

Kathy Lueders  
Program Manager

National Aeronautics and  
Space Administration



# COMMERCIAL CREW

THE CATALYST FOR A NEW SPACE AGE



# VISION



***The NASA vision of commercial human spaceflight to low-Earth orbit is a robust, vibrant enterprise with many launch providers and a wide range of government and public uses***



# GOAL

***A successful human space transportation system will fortify the International Space Station, allow NASA to focus on deep-space exploration, reduce the cost of human access to space and significantly contribute to the world's economy***

## **CCP's NASA Purpose**

Safe transport of NASA and NASA-sponsored astronauts to and from the space station

## **CCP's Public Purpose**

Support the development of non-NASA markets for commercial human transportation services to and from low-Earth orbit

# FOUNDATION

*History has taught us how to commercialize an industry  
Most successful model to date is the Commercial Airline Industry*

## Established the Need

- The government's initial need for aviation stemmed from military and communication activities
- The post office later created minimal airmail routes

## Laid the Groundwork

- Congress turned over airmail service to industry
- Airmail increased dramatically and commercial passenger air transport "took off"





# FAST TRACKED

## **Government transitioned infrastructure to industry**

- Lighted airfields for night and inclement weather operations
- Provided radio equipment for weather reports

## **Postal Service paid industry for work**

- Allowed planes to carry mail in unused capacity

## **Air Commerce Act of 1926 - aviation regulations**

- Accidents revealed a need for uniform safety regulations

## **Following WWII, air travel turned international**

- 1944 Chicago Convention established standards

## **Balanced industry needs with public safety**

- Issued and enforced air traffic rules
- Established airways
- Licensed pilots and certified aircraft
- Operated and maintained aids for air traffic control



# HUMAN



# SPACEFLIGHT





# APPROACH

## **Building Block 1: Establish the Need**

*In 2008, NASA began transitioning its cargo delivery capabilities to the American aerospace industry*

*Now, we're partnering with commercial spaceflight organizations to serve NASA's needs for station crew rotation and science transport*

- Define the want – crew transportation services and powered scientific cargo transport to space station
- Transition space activities not involving inherently governmental functions to non-governmental organizations
- Help industry to meet NASA requirements, thereby acting as a catalyst to propel commercial human spaceflight forward



# REQUIREMENT

## Building Block 2: Laying the Groundwork

*NASA provides 50 years of spaceflight knowledge*

*Transfers lessons learned from Apollo through today*

*Identifies what areas are critical for verification*



- Establish and define the partnership
- Collaborative technical interchange encouraged
- Balance liability and risk posture to maintain competitiveness
- Encourage industry development
- Space Act Agreements used for development of systems and subsystems
- Certification of integrated space systems needed
- Government will buy services



# EMPOWER

## Building Block 3: Enabling Industry

*NASA to keep mission-specific needs at a high-level and encourage industry to expand its business model for its own commercial transportation system use*  
*Balance government and industry needs*

- Make infrastructure assets available for use – launch pads, processing facilities, control centers, ground tracking, etc.
- Allow companies to retain intellectual property rights
- Encourage partnerships and collaborations



# REGULATE

## Building Block 4: Legal Framework

*For NASA, the international community and industry to continue on a sustainable path, a legal framework is needed to enable industry to flourish safely, reliably and cost-effectively*

*Governments and regulators focus*

*remains public safety and the common good*

- Facilitate Inter-Agency, Inter-Governmental and International agreements and partnerships
- Establish a liability and insurance framework
- Define jurisdiction and authority during different phases of flight along with an independent investigation authority
- Ensure secure communication pathways are available
- Create a set of uniform industry standards
- Support the licensing of missions



# RESULTS

## *Commercial Crew Program*

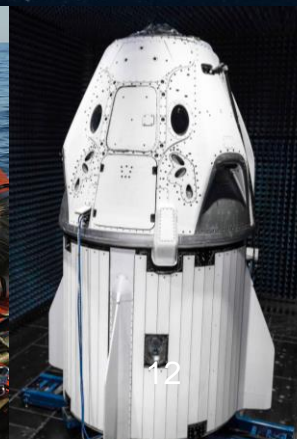
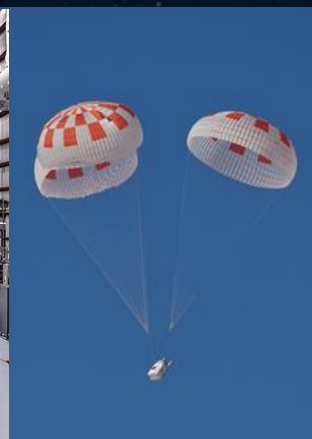
- Preparations for 10 CCP missions are underway
  - SpaceX – Demo Mission-1 **COMPLETED**, Demo Mission-2
  - Boeing – Orbital Flight Test, Crew Flight Test
  - Post Certification Missions (PCMs) – Awarded and in production
- Launch pads are configured for flight
- Mission control centers are prepared and operational
- Air Force Range, DoD, FAA and NTSB agreements are in place
- The “Government Astronaut” has been defined
- Providers are continuing critical tests and verification activities working on final flight preparations



# SPACEX

## *Design, Demonstration, Test and Evaluation*

- Spacecraft, Crew Dragon
  - Dragon Demo 1 – Used for flight and In-flight Abort Test
  - Dragon Demo 2 – Processing
- Falcon 9, Blk 5 launch vehicles in final production
- Mission Ops team partnered successfully for DM-1
- Parachute Systems Qualification and testing ongoing
- Crew training underway on spacecraft and suits
- Joint NASA/DoD/SpaceX Ocean Rescue and Recovery training
- Launch Complex 39-A upgrades complete and tested with DM-1





# SPACEX

## *Demonstration Mission-1*



# BOEING

## *Design, Demonstration, Test and Evaluation*

- Spacecraft CST-100 Starliner
  - SC-1 – Pad Abort Test
  - SC-2 – Environmental Testing
  - SC-3 – Processing for OFT
- ULA Atlas V and Centaur launch vehicle systems in final testing
- Launch Abort Engine hot fire testing continues
- Parachute Systems Qualification and testing ongoing
- Boeing Mockup Trainer complete
- Crew training underway on spacecraft and suits
- Space Launch Complex-41 upgrades complete







# GOING FORWARD



**NASA, through the Commercial Crew Program,  
will continue to be the catalyst  
for the evolution of a new space age**

**We are on the cusp of a vibrant, new era  
in commercial spaceflight**

Industry will mature the environment, continue to advance capabilities and establish new markets while we collaborate with them to ensure:

- Industry-wide standards
- Uniformity and common interfaces
- Regulation clarity and consistence



