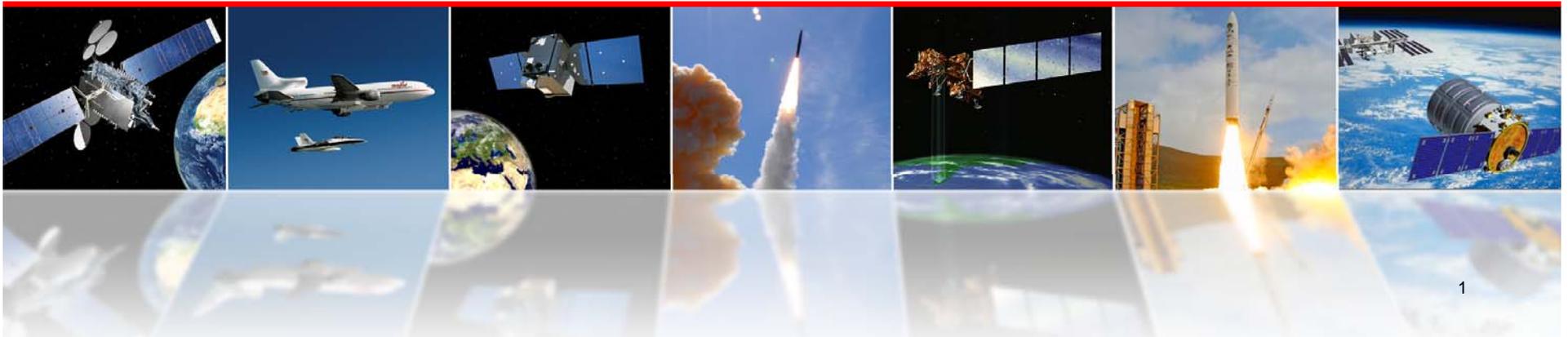




17th Annual FAA Commercial Space Transportation Conference

Orbital's Commercial Cargo Program

Bill Claybaugh
Senior Director, Human Spaceflight Systems
February 5th, 2014

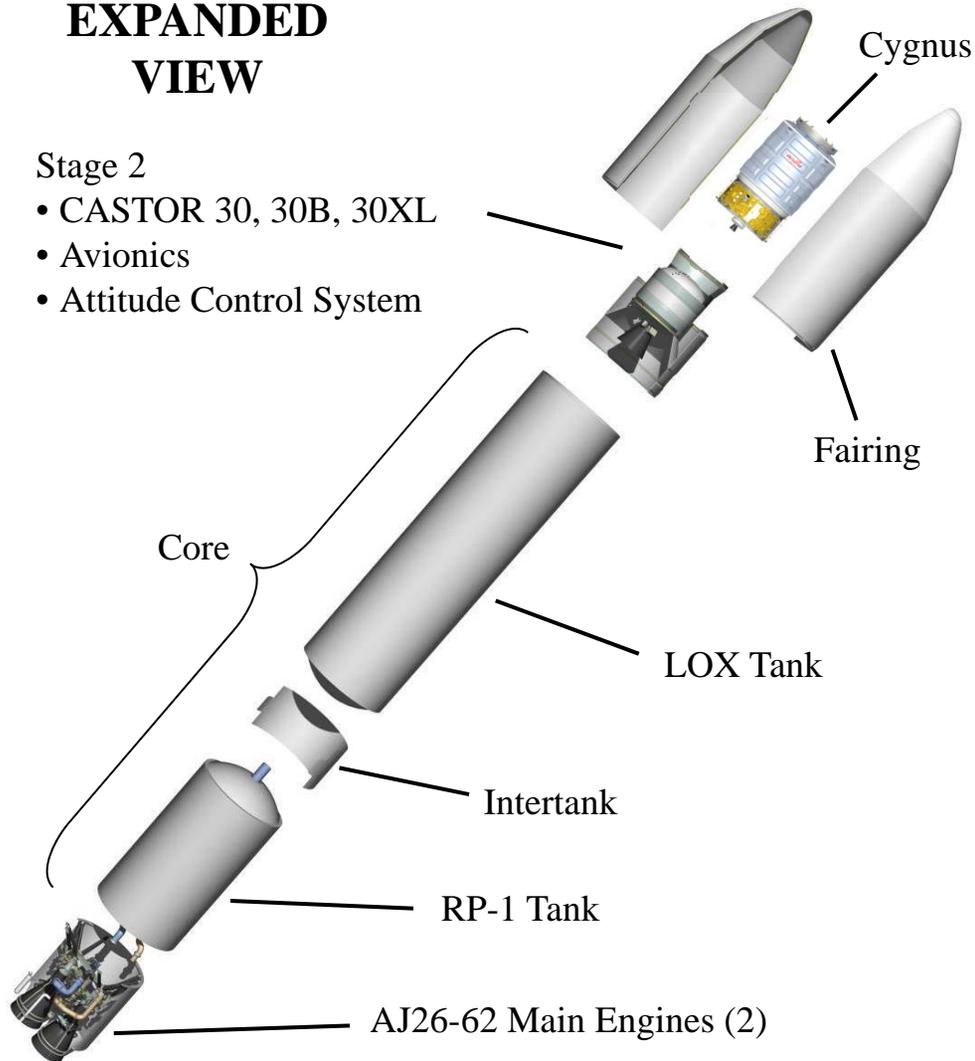


Antares Mission Manifest

EXPANDED VIEW

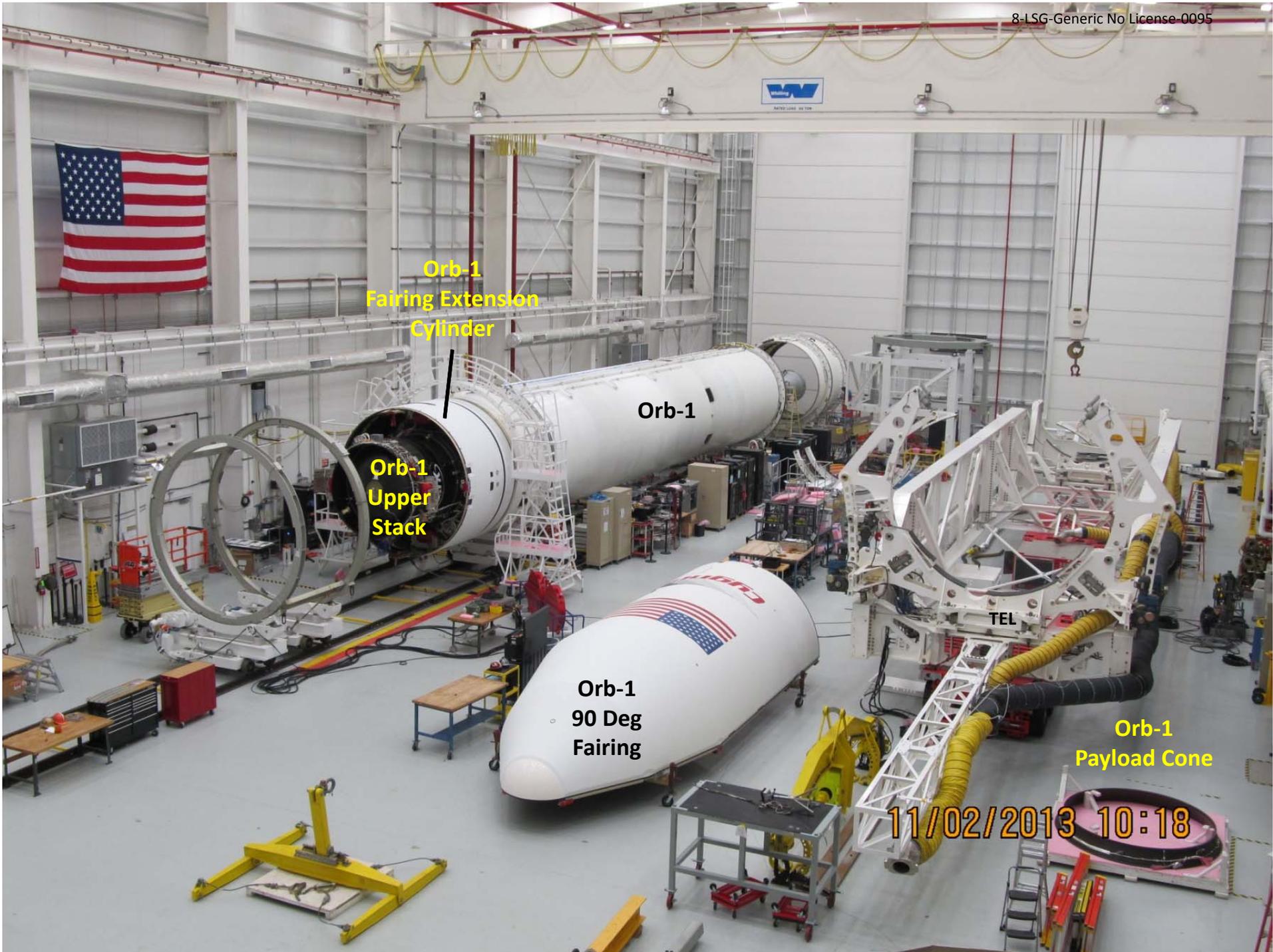
Stage 2

- CASTOR 30, 30B, 30XL
- Avionics
- Attitude Control System



Mission	Configuration	Status
COTS Test Flight (A-ONE)	110	Launched 4/21/13
COTS-Demo (Orb-D1)	110	Launched 9/18/13
Orb-1	120	Launched 1/9/14
Orb-2	120	5/1/14
Orb-3	130	
Orb-4	130	
Orb-5	130	
Orb-6	130	
Orb-7	130	
Orb-8	130	
Baseline S1 w/ CASTOR 30	110	
Baseline S1 w/ CASTOR 30B	120	
Baseline S1 w/ CASTOR 30XL	130	

Orbital Sciences Corporation
Orion/Cygnus COTS Demo Mission
September 18 - October 23, 2013



Orb-1
Fairing Extension
Cylinder

Orb-1

Orb-1
Upper
Stack

Orb-1
90 Deg
Fairing

TEL

Orb-1
Payload Cone

11/02/2013 10:18





12/07/2013 08:12



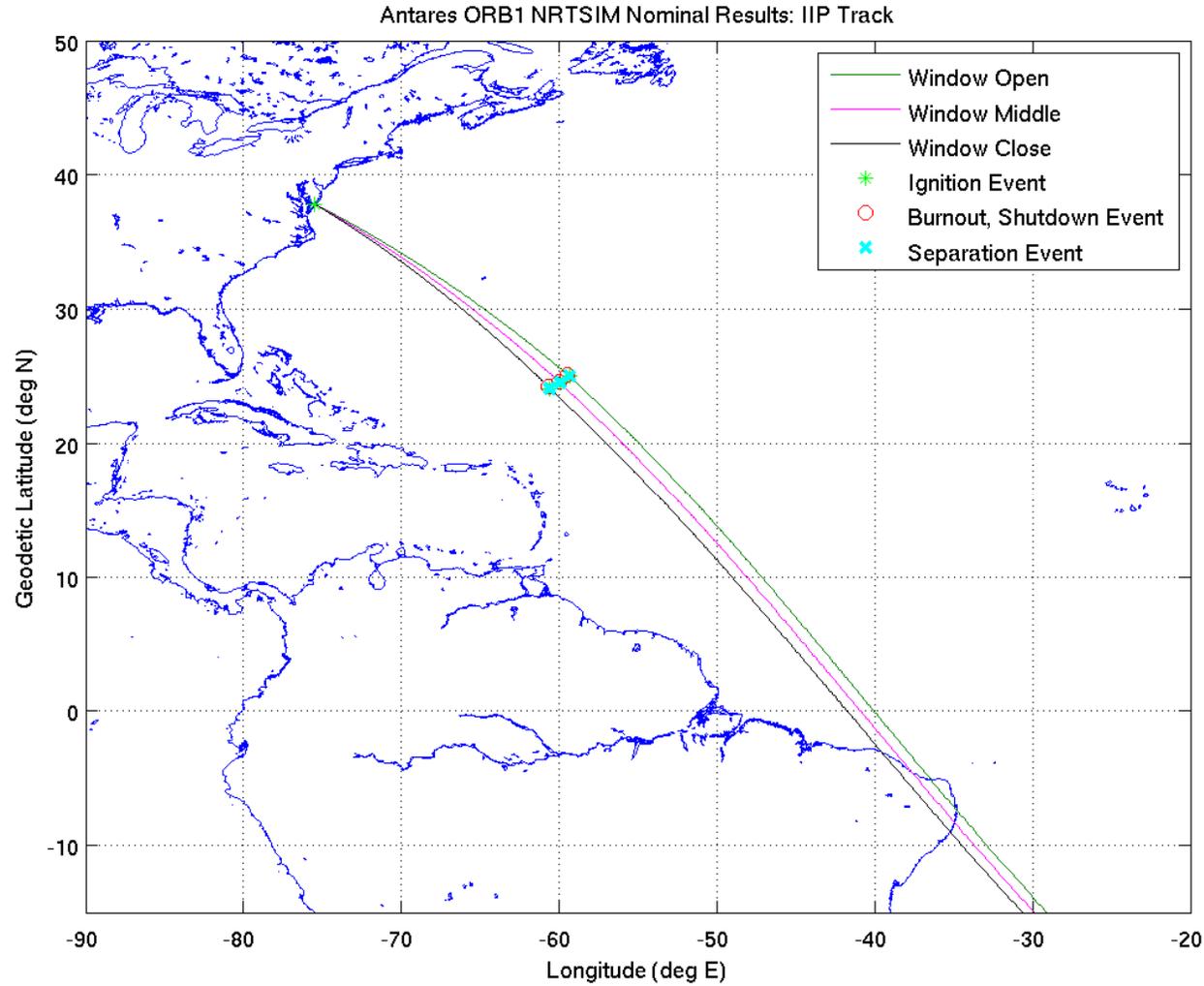
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Instantaneous Impact Point (IIP) Track Reflects 5 Minute Launch Window



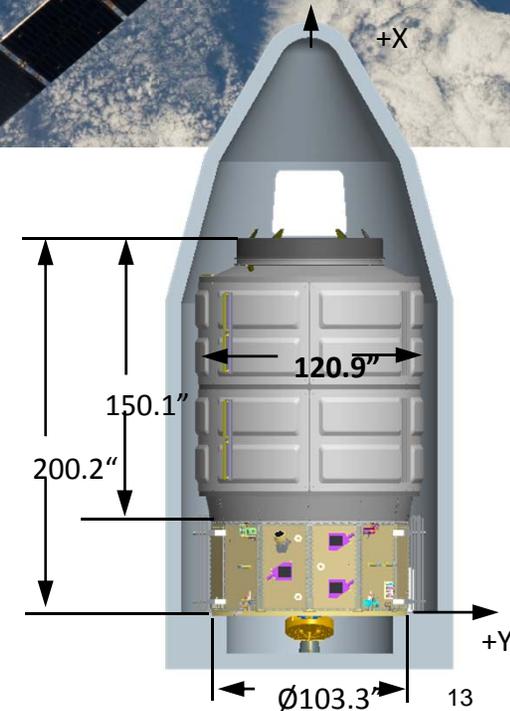
Orb-1 Top-Level Mission Timeline Overview

- Launch – 9 January 2014- 5 Minute Launch Window
- Berthing – 12 January 2014
- Hatch Opening/Ingress – 12 January 2014
- Planned Unberthing – 18 February 2014 (TBC)
- Planned Reentry – 19 February 2014



Cygnus Overview

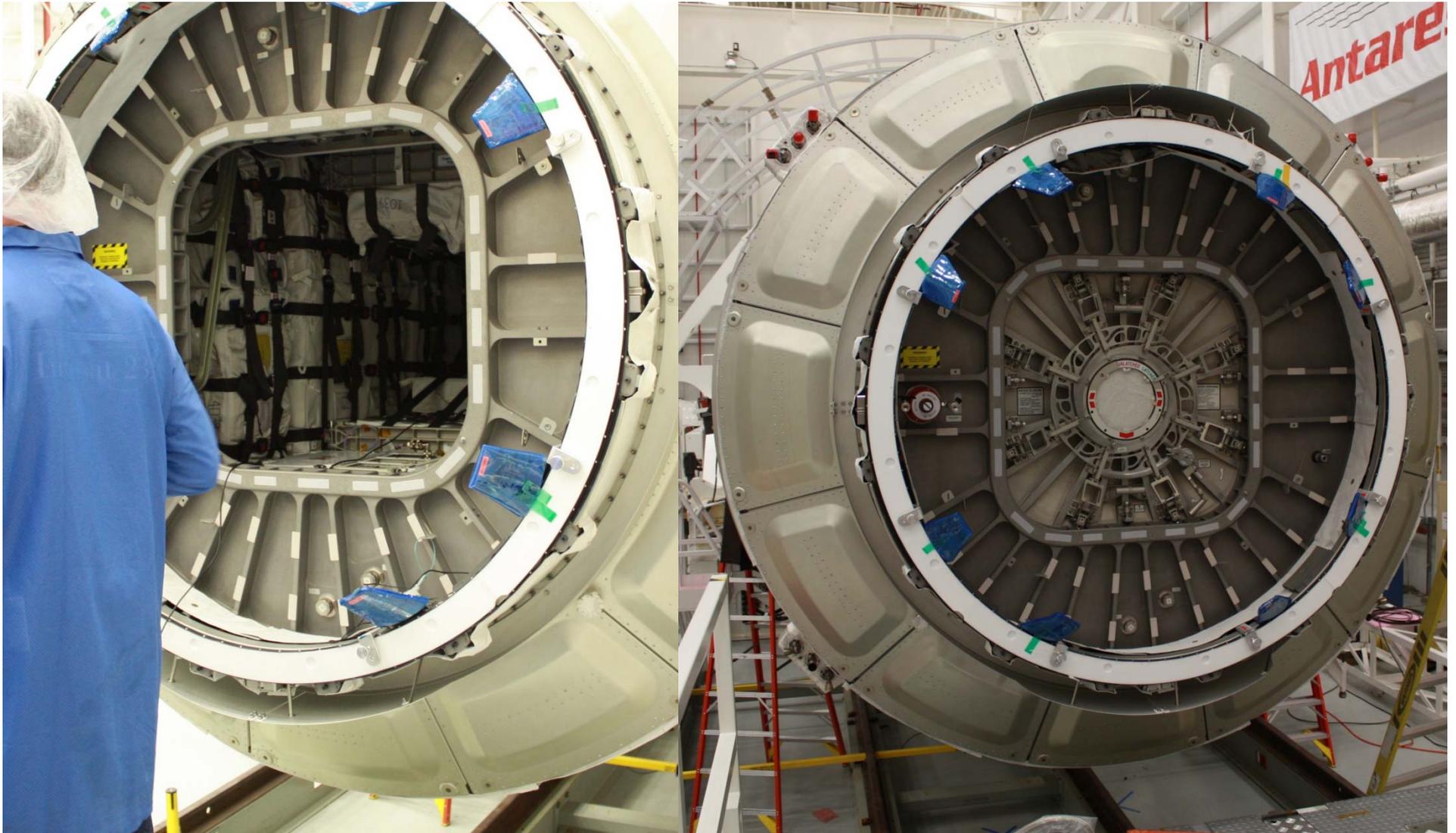
- The Cygnus vehicle is comprised of two major elements
- Pressurized Cargo Module (PCM)
 - Heritage: Multi-Purpose Logistics Module (ISS); ATV
 - Total Payload Mass: 2,000 kg, 2700 kg
 - Pressurized Volume: 18.7 m³, 27 m³
 - Berthing at ISS: Node 2 Common Berthing Mechanism
- Service Module (SM)
 - Heritage: Orbital GEO and LEO missions
 - Power Generation: 2 Fixed Wing Solar Arrays,
 - Power Output: 3.5 kW (sun-pointed)
 - Propellant: Dual-mode
 - Compatible with Antares







Final Cargo Installed – Hatch Closed



Cygnus Cargo

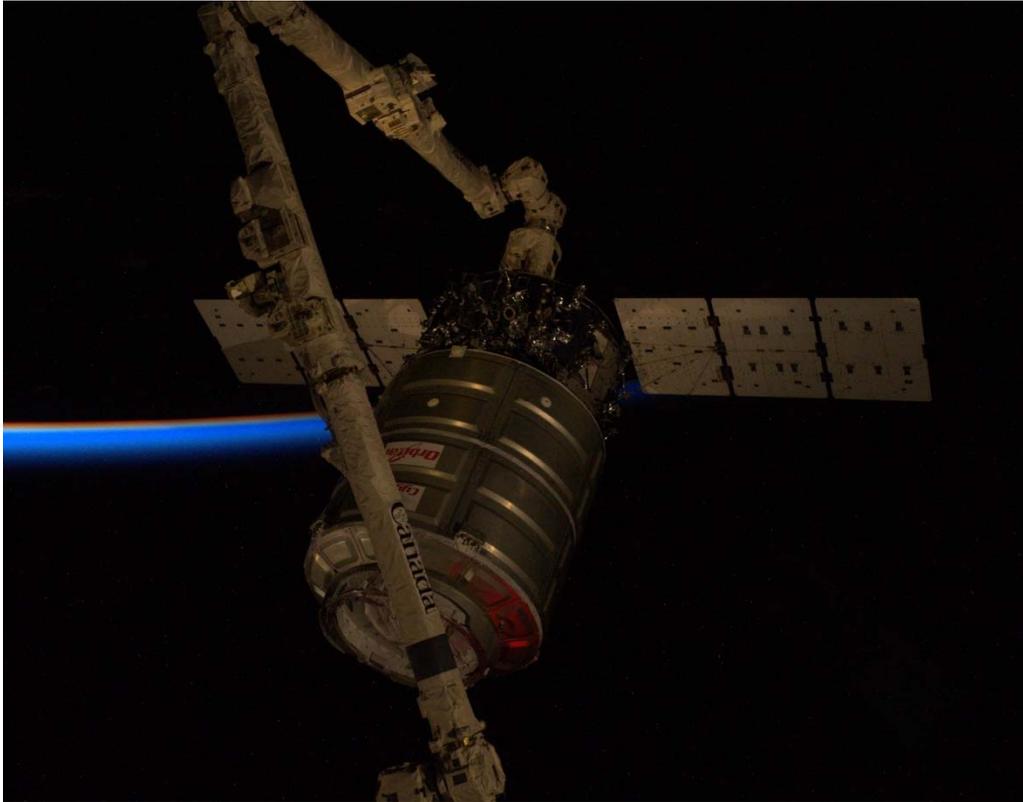
- Cygnus carried 1465 kg (3230 lbs) of cargo and payloads to the ISS
 - Cargo included food, crew provisions, spare parts for life support and medical systems, and TV system components

- Cygnus payloads also included 33 CubeSats for US and foreign groups to be deployed by the NanoRack Deployers (also manifested on Orb-1), plus,
 - NLP Vaccine-21
 - SPHERES-Slosh
 - BCAT-Kinetic Platform
 - BASS-2 Combustion Experiment
 - Story Time in Space
 - Ants in Space
 - Nanoracks Student Experiments

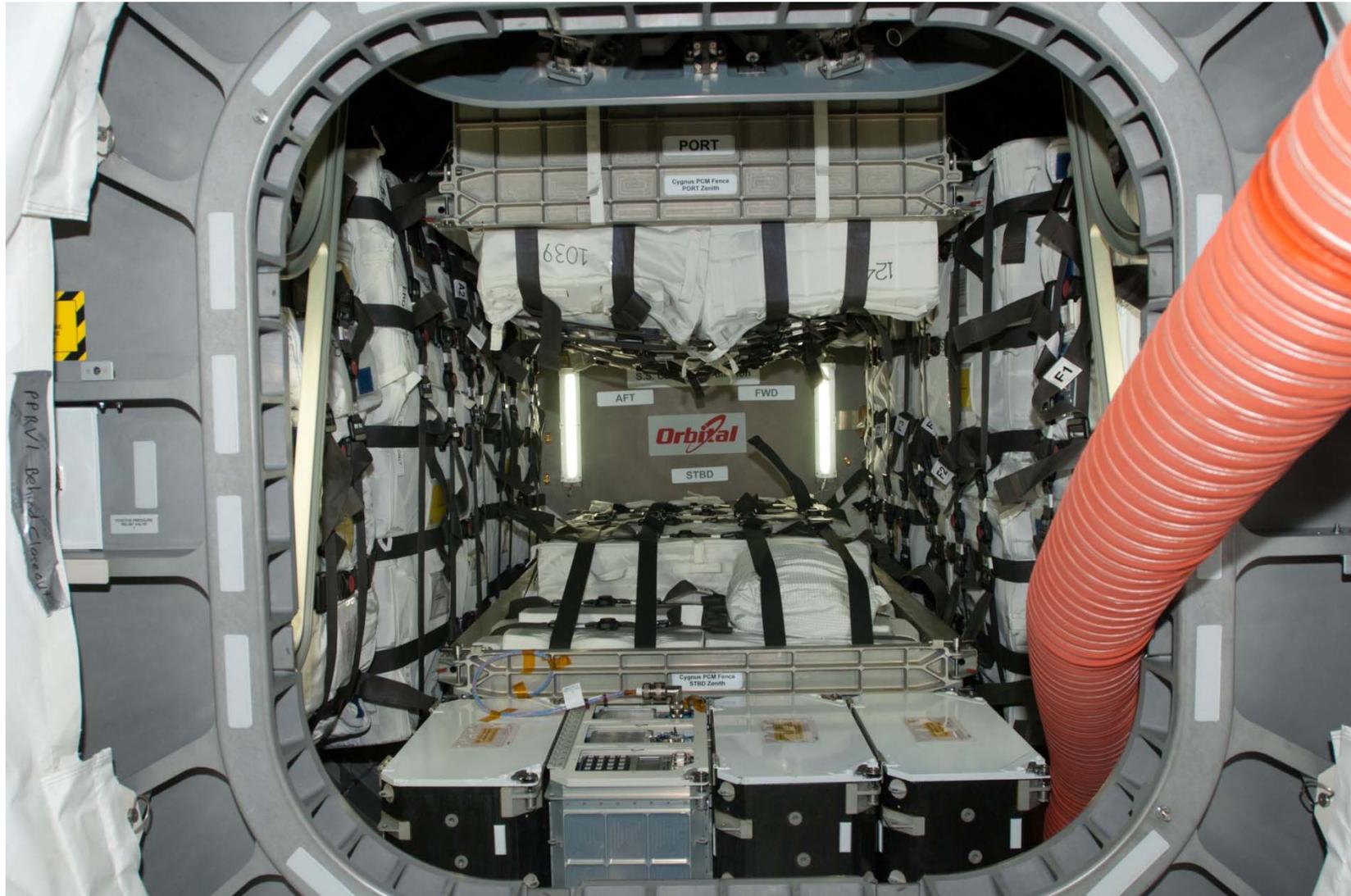
Orb-1 on Approach



Cygnus Grappled



Cygnus Orb-1 Hatch Open



S. S. C Gordon Fullerton



Future Missions

- Orb-2 Scheduled For 1 May 2014
 - NASA Currently Estimating 1650 Kg Of Cargo
 - All Elements Are On-Track For Launch

- Orb-3 Set For October 2014; Orb-4 For January, 2015

- Tentative Manifest Set Through Orb-8 In Late 2016
 - Additional Missions Through 2024 In Planning At Orbital
 - Additional Capabilities Under Consideration
 - Long Lead Hardware Orders Beyond Orb-8—At Risk To Orbital—Have Been Placed

- Additional Non-ISS Missions For Cygnus Identified
 - Cygnus Service Module Is A Capable Orbital Transfer Vehicle
 - Built In Autonomous Rendezvous And Capture Capabilities
 - Significant On-Board Delta-V Available; Additional Delta-V Possible

Orbital's Commercial Cargo Program Is Up And Running