

# CRS

ISS Commercial Resupply Services

## FACT SHEET



### Overview

Under the joint NASA/Orbital ATK Commercial Orbital Transportation Services (COTS) program, Orbital ATK developed the Cygnus™ advanced maneuvering space vehicle, which is designed to deliver cargo to the International Space Station (ISS). Under a separate but related effort, Orbital ATK privately developed the Antares™ launch vehicle, to provide low cost access to space for medium-class payloads. These elements were used for a successful flight demonstration of Orbital ATK's commercial resupply capability to the ISS in September 2013.

With the successful completion of the COTS program, Orbital ATK commenced ISS resupply flights under the Commercial Resupply Service (CRS) contract. This NASA contract authorizes eleven missions to carry approximately 30,000 kilograms of cargo to the ISS as well as disposal of ISS waste. The first of these missions was successfully conducted in early 2014.

### Cygnus Advanced Maneuvering Spacecraft

The Cygnus spacecraft consists of a common service module and a modular pressurized cargo module. The service module incorporates avionics systems from Orbital ATK's flight-proven LEOSTAR™ and GEOSTAR™ product lines plus propulsion and power systems from our GEOSTAR communications satellites. The pressurized cargo module is based on the Multi-Purpose Logistics Module (MPLM), developed by Thales Alenia Space for the ISS. Performing a similar function as the MPLM, the Cygnus pressurized cargo module carries crew supplies, spares and scientific experiments. After being launched into low-Earth orbit, the Cygnus spacecraft has substantial maneuvering capability as it transports the cargo from a low parking orbit to the ISS where it is grappled by the ISS robotic arm and berthed to the station. After the cargo is removed and any ISS disposal items are added, Cygnus is steered to a safe destructive reentry over the Pacific Ocean.

## FACTS AT A GLANCE

### Mission Partners

#### Orbital ATK

Prime contractor and operator of the CRS program, including the Cygnus spacecraft, the Antares launch vehicle, mission and cargo operations, and the Stage 2 motor

#### Thales Alenia Space

Pressurized cargo module

#### Mitsubishi Electric Corporation (MELCO)

Proximity link system

#### Draper Laboratory

Guidance, navigation and fault tolerant computer support

#### Odyssey Space Research

Visiting vehicle requirements support

#### KB Yuzhnoye/Yuzhmash

Antares Stage 1 core tank design, production and verification

#### NPO Energomash

Antares Stage 1 engines

#### JAMSS America, Inc.

Operations support

#### United Launch Alliance

Launch Vehicle provider for the OA-4, OA-6 and OA-7 missions

## Antares Medium-Class Space Launch Vehicle

Orbital ATK privately developed Antares, a new launch vehicle designed to provide low cost access to space for medium-class payloads. Antares is used to conduct ISS commercial resupply services as well as future NASA science and exploration, commercial and national security space missions. The Antares launch system utilizes Orbital ATK's proven MACH avionics system and many management approaches, engineering standards, production and test processes common to Orbital ATK's family of successful small-class Pegasus® and Minotaur launch vehicles.



Cygnus is boosted into orbit by Orbital ATK's Antares medium-class space launch vehicle.

## Atlas V Space Launch Vehicle

For the OA-4, OA-6 and OA-7 missions, Cygnus will be boosted into orbit by an Atlas V rocket. Atlas V will fly in the 401 configuration with a standard common core booster™ powered by a single RD-180 engine, no strap-on solid rocket boosters, a single engine Centaur upper stage and a 4 meter payload fairing.



## Key Contacts

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## Antares Launch Vehicle

- Diameter: 3.9 m
- Height: 42.5 m
- Mass: 290,000 - 310,000 kg

### Stage 2

- Orbital ATK CASTOR® 30XL solid motor (CASTOR 120 Heritage) with thrust vectoring

### Stage 1

- Two Energomash RD-181 engines each with independent thrust vectoring
- Liquid oxygen/kerosene fueled
- Orbital ATK responsible for system development and integration
- Core tank design and design verification by KB Yuzhnoye (Zenit-derived heritage)
- Core tank production by Yuzhmash



### Cygnus Advanced Maneuvering Spacecraft

- Service Module incorporating avionics from Orbital ATK's GEOSTAR bus and other product lines
- Pressurized Cargo Module based on Multi-Purpose Logistics Module
- 3.5 kW power output
- 3,200 - 3,500 kg total cargo

## Mission Operations

Cygnus mission operations are managed from Orbital ATK's state-of-the-art Mission Control Complex in Dulles, Virginia, in concert with NASA Johnson Space Center in Houston, Texas.



Mission Control Complex – Dulles (MCC-D)