



Briefing to the Review of U.S. Human Space Flight Plans Committee

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A Safe, Affordable, and Sustainable Launch Approach

- ❑ Joint utilization of flight-proven systems by NASA, DoD, and commercial provides a safe, affordable, and sustainable approach to exploration
 - Leverages existing investments and reduces annual standalone lien
- ❑ Delta IV Heavy provides safe, low cost capability to launch Orion by 2014 with greater than 20% performance margin
- ❑ Atlas V provides commercial crew to ISS by 2013
- ❑ Further evolution of EELV systems and components provides options and flexibility for exploration to the Moon and beyond
- ❑ Options available for manufacturing, integration and launch operations to address workforce transition and unique requirements

ULA is prepared to support the thorough evaluation of options with the Committee

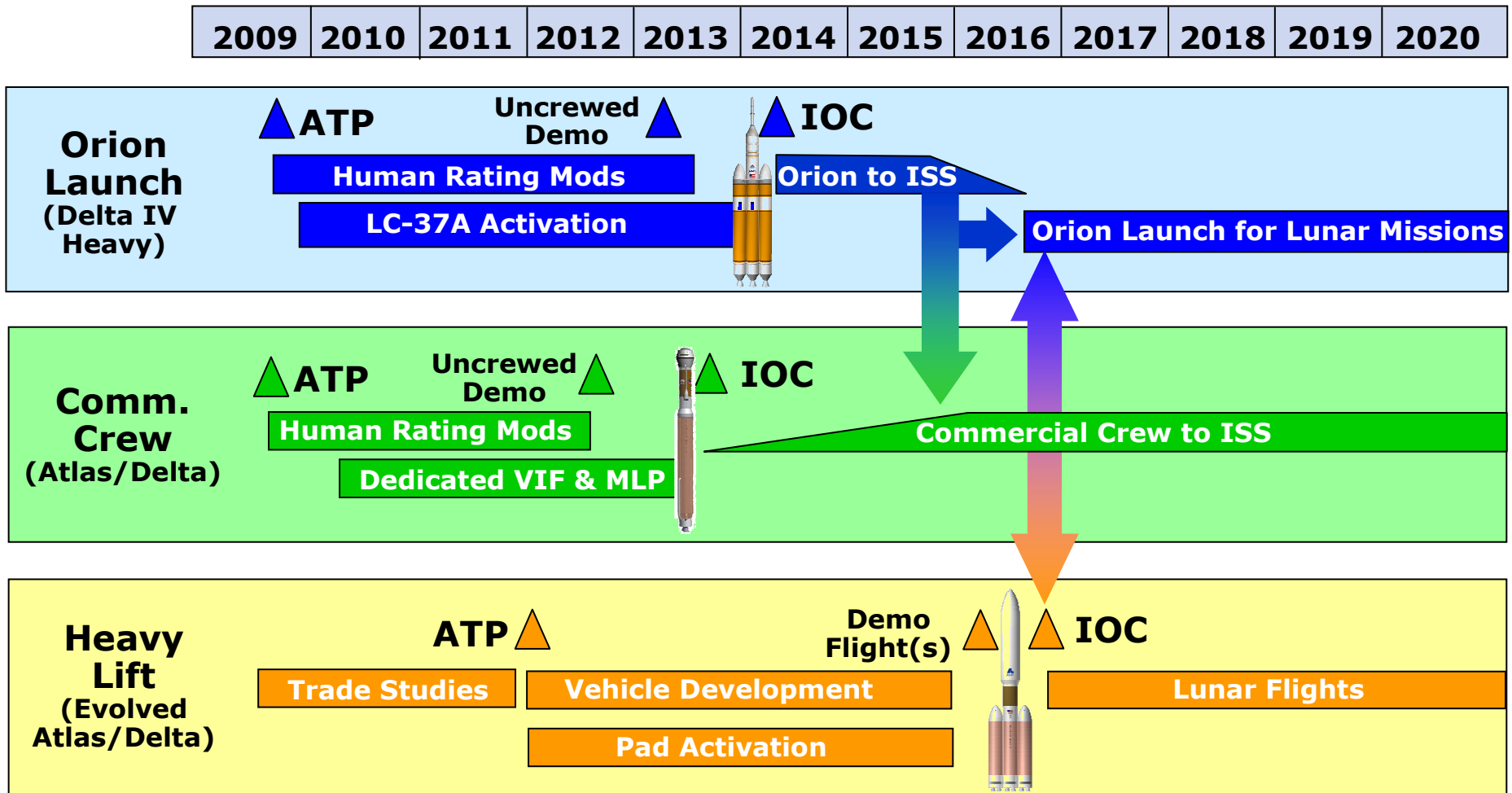
ULA Operates the Nation's Expendable Launch Fleet



- ❑ Proven Government-Industry Partnership
 - More than 50 years and 1,300 launches
 - Experienced workforce and proven management systems
- ❑ Recent, successful development experience
 - Delta IV and Atlas V developed within the last decade
- ❑ Fully operational state-of-the-art launch systems
 - ULA's stewardship has delivered 100% mission success over 24 missions

ULA is the Nation's center of expertise for expendable launch systems

Building Blocks for Exploration

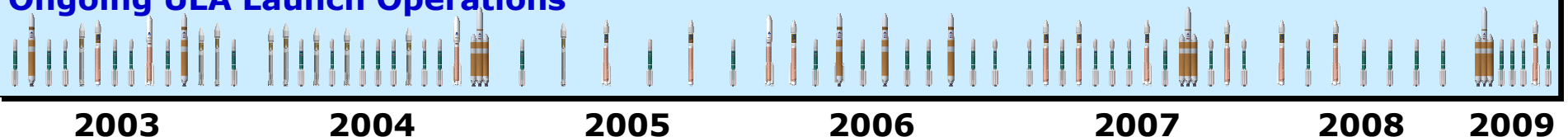




ULA Experience with Human Rating

- ❑ Involved with NASA and commercial human rating launch studies over the past 8 years
 - Orbital Space Plane, NASA Exploration Launch Studies, NASA CE&R studies, NASA ESAS studies, Bigelow, NASA COTS, FAA studies
 - Input to NASA Human Rating Requirements (8705.2A and 2B)
- ❑ Flight experience key to human rating
 - Detailed understanding of system behavior and environments
 - System margins and risks
 - Precise abort criteria for Emergency Detection System (EDS)
 - Non-crewed missions retire risk prior to first crewed mission

Ongoing ULA Launch Operations



Human rating is the interaction between requirements and in-depth systems knowledge best gained with Flight Experience

Delta IV Heavy Launch of Orion

- ❑ Delta IV Heavy has launched 2 operational missions with 100% mission success
- ❑ Human rating Delta IV Heavy is understood
 - Addition of an Emergency Detection System (EDS)
 - Separate launch pad with crew ingress/egress
 - Additional reliability improvements options identified
- ❑ Greater than 20% performance margin for both ISS and lunar missions
 - Trajectories shaped to eliminate black zones
 - DoD planned propulsion improvements benefit NASA
- ❑ Benign launch and abort environments reduce risks for Orion
- ❑ Affordable and credible costs
 - Non-recurring (\$800M pad, \$500M human rating)
 - Recurring (\$300M/launch)
- ❑ Available within 4.5 years from start



Minimum change to existing, flight-proven system

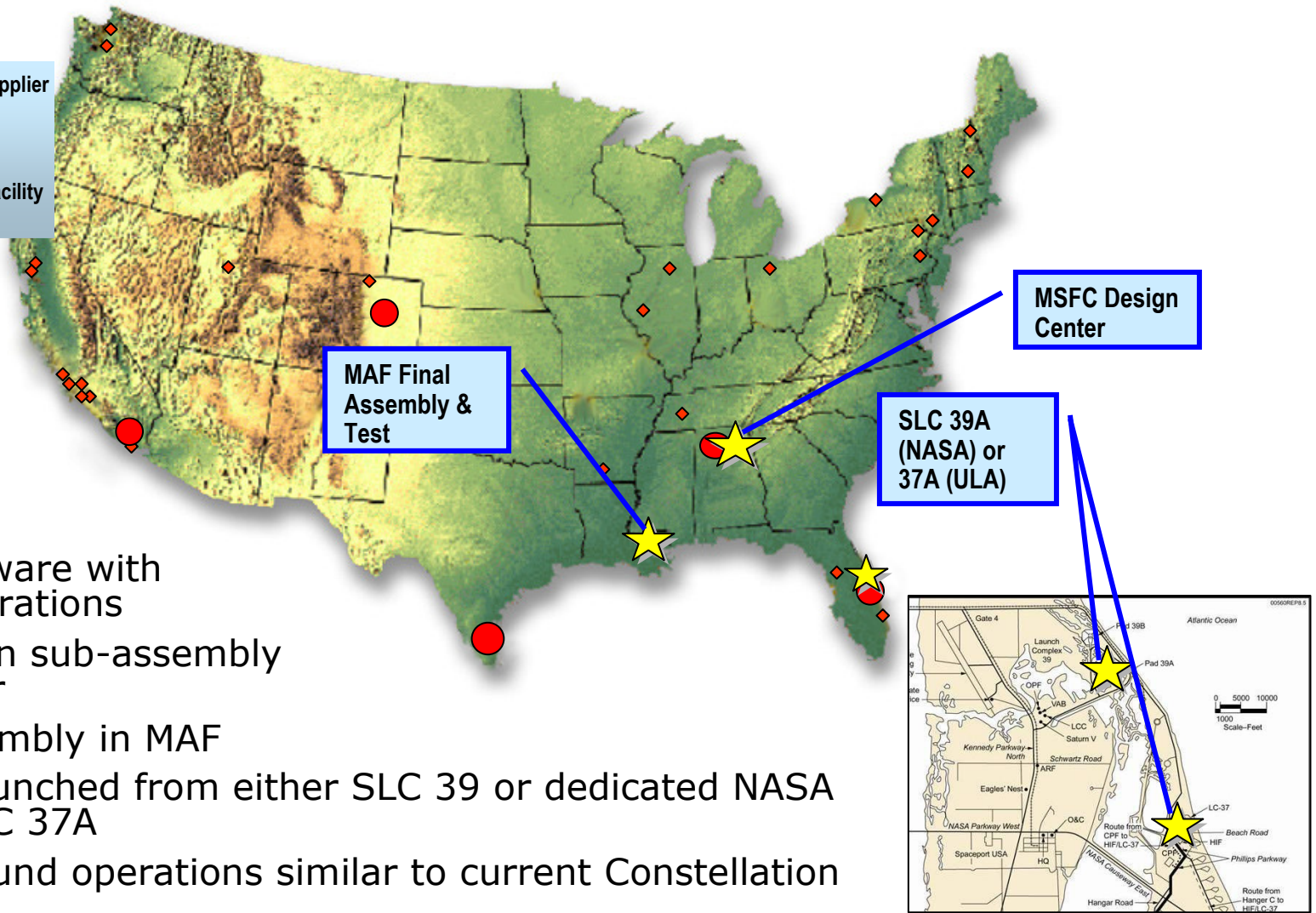
Concepts of Operations

- ❑ Multiple approaches to manufacturing, integration and launch operations exist
 - Options range from commercial service to traditional NASA program
 - Optimum con ops depends on balance of: cost, workforce, and desired levels of synergy/independence
- ❑ Example 1: ULA Launch Services approach
 - Addition of dedicated NASA pad (SLC 37A)
 - Modeled on current successful NASA approach to science missions
 - Used as basis of cost estimates
- ❑ Example 2: NASA Integrator/Operator approach
 - (ULA) Common supply base; fabrication and sub-assembly test in Decatur
 - (ULA) Design, manufacturing and operations support
 - (NASA) MSFC design and integration of human rating accommodations
 - (NASA) Final assembly in MAF
 - (NASA) Launch operations at VAB/LC-39 or dedicated NASA LC-37A

Conops flexibility can balance unique customer needs

NASA Integrator/Operator Approach

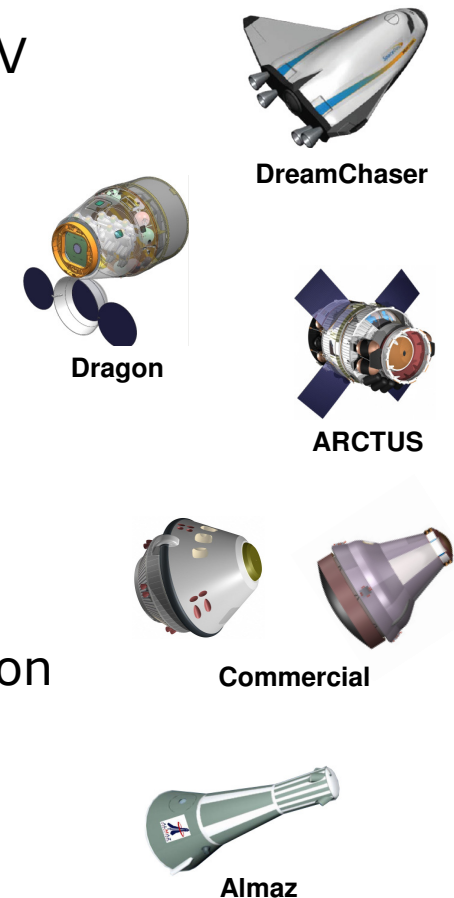
- ◆ Existing ULA Major Supplier
- Existing ULA Facility
- ★ Potential NASA/ULA facility



- ULA hardware with NASA operations
- Fabrication sub-assembly in Decatur
- Final assembly in MAF
- Vehicle launched from either SLC 39 or dedicated NASA pad at SLC 37A
- NASA ground operations similar to current Constellation conops

EELV Launch of a Commercial Human Spacecraft

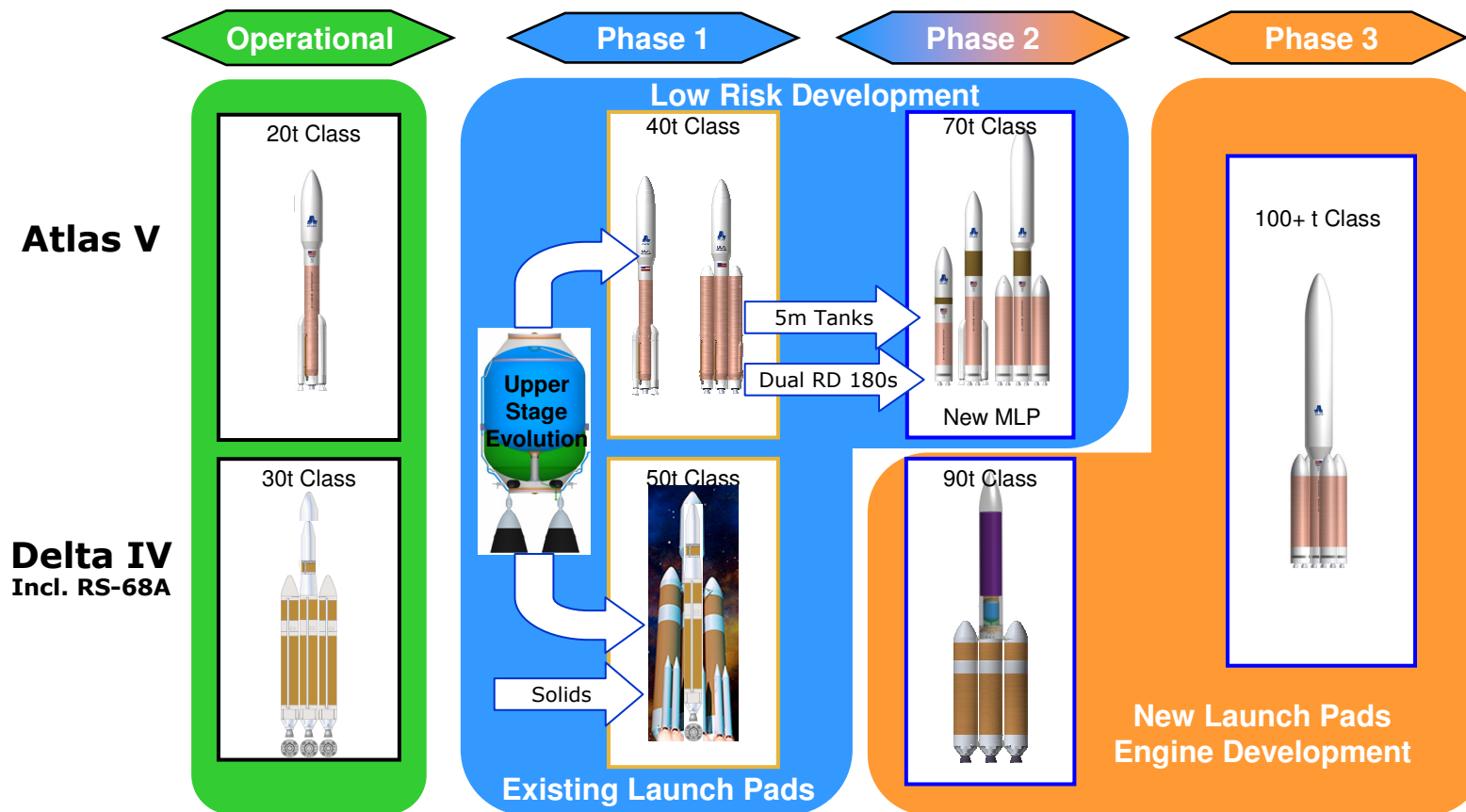
- ❑ Human rating impacts to flight-proven existing EELV are understood
 - Addition of an Emergency Detection System (EDS)
 - Separate VIF/MLP or pad with crew ingress/egress
- ❑ Low non-recurring (\$400M) and recurring costs (\$130M/launch)
- ❑ Human rated Atlas V offered by numerous Prime Contractors during NASA COTS competitions
 - Ongoing integration of entrepreneurial and traditional prime designed commercial crew vehicles
- ❑ Non-crewed missions provide vehicle characterization and flight data prior to first crewed mission
- ❑ EELV is not the critical path to launch a commercial crew transfer vehicle
 - Launch within 4 years of start



Flight-proven EELV Provides Low-Risk Launch Solution To Launch Commercial Crew Vehicles to LEO

EELV Evolution Enables Flexible Mission Architectures

- EELV evolution plans developed for NASA studies during 2003/4
 - Low risk developments achieve 70t Class to LEO
 - With new propulsion and launch site >100t payloads



Summary

- ❑ We believe Human Space Flight on EELV could:
 - Enhance safety
 - Lower costs
 - Accelerate initial capabilities to support utilization of ISS
 - Enable resources to be applied to supporting missions to the Moon and other destinations beyond Low-Earth orbit
 - Stimulate commercial space flight capability
 - Provide options to address workforce transition and unique requirements
- ❑ We are prepared to support the committee and NASA with the detail data for the evaluations

Open and thorough evaluation of options will lead to the best solution for the Nation