



# ISS Commercial Cargo Resupply Services

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# CRS History

- **August 2006 SpaceX and Rocketplane Kistler (RpK) awarded funded Space Act Agreements**
- **February 2008 Second round competition awarded to SpaceX and Orbital Sciences Corporation was selected**
  - ◆ **Orbital and SpaceX successfully completed COTS Demo missions in 2010 and 2013 establishing viable commercial transportation to LEO**
- **December 2008 ISS Commercial Resupply Services (CRS) contracts were awarded to SpaceX and Orbital to deliver cargo to ISS. Additional flights to both companies have been awarded under the CRS 1 to bridge the gap until CRS 2**
  - ◆ **SpaceX awarded total of 20 missions; Orbital awarded a total of 10 missions**
  - ◆ **SpaceX has completed 9 mission and Orbital has completed 5 missions**
  - ◆ **Industry has demonstrated resilience and agility by returning to flight quickly after their mishaps (6 months for SpaceX, 13 months for OATK).**
    - ☞ **Orbital mission OA-5 scheduled to launch this Sunday**
    - ☞ **SpaceX current investigation still ongoing. SPX 10 scheduled to launch in January 2017.**
- **January 2016 CRS 2 contracts were awarded to SpaceX, Orbital and Sierra Nevada**



# CRS 2 Expectations

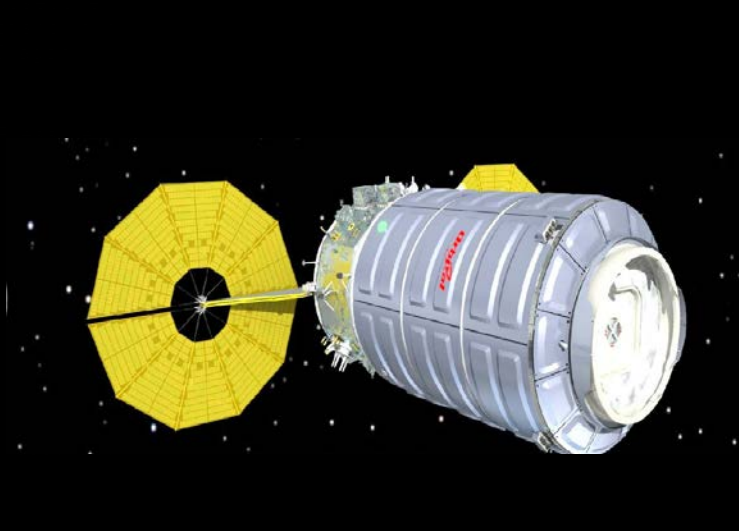
- The CRS2 contract is a FAR Part 12 Commercial Services Contract with expanded requirements to meet ISS scientific and resupply needs
- Contract format still allowed for ability of the provider to propose innovative, creative solutions and mission profile combinations to meet ISS and their company goals and strategies
- Key contract updates were aimed at areas critical to the execution of the ISS Program goals
  - ◆ On-time, reliable transportation
  - ◆ Cargo manifest flexibility
  - ◆ Increased up and down mass requirements
  - ◆ Additionally payload requirements and time-critical services
- The success of ISS is closely tied to the success of the CRS 2 providers and their innovations





## CRS 2 Award Overview

- **CRS2 has a contract minimum of 6 missions with defined capabilities and maximum value of \$14B (CRS1 had minimum 20 metric tons and \$3.1B maximum).**
- **Initial missions have been ATP and are completing ISS Integration**
  - ◆ **SpaceX Docked Cargo Dragon 2 providing pressurized cargo launch and return; unpressurized launch/disposal; Launch and return from KSC (propulsive landing)**
  - ◆ **Sierra Nevada Berthed Dreamchaser providing pressurized cargo launch and return; unpressurized launch/disposal; Launch and return from KSC (runway landing)**
  - ◆ **Orbital ATK Berthed Cygnus providing pressurized cargo launch and disposal, unpressurized FRAM disposal; Launch from Wallops**





# CRS - Fostering Commerce in Space

- **Successful example of “Government as a customer” - Commercial partner retains ownership of the hardware; government is only buying services**
- **Commercial partners can expand markets by offering services to other non-traditional customers to close their business model**
  - ◆ **NASA working challenge with providers to allow commercial providers to sell unused upmass without compromising ISS needs and priorities**
  - ◆ **Limited success on cubesats**
- **CRS 2 award to Sierra Nevada further increases commercial transportation LEO stakeholder base and diversity**
- **CRS 1 and 2 contracts allow Commercial partners to explore options for “best practices” to supply ISS with goods/services as opposed to government prescribed integration processes – requirements tied to safety and leave mission success to the providers**
- **CRS 1 and 2 allow for reusability to assist with driving down launch costs**



# Other Commercial Companies Currently Operating on ISS

- UTC : Sabatier
- NanoRacks: Internal & External platforms; sat deployers; airlock
- SpaceX, Orbital ATK, Sierra Nevada : Cargo
- Teledyne Brown Engineering: External precision pointing platform
- Bigelow Aerospace: Bigelow Expandable Activity Module
- Boeing, SpaceX; Crew
- HNu nanoPoint: Microfluidics cell culture platform
- Alpha Space: External materials exposure platform
- BioServe: Space Biology platforms and services
- Kentucky Space: Multilab space biology platform
- Red: Ultra High Def digital cinema camera
- Techshot: Bone densitometer, centrifuge facility
- Made In Space: Additive Manufacturing Facility
- STaARS: Space biology platform





# Foster Commerce in Space

## Multiple agreements being utilized

- **Space Act Agreements**

- ◆ Grants commercial partner the on-orbit “real estate”
- ◆ Documents formal relationship with NASA to attract funding/customers
- ◆ Does not provide any NASA funding

- **Cooperative Agreements**

- ◆ Enable new capabilities by “pre-buying” services
- ◆ Can front load portion of funding to buy down financial risk during development
- ◆ Services of equivalent value provided to NASA on back end
- ◆ Requires <50% NASA contribution

- **Indefinite Delivery/Indefinite Quantity Contracts**

- ◆ Fixed Price “Menu of Services”
- ◆ Serves as a “mini-GSA” schedule so other government agencies can buy services

- **Traditional Contracts**

A photograph of the Space Shuttle Columbia in orbit above Earth. The shuttle is oriented vertically, with its nose pointing towards the top left. The orbiter is attached to the external tank and solid rocket boosters. The Earth's surface is visible in the background, showing blue oceans and white clouds. The text "Open Questions?" is overlaid in yellow in the upper right quadrant.

Open Questions?