

National Aeronautics and Space Administration



# **Commercial Crew and Cargo Program Overview**

**June 17, 2009  
Doug Cooke**

**COMMERCIAL CREW & CARGO**



# Agenda

- **Commercial Crew and Cargo Program/COTS Overview**
  - SpaceX
  - Orbital
  - Other Unfunded Partnerships
- **Recovery Act Commercial Crew Initiatives**



# National Direction



- **National Aeronautics and Space Act of 1958 (as amended 1984)**

- ...the National Aeronautics and Space Administration (as established by title II of this Act) **seek and encourage to the maximum extent possible the fullest commercial use of space.**

- **National Space Exploration Policy/Vision for Space Exploration, 2004**

- [The United States will] Promote... **commercial participation in exploration...** to further U.S. scientific, security, and economic interests.
- [The NASA Administrator will] Pursue **commercial opportunities for providing transportation and other services supporting the International Space Station and exploration missions beyond low Earth orbit.**

- **NASA Authorization Act of 2005**

- The Administrator shall establish a program to develop a sustained human presence on the Moon... **to promote exploration, science, commerce...**

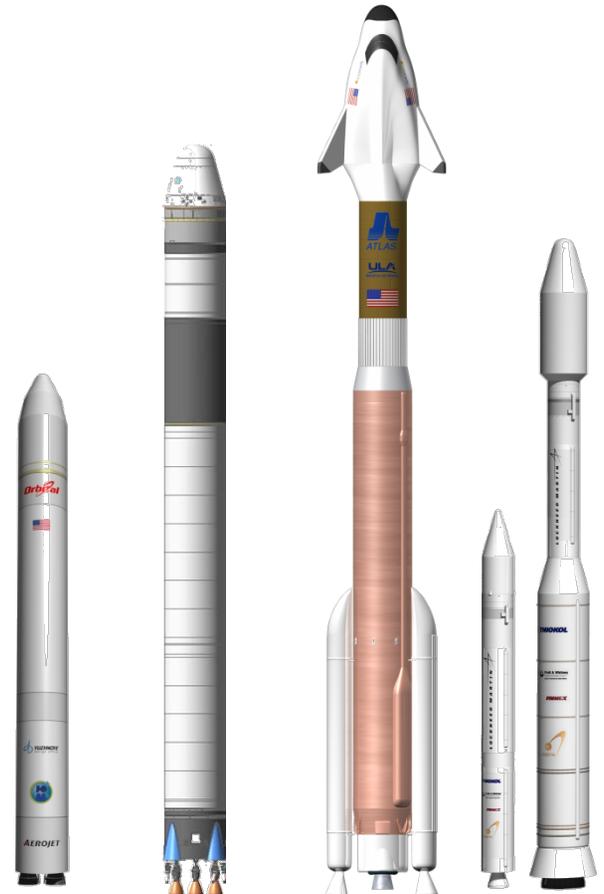
- **NASA Authorization Act of 2008**

- ...Congress encourages NASA to look for such service opportunities and, to the maximum extent practicable, **make use of the commercial sector to provide those services.**



# Program Objectives

- **NASA established the Commercial Crew & Cargo Program in November 2005 to accomplish the following objectives:**
  - **Implement U.S. Space Exploration policy with investments to stimulate the commercial space industry**
  - **Facilitate U.S. private industry demonstration of cargo and crew space transportation capabilities with the goal of achieving safe, reliable, cost effective access to low-Earth orbit**
  - **Create a market environment where commercial space transportation services are available to Government and private sector customers**



*Extending human presence in space by enabling an expanding and robust U.S. commercial space transportation industry*

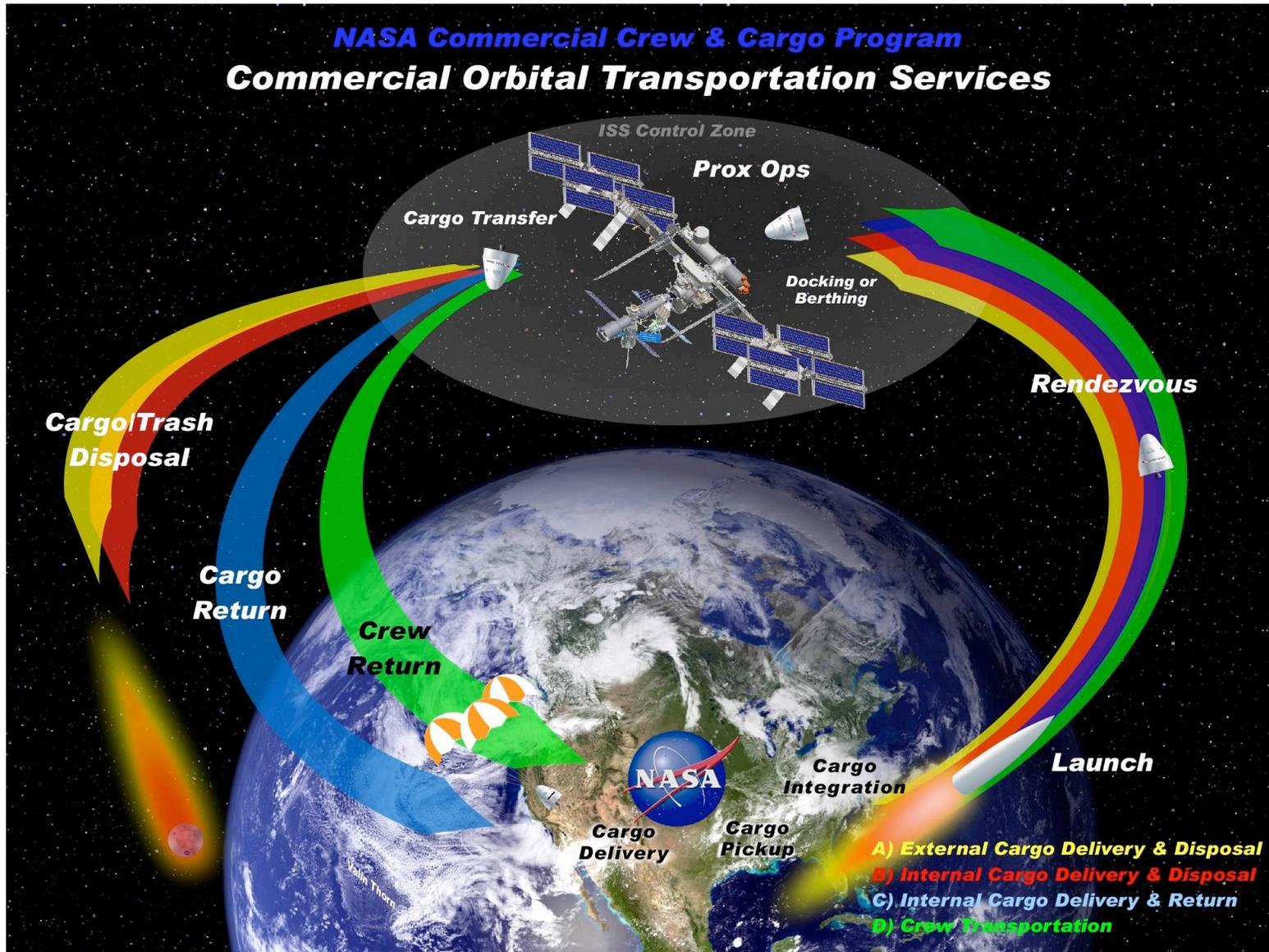
# Commercial Orbital Transportation Services (COTS) Overview



- **\$500M budgeted in FY06-FY10 as an *investment* for the demonstration of commercial orbital transportation capabilities**
- **COTS executed in two phases:**
  - Phase 1: Technical Development/Demonstration funded *Space Act Agreements* (SAA)
  - Phase 2: Competitive Procurement of ISS Commercial Resupply Services (managed by SOMD/ISS Program)
- **Phase 1 first round competition for funded SAAs awarded August 2006**
  - SpaceX awarded \$278M SAA
  - Rocketplane Kistler awarded \$208M SAA (Terminated in Oct 07 for failure to meet milestones)
- **Phase 1 second round competition awarded February 2008**
  - Orbital Sciences Corp. awarded \$170M SAA
- **Phase 2 procurement of ISS Commercial Resupply Services (CRS) contracts awarded December 2008**
- **Potential contract value for:**
  - SpaceX \$1.6B for ISS cargo services
  - Orbital \$1.9B for ISS cargo services



# Potential COTS Capabilities



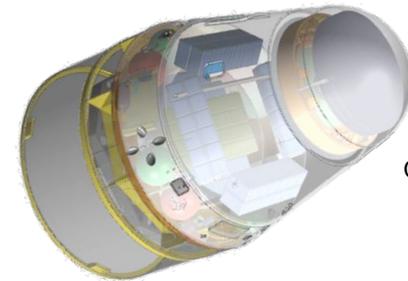
**COMMERCIAL CREW & CARGO**

# SpaceX COTS System

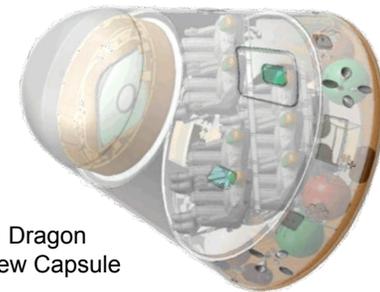


## Description and Features:

- Falcon 9 Medium Class Launch Vehicle
- Dragon Crew/Cargo Spacecraft
- Recoverable launch vehicle and spacecraft
- Cape Canaveral LC-40 Launch Site
- ISS Flight Demonstration: March 2010 (per SAA)
- Cargo Demonstration – up to \$278 M
- Crew Demonstration Option – up to \$308 M (not funded)



Dragon Cargo Capsule



Dragon Crew Capsule

Falcon 9 Rocket



SpaceX Launch Site at Cape SLC 40



# Orbital COTS System



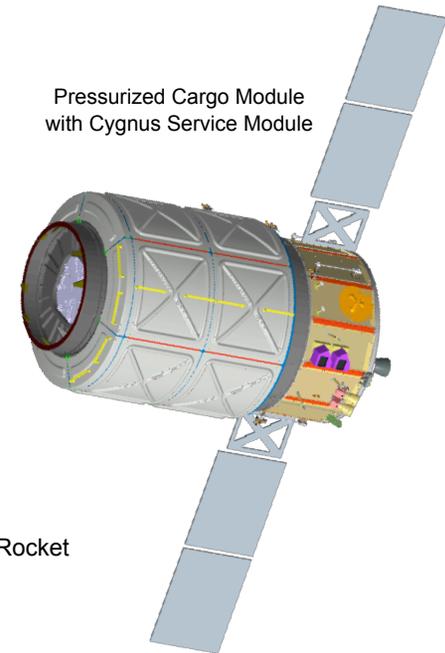
## Description & Features:

- Taurus II Launch Vehicle – derivative of Taurus I with Aerojet AJ-26 engines (2) & Castor 30 2<sup>nd</sup> stage
- Cygnus Service Module used for all missions – derived from STAR™ & Dawn spacecrafts
- Pressurized Cargo Module (PCM): Heritage - ISS MPLM
- Wallops Flight Facility Launch Site
- ISS Flight Demonstration: March 2011
- Cargo Demonstration – up to \$170 M



Taurus II Rocket

Pressurized Cargo Module with Cygnus Service Module

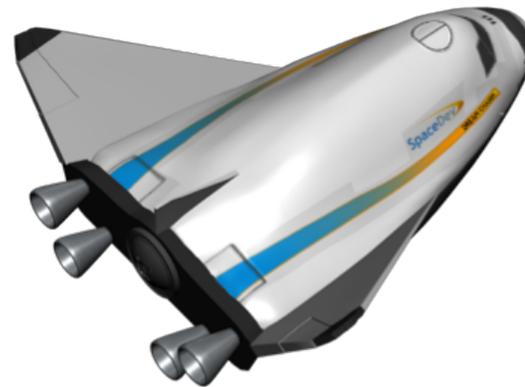


MARS/Wallops Launch Site

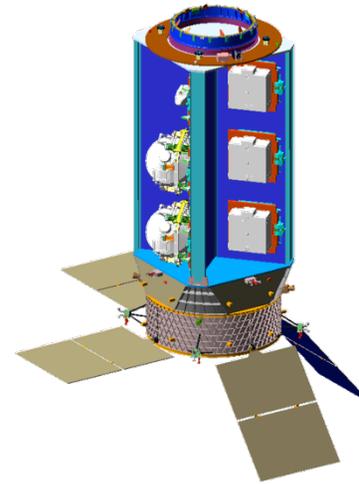


# Other Commercial Partners

- NASA continues to support two unfunded SAA commercial partners
  - PlanetSpace
  - SpaceDev



SpaceDev DreamChaser



PlanetSpace  
Athena III



**SPACEX COTS Milestone Tracking (Amendment 2)**

#	Description	Planned (R0 - 8/06)	Planned (R1- 1/07 )	Planned (R2 - 2/08)	Submitted	Approved	\$M	\$M Total	Notes
FY06									
1	Project Management Plan	Sep-06	Sep-06	Sep-06	Sep-15-06	Sep-15-06	23.1	23.1	
FY07									
2	Demo 1 System Requirements Review	Nov-06	Nov-06	Nov-06	Nov-29-06	Dec-4-06	5.0	28.1	
3	Demo 1 Preliminary Design Review	Jan-07	Feb-07	Feb-07	Feb-8-07	Feb-8-07	18.1	46.2	Date changed per NASA's request.
4	Financing Round 1	Mar-07	Mar-07	Mar-07	Mar-1-07	Mar-7-07	10.0	56.2	
5	Demo 2 System Requirements Review	Mar-07	Mar-07	Mar-07	Mar-15-07	Mar-29-07	31.1	87.4	
6	Demo 1 System Critical Design Review	Aug-07	Aug-07	Aug-07	Aug-22-07	Aug-29-07	8.1	95.5	
FY08									
7	Demo 3 System Requirements Review	Oct-07	Oct-07	Oct-07	Oct-29-07	Oct-31-07	22.3	117.8	
8	Demo 2 Preliminary Design Review	Dec-07	Dec-07	Dec-07	Dec-19-07	Jan-7-08	21.1	139.0	
9	Draco (RCS Thruster) Initial Hot Fire	-	-	Mar-08	Mar-21-08	Mar-28-08	6.0	145.0	New Milestone added in Rev 2.
10	Financing Round 2	Mar-08	Mar-08	Mar-08	Mar-21-08	Apr-16-08	10.0	155.0	
11	Demo 3 Preliminary Design Review	Apr-08	Apr-08	Jun-08	Jun-27-08	Jun-30-08	22.0	177.0	
12	Multi-engine Test	-	-	Sep-08	Aug-4-08	Aug-18-08	22.0	199.0	New Milestone added in Rev 2.
FY09									
13	Demo 2/3 System Critical Design Review	Jun-08/Jan-09	Jun-08/Jan-09	Dec-08	Dec-18-08	Dec-19-08	25.0	224.0	Combined original Milestones 12/15.
14	Financing Round 3	Mar-09	Mar-09	Mar-09	Feb-8-09	Mar-3-09	10.0	234.0	Was Milestone 16 in original SAA.
15	Demo 1 Readiness Review	Feb-08	Feb-08	Mar-09			5.0		Was Milestone 9 in original SAA.
16	CUCU Flight Unit Design, Accept, Delivery	-	-	May-09			9.0		New Milestone added in Rev 2.
17	Demo 1 Mission	Sep-08	Sep-08	Jun-09			5.0		Was Milestone 13 in original SAA.
18	Demo 2 Readiness Review	Dec-08	Dec-08	Sep-09			5.0		Was Milestone 14 in original SAA.
FY10									
19	Demo 2 Mission	Jun-09	Jun-09	Nov-09			5.0		Was Milestone 17 in original SAA.
20	Cargo Integration Demonstration	-	-	Jan-10			5.0		New Milestone added in Rev 2.
21	Demo 3 Readiness Review	Jul-09	Jul-09	Jan-10			5.0		Was Milestone 18 in original SAA.
22	Demo 3 Mission	Sep-09	Sep-09	Mar-10			5.0		Was Milestone 19 in original SAA.
<b>TOTAL</b>							<b>278.0</b>		

**ORBITAL COTS Milestone Tracking (Amendment 2)**

#	Description	Planned (R0 - 2/08)	Planned (R1 - 10/08)	Planned (R2-03/09)	Submitted	Approved	\$M	\$M Total	Notes
FY08									
1	Program Plan Review	Mar-08	Mar-08	Mar-08	Mar-31-08	Apr-17-08	10.0	10.0	Complete
2	Demo Mission System Requirements Review	Jun-08	Jun-08	Jun-08	Jul-17-08	Jul-30-08	20.0	30.0	Complete
3	Unpressurized Cargo Module (UCM) PDR	Jul-08	Jul-08	Jul-08	Aug-14-08	Aug-20-08	10.0	40.0	Complete
4	<del>DELETED</del>								Sys. PDR renumbered to M 10 in R2
5	COTS Integration/Ops Facility Review	Oct-08	Sep-08	Sep-08	Sep-22-08	Sep-23-08	10.0	50.0	Complete
FY09									
6	Pressurized Cargo Module (PCM) PDR	Nov-08	Oct-08	Oct-08	Oct-09-08	Nov-03-08	10.0	60.0	Complete
7	<del>DELETED</del>								Replaced UCM w/ PCM CDR in Amend 2
8	Instrumentation Program & Command List	Feb-09	Feb-09	Feb-09	Feb-18-09	Mar-12-09	10.0	70.0	Complete
9	Completion of ISS Phase 1 Safety Review			Mar-09	Mar-27-09	Mar-27-09	10.0	80.0	Complete. New Milestone in Amend. 2
10	COTS System PDR	Sep-08	Feb-09	Apr-09	May-22-09	May-26-09	20.0	100.0	Renumbered , was Milstone 4.
11	PCM CDR			Jul-09			10.0		New Milestone in Amend. 2
12	COTS Visiting Vehicle (Cygnus) Avionics Test	Jun-09	Jun-09	Aug-09			10.0		Renumbered; was Milestone 10; -\$5M
13	Completion of ISS Phase 2 Safety Review			Aug-09			10.0		New Milestone in Amend. 2
14	COTS System CDR	Mar-09	Mar-09	Sep-09			10.0		Renumbered; Was Milestone 9; -\$10M
FY10									
15	Service Module (SM) Core Assembly Complete	Oct-09	Oct-09	Dec-09			7.5		Renumbered ; Was Milestone 12
16	SM Test Readiness Review	Jan-10	Jan-10	Apr-10			7.5		Renumbered; Was Milestone 13
17	SM Initial Comprehensive Performance Test	May-10	May-10	Jul-10			5.0		Renumbered ; Was Milestone 14
FY11									
18	Launch Vehicle Stage I Assembly Complete	Sep-10	Sep-10	Oct-10			2.5		Renumbered ; Was Milestone 15; -\$2.5M
19	Cargo Integration Demonstration			Dec-10			2.5		New Milestone in Amend. 2
20	Mission Readiness Review	Oct-10	Oct-10	Feb-11			2.5		Renumbered ; Was Milestone 16
21	System Demonstration Flight	Dec-10	Dec-10	Mar-11			2.5		Renumbered ; Was Milestone 17
<b>TOTAL</b>							<b>170.0</b>		

\*Dates are on existing Space Acts - not projected dates

# American Recovery and Reinvestment Act of 2009



- **\$400M allocated to Exploration**
- **\$150M planned for Commercial Crew and Cargo to stimulate efforts within the private sector to develop human spaceflight capabilities**
- **Funding will support four activities:**
  - **\$80.0M for development of commercial crew space transportation concepts and enabling technologies and capabilities**
  - **\$42.0M to accelerate U.S. development of ISS docking system interfaces for crew vehicles**
  - **\$20.0M for enhancement of commercial cargo systems to improve reliability for crew transportation**
  - **\$8.0M for the development of human-rating requirements documentation**