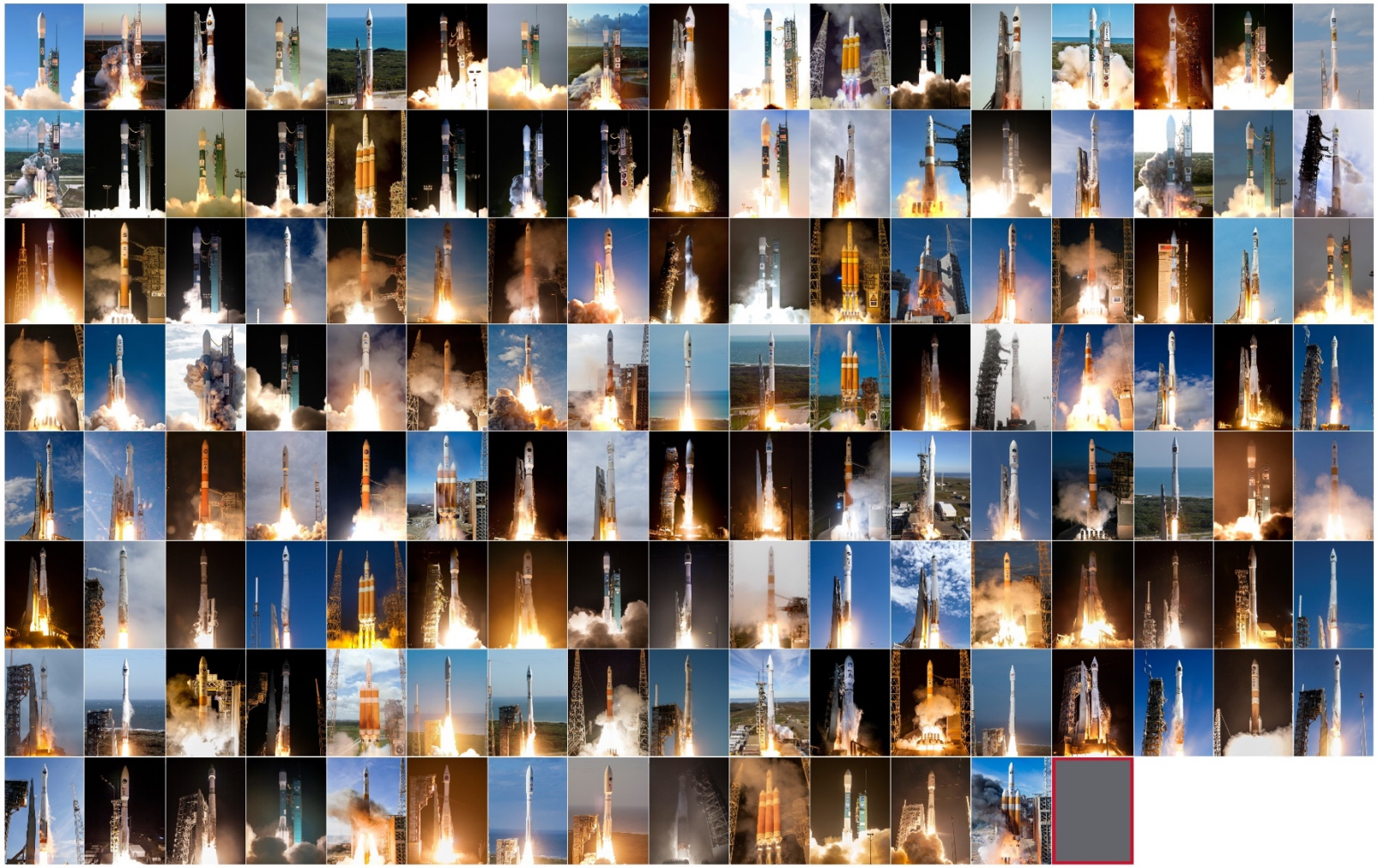
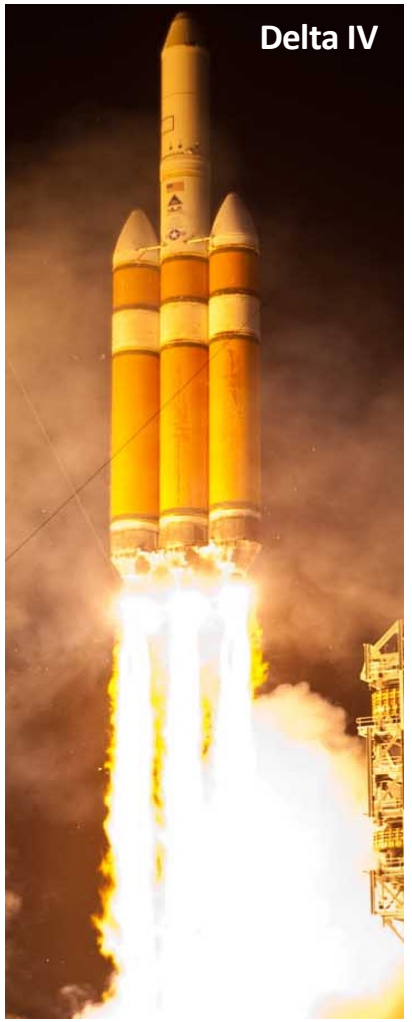
VULCAN CENTAUR LAUNCH SYSTEM

Hardware of the Future

02.12.2019

MISSION SUCCESS…132 AND COUNTING!



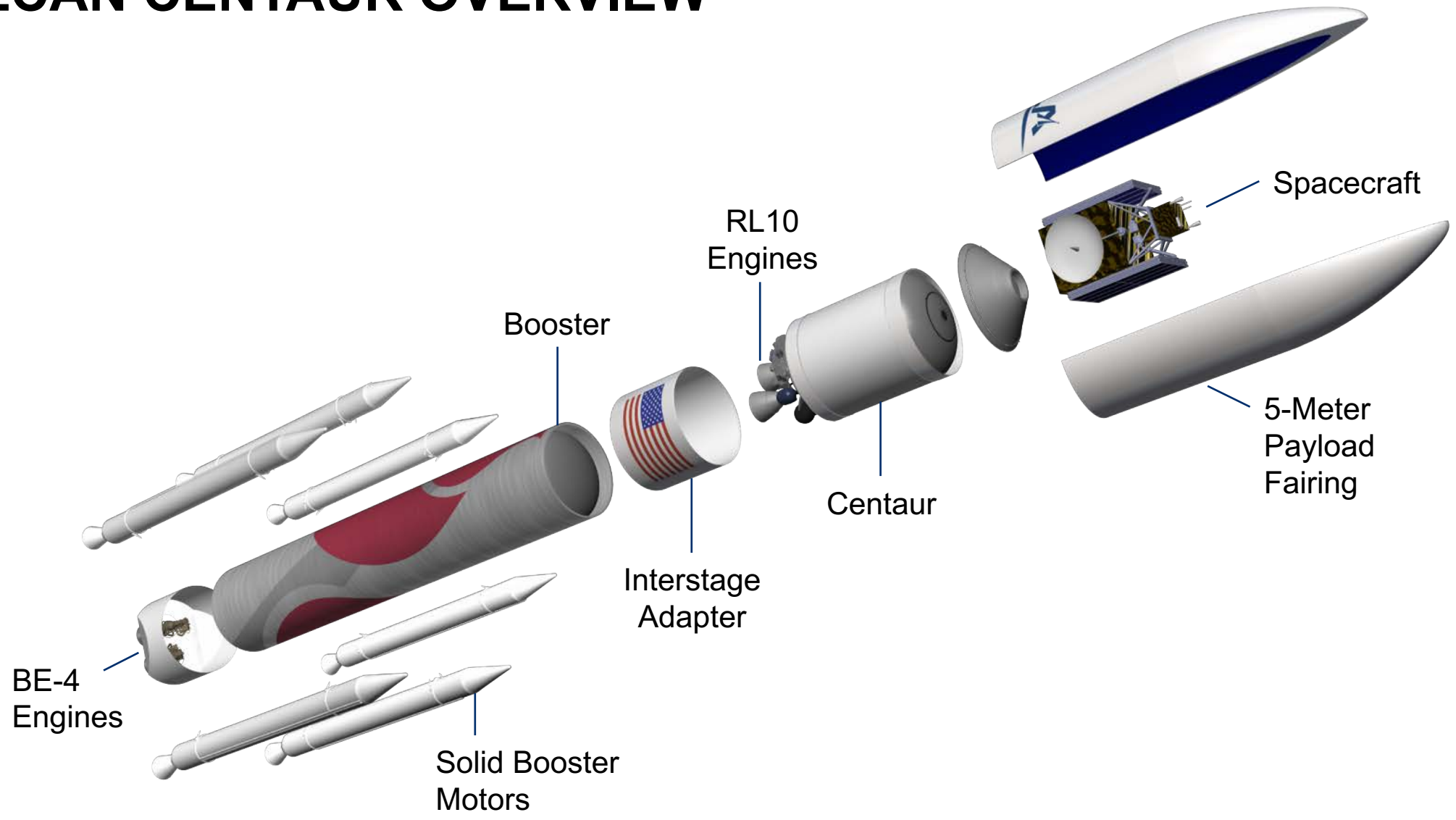


ULA™

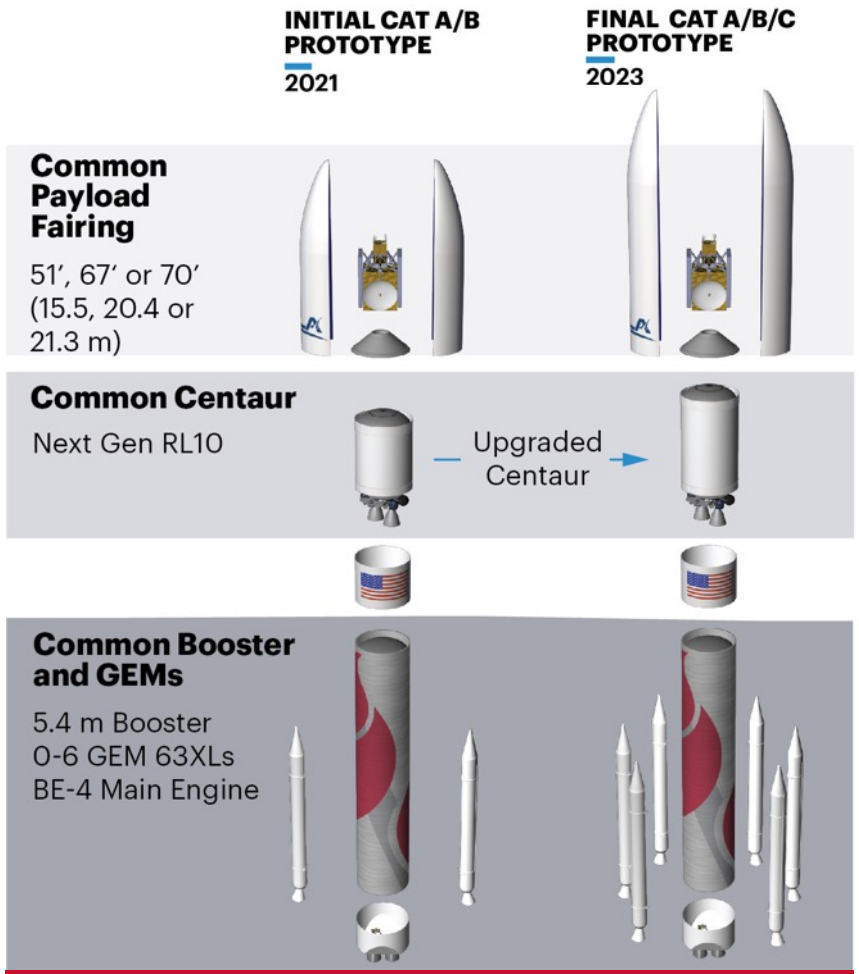
DEVELOPING A NEXT GENERATION ROCKET

VULCAN CENTAUR

VULCAN CENTAUR OVERVIEW



VULCAN CENTAUR LAUNCH SYSTEM



Vulcan Centaur:
Higher Performance, Lower Cost

Major Investments in Factory Automation

1.6M square-foot Factory in Alabama

State-of-the-Art Manufacturing

State-of-the-Art Test Facilities

Upgraded, Flexible Launch Pads

SLC-41, CCAFS – Florida

SLC-3, VAFB – California

Vertical Payload Integration

Upgraded Infrastructure

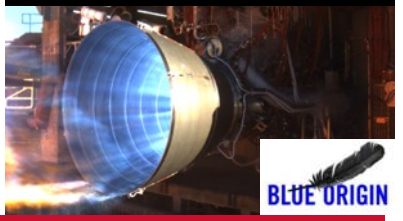
U.S.-Produced Components

Composites

RL10 Upper Stage Engine

GEM 63XL Solid Rocket Motors

BE-4 Booster Engines



ULA Know-How:
132 Mission Successes

MASSIVE CAPITAL IMPROVEMENTS COMPLETE

UP TO 20 VULCAN VEHICLES PER YEAR

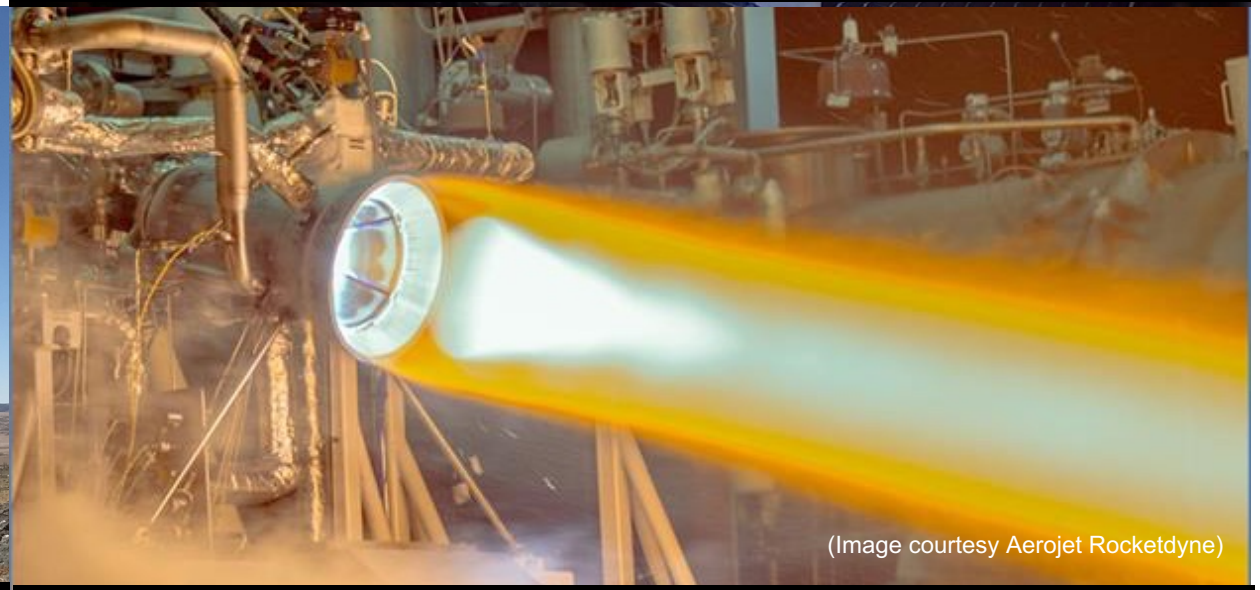
- Universal Weld System (UWS)

Circumferential Friction Stir Welding (CFSW)

ADVANCED ENGINE & MOTOR DEVELOPMENT

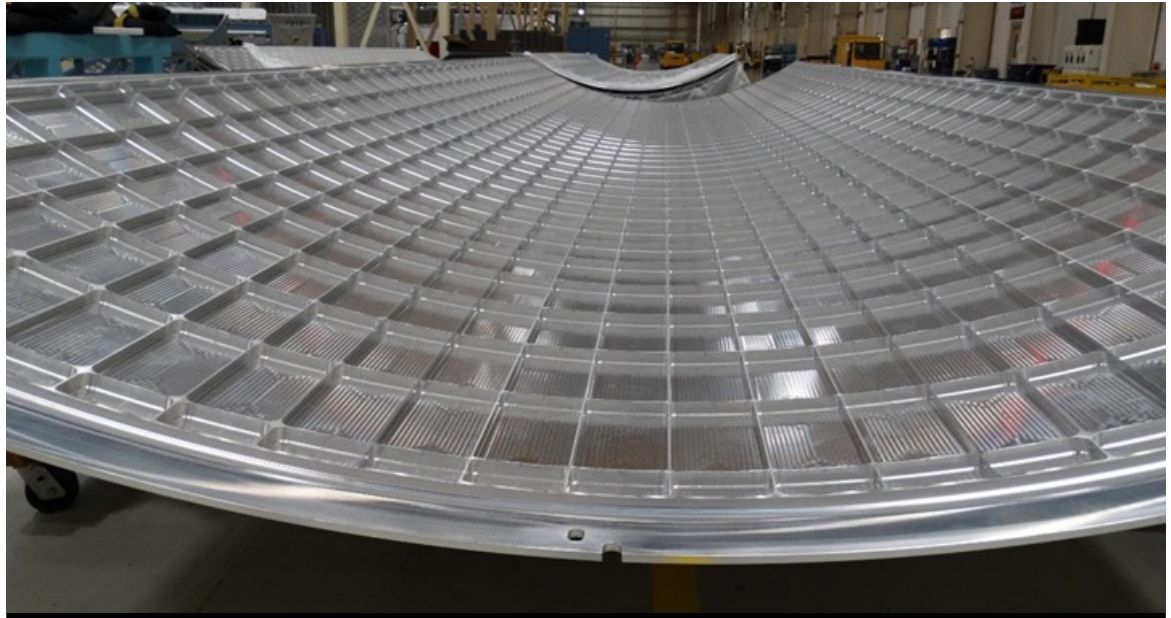
Hotfire Test of BE-4 Engine

Hot Fire Testing of GEM 63 SRB



Hot Fire Test of Additively Manufactured RL10CX Combustion Chamber

INNOVATIVE DESIGN AND MANUFACTURING MORE CAPABLE AND COST EFFICIENT HARDWARE

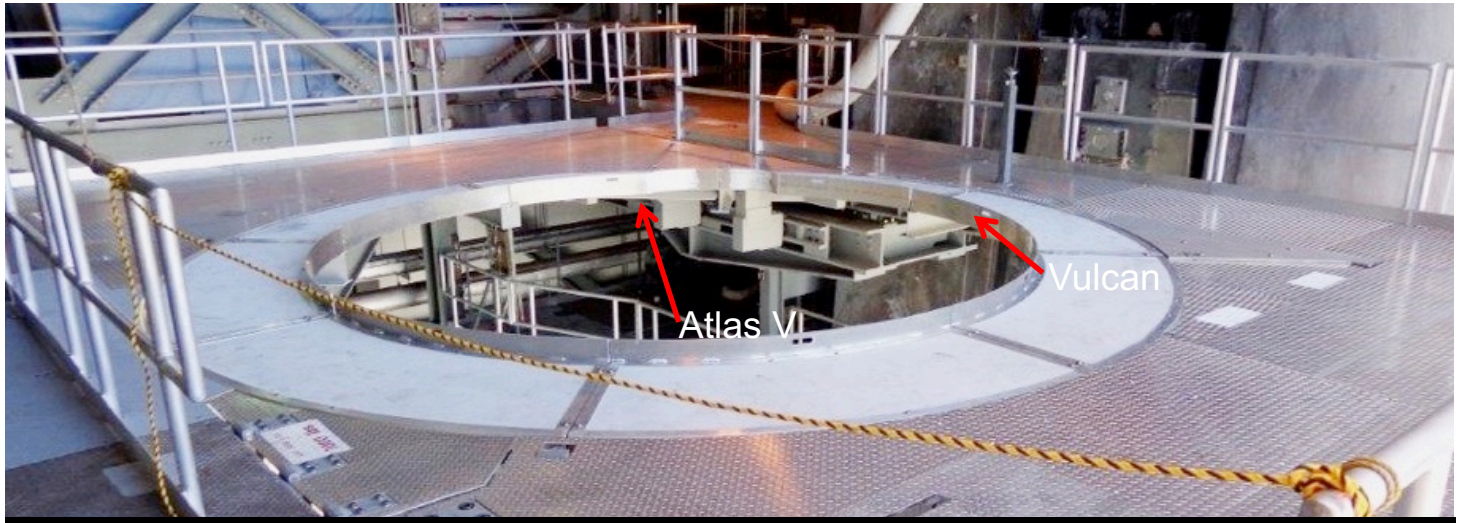


Booster Tank Panel Orthogrid Pattern

(Image courtesy RUAG Group)

First Made-In-America Out of Autoclave Composite Payload Fairing

PAD MODIFICATIONS UNDERWAY SUPPORTING FIRST VULCAN FLIGHT IN 2021

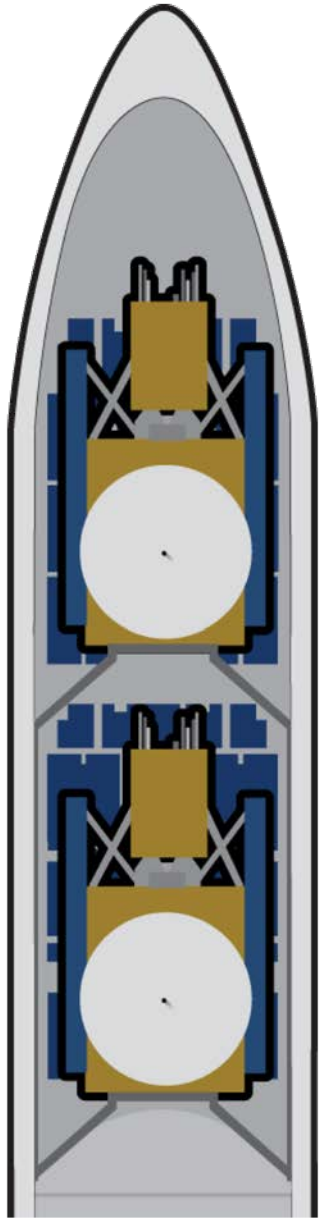


Retrofitted Launch Facilities

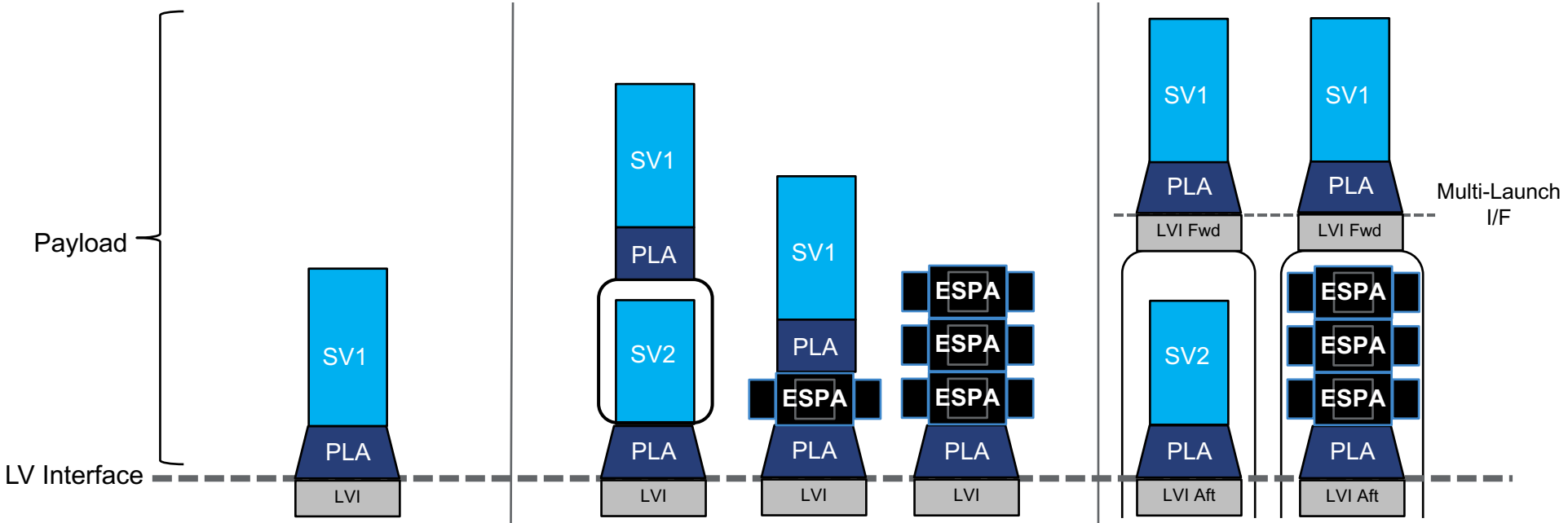
Vertical Payload Integration; Both Coasts, All Vehicles

MULTI-LAUNCH CAPABILITIES

- **Berth-Agnostic Approach**
  - Conditioned Upper and Lower Berth
  - Individual Instrument Purges
  - Dual Re-Rad Capability
  - Environments In Line w/ Single Launch Configuration
  - Individual Payload Users Room
  - Manifest Flexibility



POTENTIAL PAYLOAD CONFIGURATIONS



Single Payload Configuration

Multi-Manifest Payload Configuration

Multi-Launch Canister Payload Configuration

Rideshare

ABC Payload
(Aft End Centaur)

Not to Scale

SUMMARY

Vulcan Centaur Provides the World's Best Value for Launch Services

- Innovation Hardware Solutions Provide Affordable Space Access
- Reliable Launch of Critical Customer Payloads

Leverages Atlas and Delta Experience and Mission Success

- Retains Flight Proven Systems for Optimized Orbital Insertion Accuracy
- Increased Lift Capability and Rideshare Opportunities
- Maintains Unparalleled Mission Success Record

On track for 2021 First Launch!

Vulcan Centaur is the Future of Affordable, Flexible, and Reliable Space Flight