



## *National Space Club Luncheon*

# Innovation and the Next Step in U.S. Space Transportation

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***Commercial Crew Program - Same Crew...New Ride***

National Aeronautics and  
Space Administration

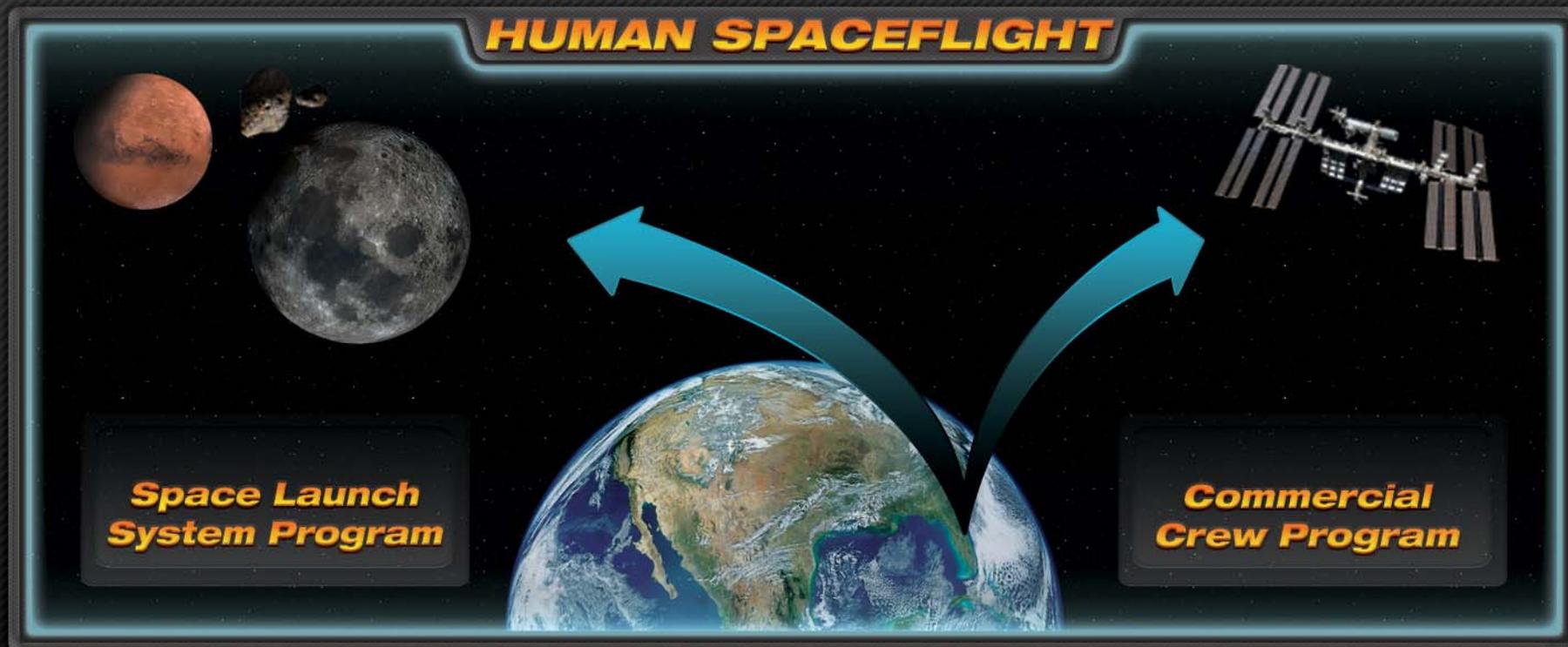




# **Commercial Crew Program (CCP) is vital to NASA's Future**

The Future of American

## **HUMAN SPACEFLIGHT**

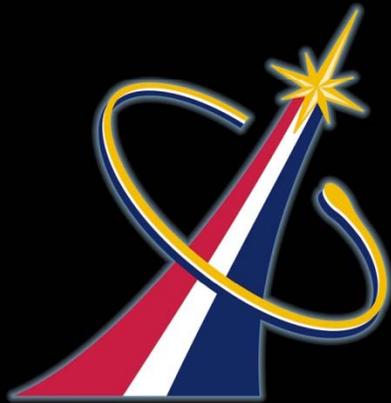


**Space Launch  
System Program**

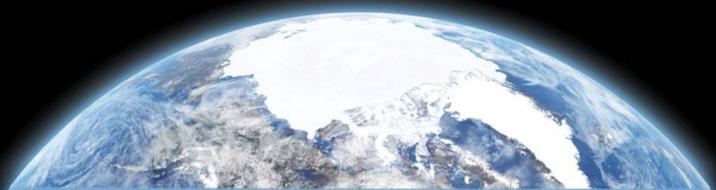
**Commercial  
Crew Program**

**Human  
Exploration**

**ISS Research &  
Development**



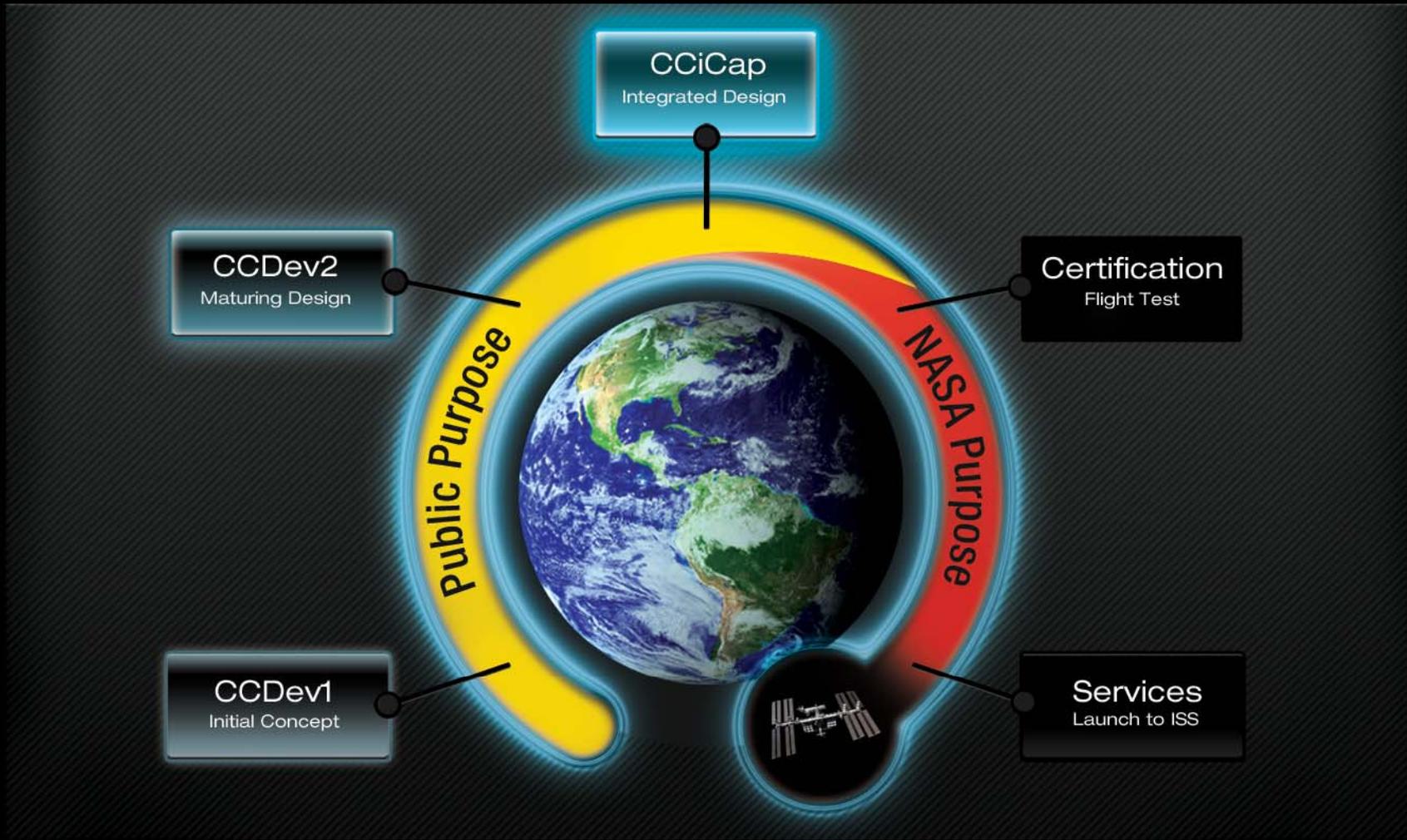
COMMERCIAL  
CREW  
PROGRAM



***The Commercial Crew Program (CCP) is leading NASA's efforts to develop the next U.S. capability for crew transportation and rescue services to and from the ISS by the mid-decade timeframe. The outcome of this capability will stimulate and expand the U.S. space transportation industry.***

***The CCP logo is derived from the NASA flight crew symbol as the foundation for the Program. The red/white/blue swoosh illustrates an American-led capability. The star depicts a future vehicle emerging from the overlapping double C's representing the CCP.***

# Program Design Development





# Summary of C*Ci*CAP Portfolio

- **Diversity of Spacecraft types and Launch Vehicles**
  - **Two basic types of Spacecraft**
    - **Capsules and Lifting Body**
  - **Two different Launch Vehicles**
    - **Falcon 9 and Atlas V**
  
- **The portfolio of companies maintains competition for future phases of the Program which should produce “best value” for the government**
  
- **Significant progress planned for the base period with analysis, integrated design, development, and hardware testing**
  
- **Total set of milestones provide insight into the cost and schedule required to achieve a crewed demonstration flight to low Earth orbit**

# Sierra Nevada Corporation



## ➤ Descriptions & Features

- **Dream Chaser spacecraft is a reusable, piloted, lifting body.**
  - **Carries up to 7 crew members**
  - **Utilizes non-toxic propellants**
  - **Primary Launch/Landing Site: Florida**
  - **Ability to abort to a runway landing**
- **Atlas V launch vehicle**



Artist rendition of Dream Chaser in low-Earth orbit

## ➤ Base Period

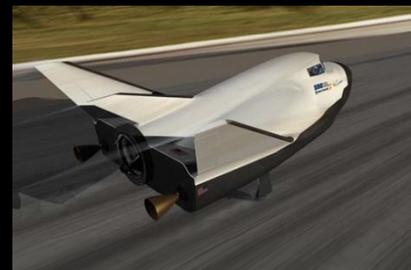
- **\$212.5M total NASA funding for 9 milestones**
- **Significant progress toward completion of critical design and Safety Reviews**

## ➤ Testing:

- ◆ **Engineering Test Article Flight(s)**
- ◆ **Wind Tunnel Risk Reduction**
- ◆ **Spacecraft Subsystem Risk Reduction**
- ◆ **Main Propulsion Risk Reduction**
- ◆ **Reaction Control System Risk Reduction**



Artist rendition of Dream Chaser and Atlas V on launch pad



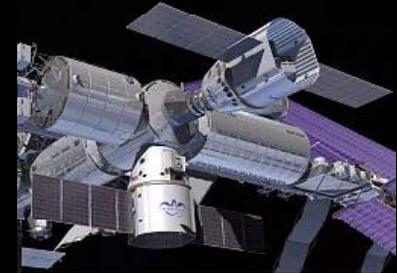
Artist rendition of Dream Chaser landing on a runway

# Space Exploration Technologies Corporation



## ➤ Descriptions & Features

- **Spacecraft uses a crewed version of the SpaceX Dragon capsule**
  - Carries up to 7 crew members
  - Primary Launch Site: Florida
  - Primary Landing Site: “On land” landing
- **Upgraded Falcon 9 launch vehicle**



Artist rendition of Dragon attached to ISS

## ➤ Base Period

- **\$440M total NASA funding for 14 milestones**
- **Culminates in an integrated critical design review milestone**

## ➤ Testing:

- **Dragon Primary Structure Qualification**

## ➤ Flight tests:

- **Pad Abort (SLC 40 and last quarter of 2013)**
- **In-Flight Abort (SLC 40 and 2nd quarter of 2014)**



Picture of Falcon 9 rocket on launch pad in Florida



Artist rendition of Dragon re-entering Earth's atmosphere

# The Boeing Company



## ➤ Descriptions & Features

- **CST-100 spacecraft is a reusable capsule design**
  - Carries up to 7 crew members
  - Primary Launch Site: Florida
  - Primary Landing Site: “On Land” landing
- **Atlas V launch vehicle**

## ➤ Base period

- **\$460M total NASA funding for 19 milestones**
- **Culminates in an integrated critical design review milestone**

## ➤ Testing:

- **Integrated Stack Force & Moment Wind Tunnel**
- **Dual Engine Centaur Development**
- **Orbital Maneuvering & Attitude Control Engine Development**
- **Mission Control Center Interface Demonstration**
- **Emergency Detection System Standalone**
- **Avionics SW Integration Lab Multi-String Demonstration**
- **Pilot-in-the-Loop Demonstration**



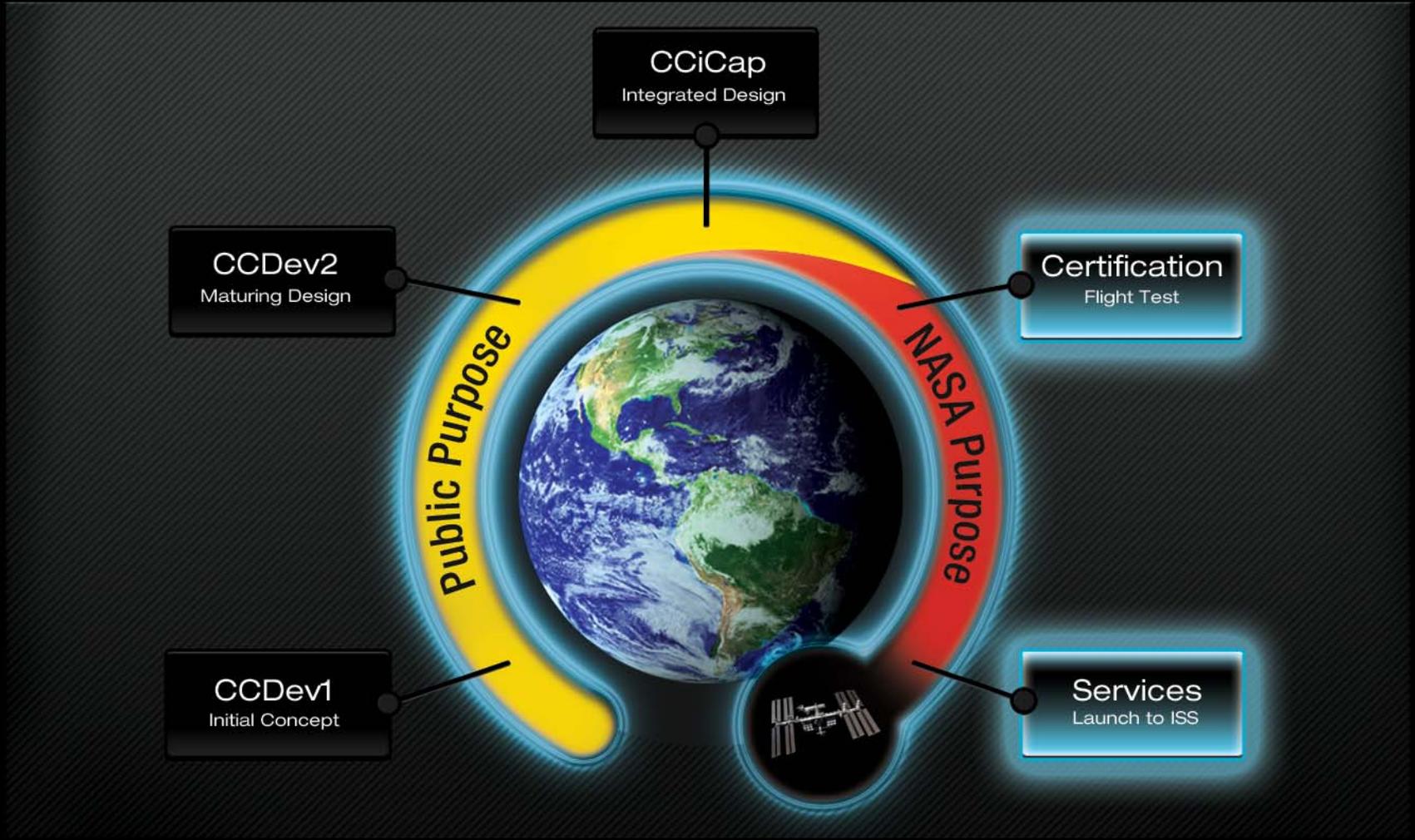
Successful parachute drop test accomplished during CCDev2

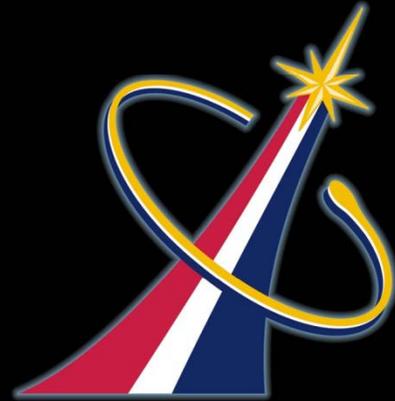


Artist rendition of CST-100 and Atlas V on the launch pad



Artist rendition of the CST-100 spacecraft





COMMERCIAL  
CREW  
PROGRAM

