CubeSat Express
The Future of Rideshare Launch

April 2017
CubeSat Express Vision

- CubeSat Rideshare on Every Atlas (Single Engine Centaur) and Vulcan Upper Stages
- Maximizing Launch Vehicle Capability and Mass to Orbit
- Providing On-Schedule, Reliable, Low Cost Access to Space

Changing the Paradigm for CubeSat Launch
# Aft Bulkhead Carrier (ABC)

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[Diagram of Atlas V Centaur with Aft Bulkhead Carrier (ABC) and ABC Payload Volume]
CubeSat Delivery System Evolution

ABC with NPSCuL
- Composite plate design
- 8 P-POD / 24U CubeSat
- Flight-proven; flown 4 times

ABC with NLAS
- Composite plate design
- 12U CubeSat capacity
- Flight Proven: Worldview-4/ENTERPRISE
- NASA MarCO configuration

CubeSat Express / NLAS
- Aluminum plate and strut design
- 4-6U / 24U CubeSat capacity
- 2017 Initial Launch Capability

- NPSCuL: Naval Post-Graduate (NPS) School CubeSat Launcher
- NLAS: Nanosatellite Launch Adapter System
CubeSat Express Operation

- (Revenue-generating)
- (Free STEM)
- 21U
- 3U

- Standard Interface
  Streamlined/in Flow Integration
  Predictable Customer CONOPS

24U capacity per Launch

- Tyvak APIC Marketing, Selection & Integration

- Four 6U NLAS Dispensers
  Reference architecture
In Work Development Update

- Final Design for 24U CubeSat Express,  
  - 4x 6U Express Configuration
- Implementing Class Analysis for Loads and Thermal Environments
- Developing CONOP for 12U Dispensers
- Preparing for Centaur Park-Orbit Separation Study
  - Optimize CubeSat Orbit and Useful Life
  - Reduce Risk in Separation Events

Continuing to Enhance Capabilities
CubeSat Express Near Term Flight Option
Performance Assessment

Vehicle Configuration Baseline Definition

Mission Requirements
(Primary SV Mass, ESPA Configuration, Mission Orbits, OCU Circuits Req’d, ILC)

- Performance Assessment (Baseline 235 lbs as part of Centaur Vehicle)
- Can Performance be achieved without an SRB, just for CubeSat Express?
  - Yes
  - No → CubeSat’s Not Flown
- Are sufficient Ordnance Circuits available with Primary SV (~13% use more than 4 OCU Circuits)
  - Yes
  - No
- Identify availability of 8 or 4 CubeSat Express Door Opening Circuits
  - Available
- Orbit Assessment – Review option of a non-optimal Park Orbit (425km x 1000 km) to extend CubeSat Useful Life

Coordinate CubeSat Flights:
Orbits (Park or Final), Available Door Openings, & ILC
Anatomy of a CubeSat Mission

- 10 cm³: Volume of a CubeSat
- 1.3 kg: Mass of a CubeSat
- 55: Number of CubeSats launched by ULA to date