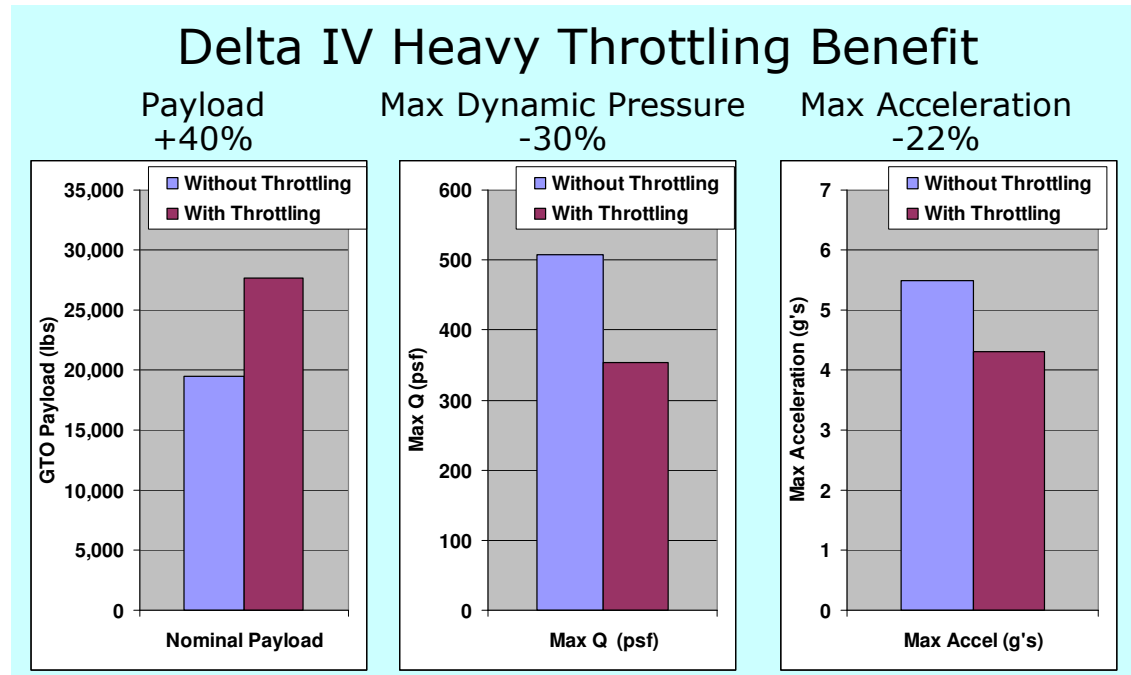
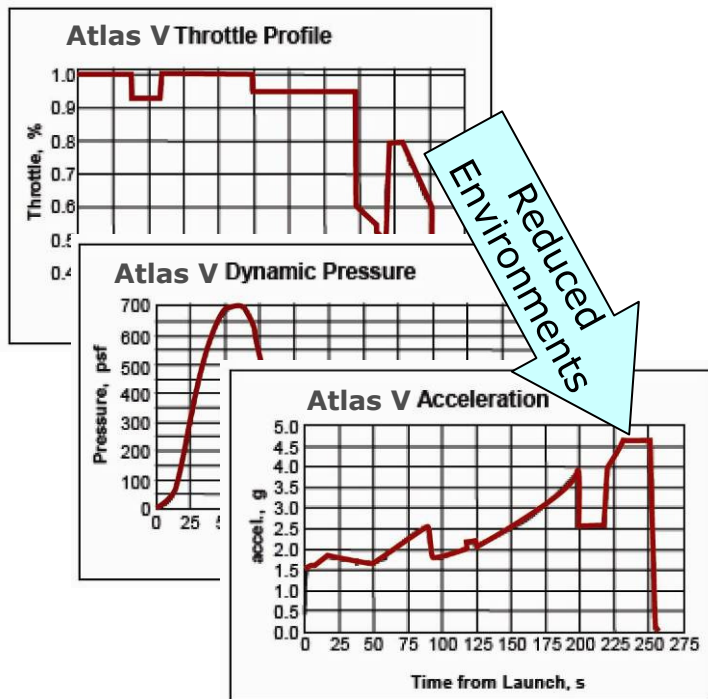


Evolution Over 1,300 Launches Provides the Reliability & Agility Necessary to Serve Today's & Tomorrow's Diverse Launch Needs



Highly Capable Boosters Enabled by Flexible Booster Propulsion

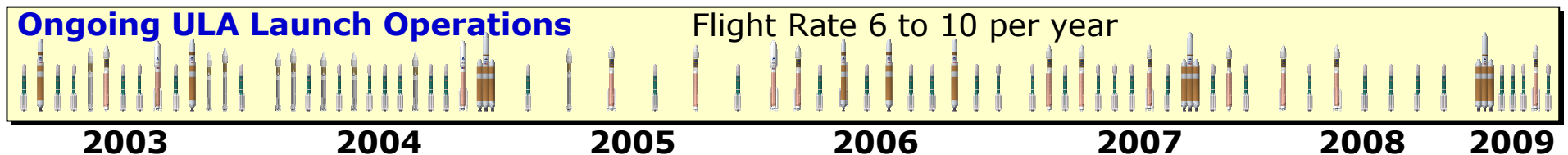
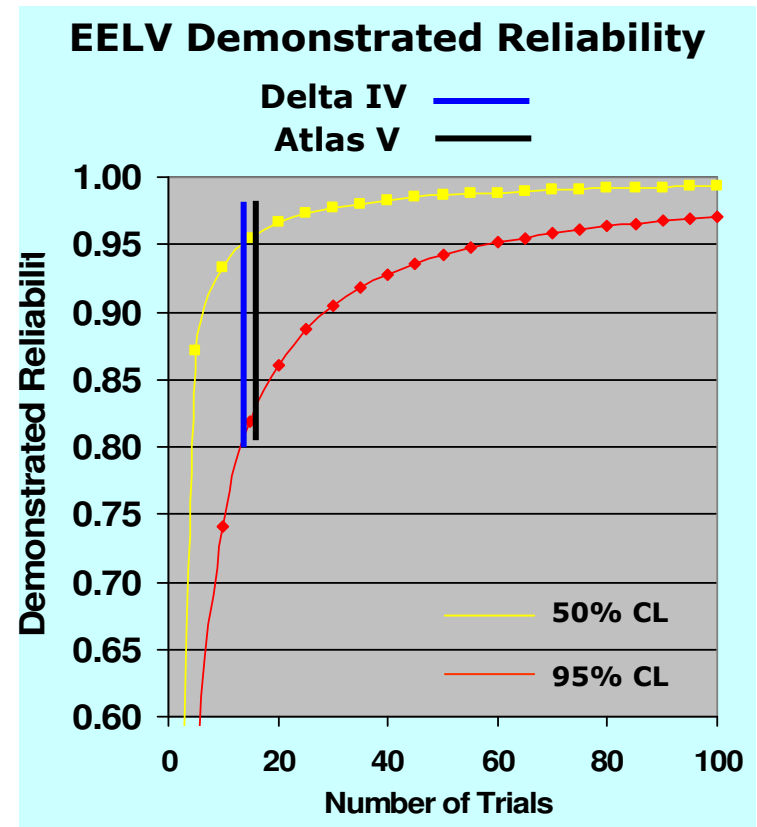
- Key Operational Features Enable Flexible Mission Designs
 - Access to Full Range of Orbit Inclinations via Launch Pads on Both Coasts
 - Engine Health Monitoring & Autonomous Launch Abort Capability
 - Flexible Mission Designs to Meet Diverse Mission Needs





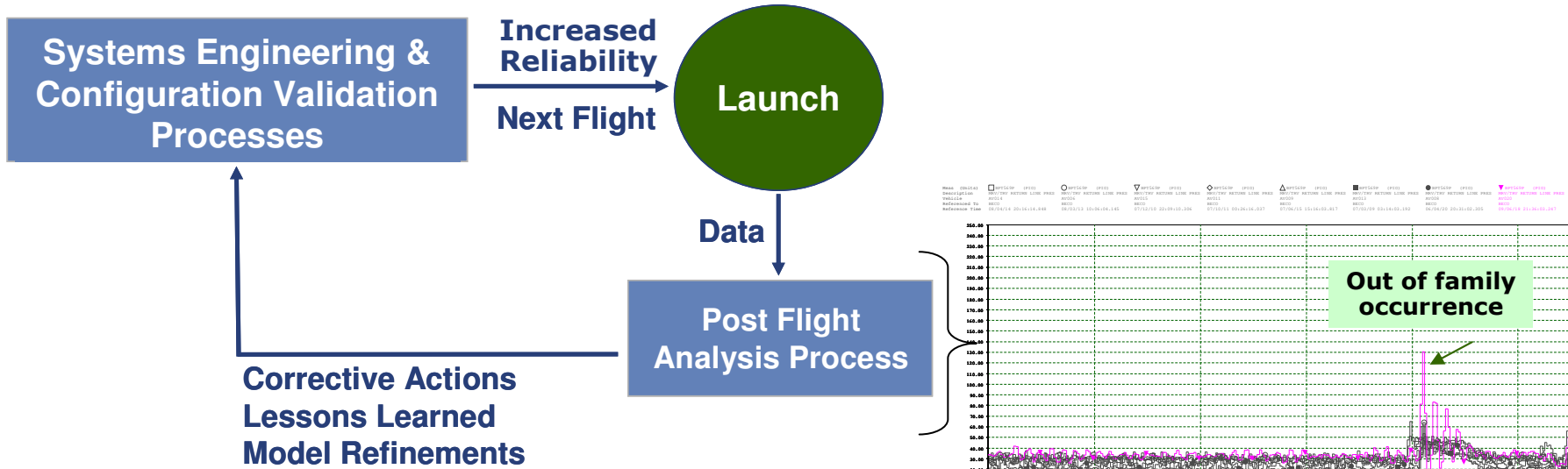
EELV: Built on 100-Years of Proven Reliability

- ❑ 100% Mission Success Through 26 Missions
- ❑ Rigorous Systems Engineering and Continuous Improvement Processes
- ❑ Independent Mission Assurance Teams





Rigorous Data Review and Collection Directly Applies to Reliability



- ❑ Recurring flight data review process enables immediate flight learning and system improvement

***Lessons Learned from Each Flight:
People, Process, Product***



Enhancing Capabilities Built on Active Flight Learning

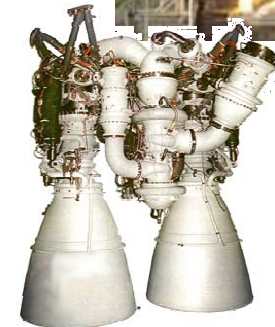
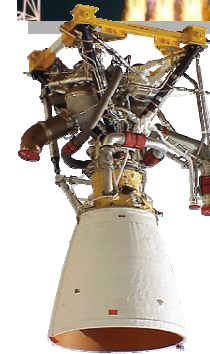
□ Low Risk Booster Propulsion System Improvements

–RD-180

- Reliability Enhancements for Improved Operating Margins
- Emergency Detection System Enhancements to Provide Improved Engine Health Monitoring

–RS-68

- RS-68A Development for Heavy Upgrade Program
- Delta IV Fleet Standardization



Delta IV Heavy Upgrade Program

- ❑ Program Objectives
 - Enhanced Delta IV HLV Mass-to-Orbit
 - Initial Launch Capability CY11
- ❑ Approach: Upgrade the RS-68
 - New Version Designated RS-68A
 - Additional Power Level (6% increase)
 - 5-10 sec Isp Increase
 - Upgrades Main Injector & Turbopump
- ❑ Status
 - Development Engine Testing Began 9/08
 - Accumulated >2350 Seconds of Run Time
 - 17 Hot Fire Tests Completed
 - Demonstrated Enhanced Power Level
 - Demonstrated Improved Isp
 - Certification Engine Testing Completed by 1QCY10

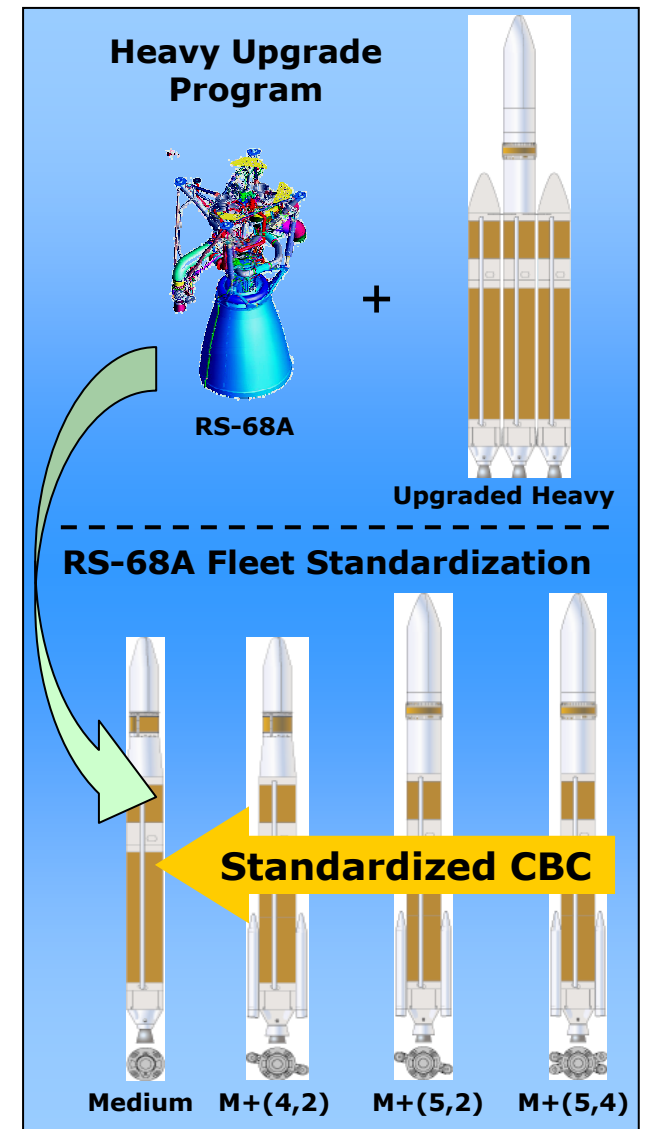




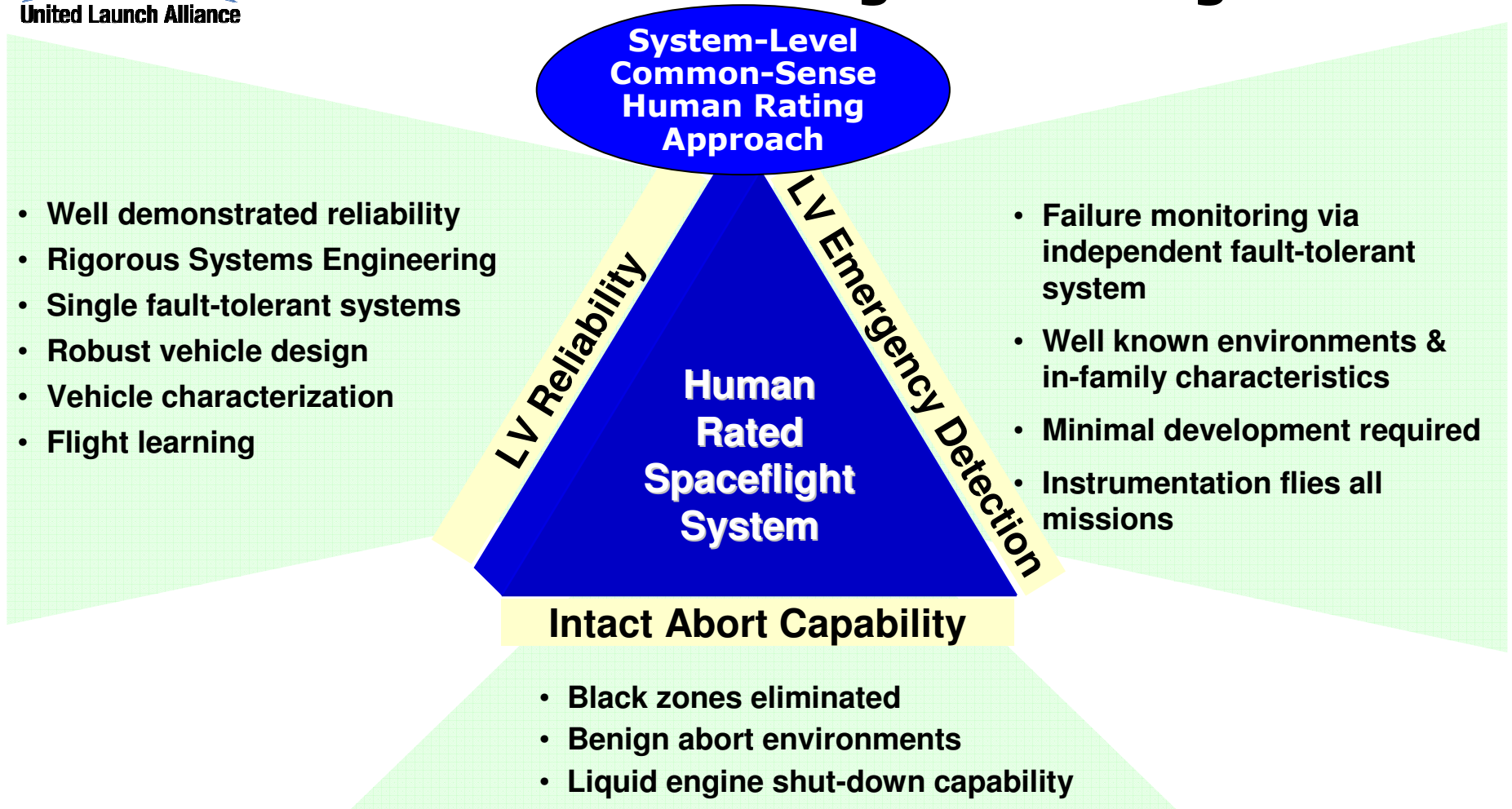
Fleet Standardization Program Leverages RS-68 Evolution

- ❑ Integrates RS-68A with Medium & Medium+ Configurations as Early as CY2014
- ❑ Implements a Standardized Booster Based on Existing M+(5,4) Booster
 - No New Hardware Development
 - Improved Launch Manifest Flexibility
 - Improved Operational Agility
 - Reconfigurable at Launch Site

***Same Booster Built Every Time =
Lower Costs, Improved Reliability,
More Flexibility***



Future EELV Capabilities Benefit from Extensive Flight Learning



Straight-Forward Expansion of Systems Flying Many Times per Year

Summary

- ❑ Atlas V & Delta IV Evolved over 100 Years & 1300 Launches
- ❑ Active Flight Learning Produces System Knowledge & Reliability for Evolution & Innovation
- ❑ Booster Propulsion System Improvements are Currently Underway
- ❑ Future EELV Capabilities Benefit from Extensive Flight Learning



Innovatively Applying Technologies & Flight Learning to Evolve More Reliable, Capable, and Flexible Missions