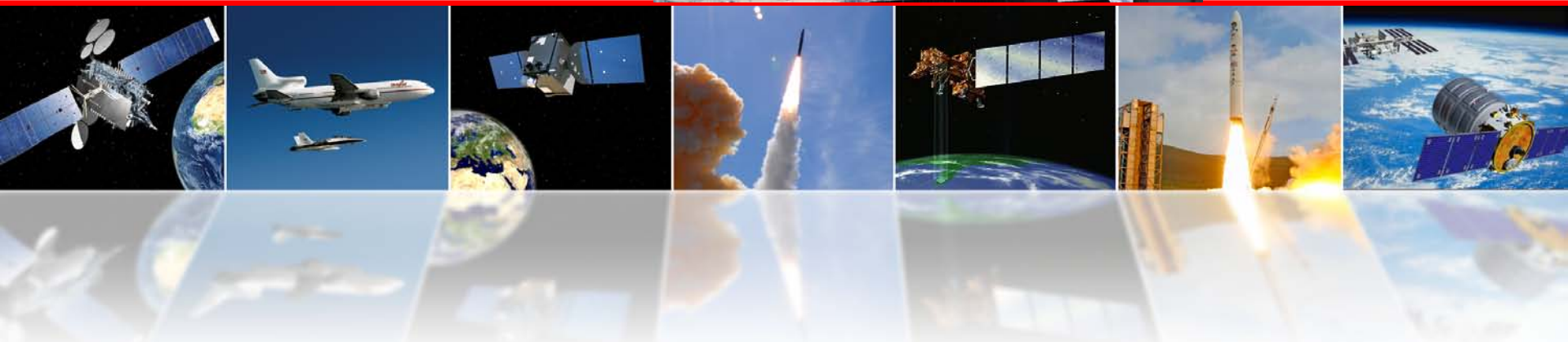




Cygnus and ISS Cargo Resupply Update

Frank L. Culbertson
Senior Vice President and Deputy General Manager
Advanced Programs Group



2012 a Big Year For Cygnus and Antares

- **COTS Demo and CRS Orb-1 Spacecraft in Advanced Testing**
 - Thermal Vacuum Testing, Mechanical Environments for COTS Demo
 - EMI/EMC Testing, Thermal Vacuum Testing and Mechanical Environments for Orb-1
- **Demo Software Ready for Final Joint Testing**
- **Antares Forging Ahead with Significant Hardware Deliveries and Integration Activities for Test Launch and COTS Demo Launchers**
- **Pad Turnover in Less Than 2 Months!**



Update – Welcome Antares

Designed to Provide
Versatile, Cost-effective
Access to Space for
Medium-Class Payloads

Currently Under Contract
to Support NASA
International Space Station
(ISS) Re-supply Missions



PAYLOAD FAIRING

- 3.9 meter diameter by 9.9 meter envelope
- Composite Construction
- Non-contaminating Separation Systems

STAGE 2

- ATK CASTOR® 30/30B Solid Motor with Active Thrust Vectoring
- Orbital MACH avionics module
- Cold-gas 3-axis Attitude Control System

STAGE 1

- Liquid Oxygen/RP-1 fueled
- Two AJ26 engines with independent thrust vectoring
- 3.9 meter booster derived from heritage Zenit design

Antares Hardware Progress

Booster



Hot Fire and Test Flight Boosters Being Processed @ Wallops



CRS Launch Cores Delivered



ORB-1 Launch Booster Tankage Complete

Main Engine System



- ✓ 1st Four Engines Successfully Hot-fire Tested @ Stennis
- ✓ 1st Three Engines Delivered to Wallops
- ✓ Hot Fire Test Engines Integrated into Engine Section



Upper Stack



- ✓ Upper Stack & Cygnus Pathfinder Complete
- ✓ Upper Stack Integration @ Wallops
- ✓ Avionics Testing Complete



Antares WFF Launch Site Progress

Horizontal Integration Facility



- ✓ Structure Complete
- ✓ Interior Complete
- ✓ Occupancy 3/11



Launch Pad



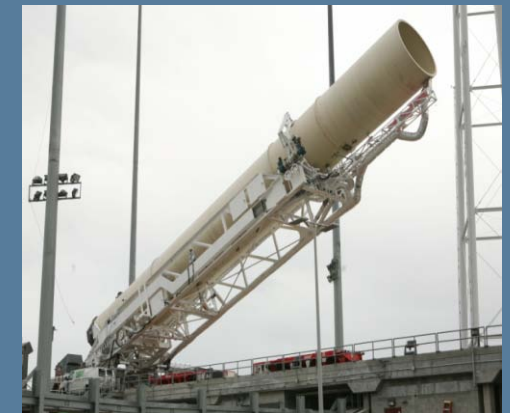
- ✓ Ramp & Flame Trench Complete
- ✓ Tanks Installed
- ✓ Deluge Tower Complete



Infrastructure



- ✓ HIF GSE Delivered
- ✓ TEL Complete
- ✓ Transporters Available
- ✓ TEL Pathfinder On-Going



Aft Bay Mated to Core for Pad Hot Fire



Wallops Launch Pad Nearing Completion



TEL Pathfinder Nov 2011 Featuring Rapid Retract and 2X Load Proof Test



Orb-1 and Orb-2 First Stage Cores Near WFF



Engine 7 Acceptance Testing - 17 Nov 2011



Recent Visits by NASA HQ (L. Garver, M. Peck) to HIF



Cygnus Service Modules for Demo and Orb-1 in Test at Dulles VA



Cygnus Service Module for Demo in TVAC at Dulles VA



Demo Mission Pressurized Cargo Module at Wallops Flight Facility



Pressurized Cargo Module M-3 Bag Loading Demonstration



Astronaut View Inside Loaded Pressurized Cargo Module at Wallops Flight Facility



PCM's for Orb-1 and 2 at Thales Alenia, Italy



First Enhanced Module Primary Structure



- **Orbital Continues to Make Progress Toward Antares Test Launch and COTS Demonstration Mission**
 - Facilities at Wallops Nearing Completion
 - Antares Hardware for First 3 Missions Either Integrated or Available for Integration
 - Cygnus Spacecraft for First 2 Missions Completing Testing and Ready for Integration at Launch Site in May 2012
- **Schedule for Major Mission Milestones Firming Up**
 - Pad Turnover in Early April
 - Pad First Stage Hot Fire in Late Spring
 - Test Flight in Early Summer
 - COTS Demo in Late Summer (Dependant on NASA approval)

Questions?

