



The Space Congress® Proceedings

2018 (45th) The Next Great Steps

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1-ISS Utilization Panel - FA Commercial Crew

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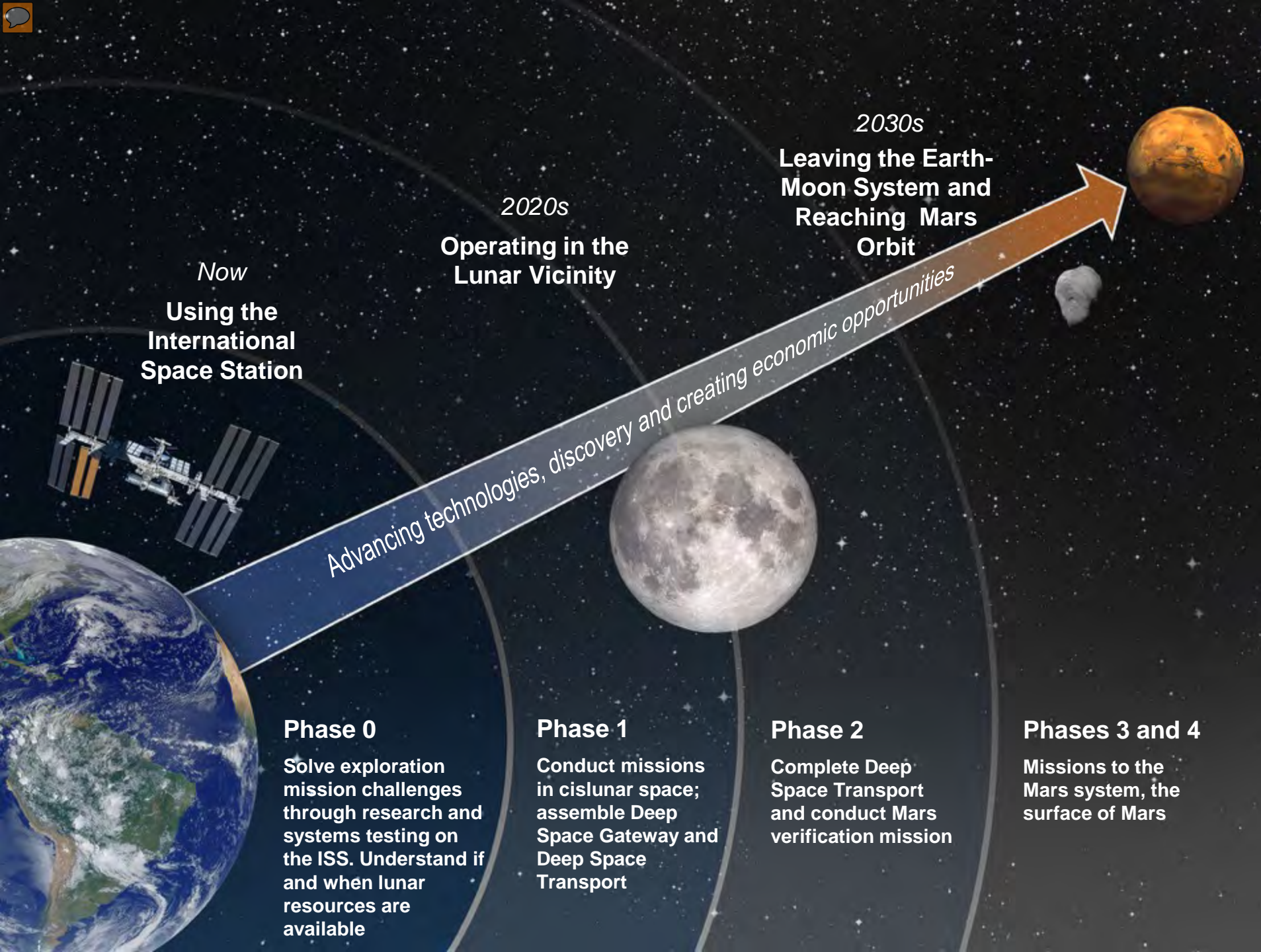
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Commercial Crew Program
Lisa Colloredo, Deputy Program Manager



NASA - Exploring Space in Partnership

Turning over low-Earth orbit astronaut transportation to **commercial companies** allows the agency to use other resources to develop the Orion spacecraft and Space Launch System rocket for missions into deep space



Commercial Crew Path

The vision of commercial human spaceflight to low-Earth orbit is a robust, vibrant enterprise with many providers and a wide range of private and public users



Industry Partnerships

Inter-Agency Collaboration

Mission Preparation

Hands-On Crew Cadre

*Enable
Commercial Space while
supporting
International Space Station
capabilities*



Industry Partnerships

*NASA **partners** with private industry and sets the safety and mission requirements*
*The companies **design, build, and own** their systems*

- **NASA works closely** with companies to develop and validate crew transportation systems that can safely, reliably, and cost-effectively carry humans to and from low-Earth orbit
- Companies **design** their transportation system to meet NASA's pre-determined set of **requirements**
- The companies are **encouraged** to apply their most efficient and effective manufacturing and business operating techniques
- This **partnership** approach allows insight into a company's development process and the agency's technical expertise and resources are accessible to partners



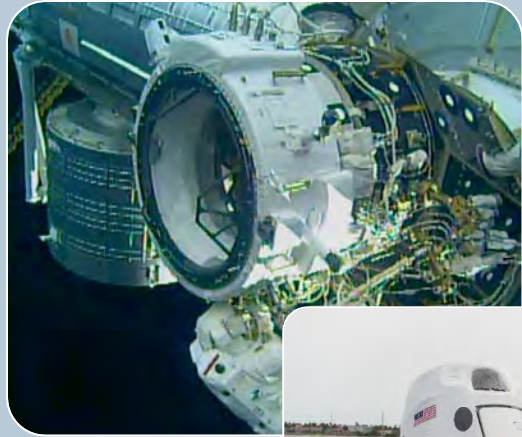
Inter-Agency Collaboration

Government agencies working together to execute the program model

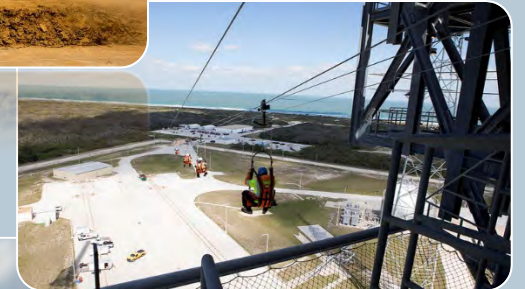
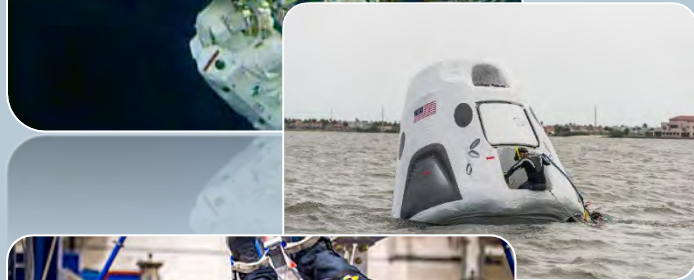


- Coordinating with the **FAA**
 - NASA/FAA Memorandum of Understanding
 - Cross waivers for government payloads
 - Government Astronaut
 - Licensing
- Working with **FCC** and **NTIA** on spectrum usage and authorization
- Working with **Air Force** and **Eastern Range**
 - Established the Launch and Entry Steering Group
 - Synergizing certification

Mission Preparation



- **On Station**
 - International Docking Adapter
 - C2V2
- **Planning and Training**
 - Joint Mission Planning
 - Ops Planning
 - Manifest Planning
 - Land/Landing Qual Testing
 - Water Rescue Training
- **Hardware**
 - Launch Pad Modifications
 - Spacecraft Production
 - Space Suits



Hands-on Crew Cadre

- Four **U.S. astronauts** assigned to train to fly initial test flights of America's first commercially built spacecraft
- Crew cadre working with commercial providers to help develop **spacecraft systems** and space suits
- Veteran astronauts working **side-by-side** with Boeing and SpaceX, assisting with testing and providing **best practices**



CCP Crew Cadre
Robert 'Bob' Behnken
Eric Boe
Douglas 'Doug' Hurley
Sunita 'Suni' Williams



2015

2016

2017

2018


2019

SPACEX

BOEING



Pad Abort Test



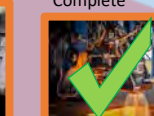
Processing Hangar Complete




Launch Site Review



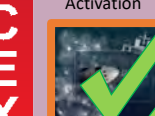
Avionics Test Bed Activation



Initial Propulsion Module Testing



Docking System Qualification Complete




CDR




Crew Insight and Feedback



Propulsive Landing Tests



First PCM Ordered



eKDP1



Astronaut Cadre Selected




Ordered PCMs 1 and 2



C3PF Complete



Flight Software Demo



Crew Access Tower Groundbreaking




Crew Access Tower and White Room Fabrication




Crew Training in Spacecraft Mock-Up



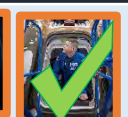
Checkout and Control Systems Activation




DM-1 Spacecraft Manufacturing




Spacecraft Qual. Testing



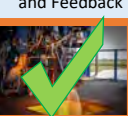
Crew Insight and Feedback




Parachute Testing



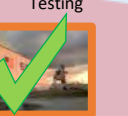
Integrated ECLSS Testing




Prop Module Testing




Spacesuit CDR



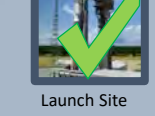
Launch Pad Modifications




Ordered PCMs 2-6



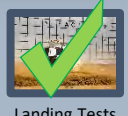
Annual Review



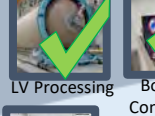
Launch Site Review




GVT/EQT TRR



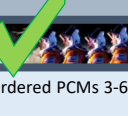
Landing Tests



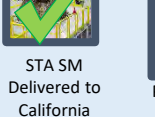
LV Processing



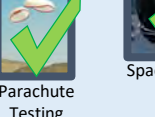
Boeing Mission Control Readiness



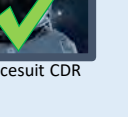
Ordered PCMs 3-6



STA SM Delivered to California



Parachute Testing



Spacesuit CDR



DM-1 Spacecraft Manufacturing



Crew Insight and Feedback



Parachute Testing Ongoing



LV Processing for Flight Tests



Prop Module Qual. Testing



Crew Training Ongoing



DM-2 Spacecraft Manufacturing



Annual Review



Parachute Testing Ongoing



Spacecraft 1 Power On



Flight Test Software Ongoing



STA Testing Ongoing



Pad EES Installed



Spacecraft 2 Manufacturing Ongoing



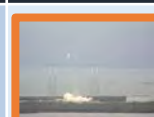
GVT/EQT Ongoing



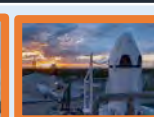
Crew Training Ongoing



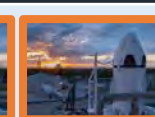
BP Trainer Delivery




In-Flight Abort Test



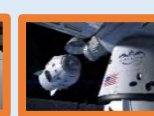
DM-1 Spacecraft



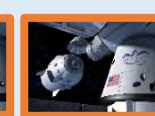
DM-2 Spacecraft




Crew Training Ongoing



DM-1



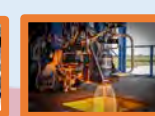
DM-2 Flight Test



Parachute Testing Ongoing



LV Processing for Flight Tests



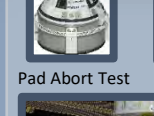
Prop Module Qual. Testing



Annual Review



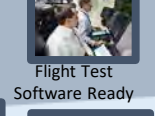
Flights to Station



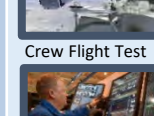
Pad Abort Test



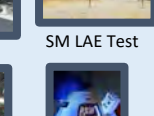
Orbital Flight Test



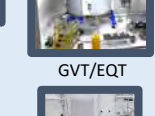
Flight Test Software Ready



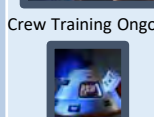
Crew Flight Test




SM LAE Test



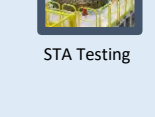
GVT/EQT



Crew Training Ongoing



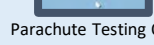
Spacecraft 2 Manufacturing



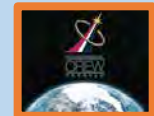
STA Testing




Spacecraft 3 Manufacturing



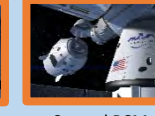
Parachute Testing Ongoing




Certification Review




First PCM




Second PCM




Agency Certification Approvals



Flights to Station



Certification Review



First PCM



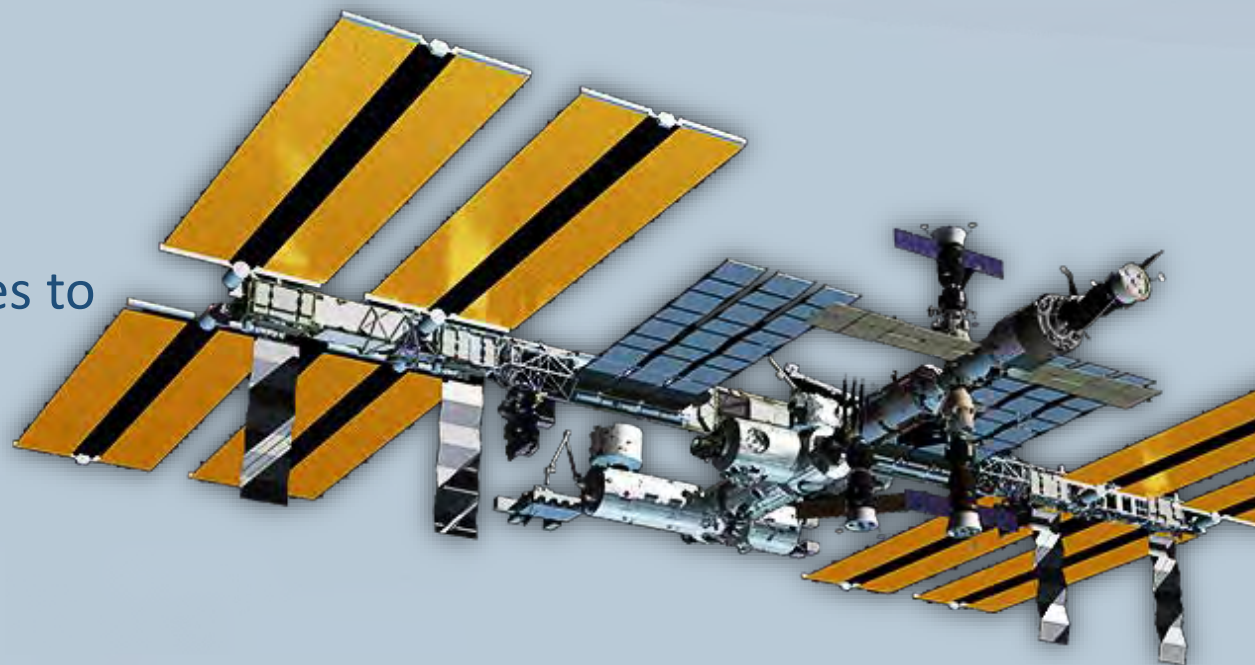
Second PCM



Looking Ahead

Planning and preparations for eight CCP missions are in the work

- **Boeing:**
 - Pad Abort Test
 - Orbital Flight Test (uncrewed flight)
 - Crewed Flight Test (crewed flight)
 - PCMs 1&2 - Completed eight milestones to date with more coming
- **SpaceX:**
 - Demo Mission 1 (uncrewed flight)
 - Inflight Abort Test
 - Demo Mission 2 (crewed flight)
 - PCM 1&2 - Completed five milestones to date, with more coming
- **Blue Origin:**
 - Launch Site Development - Milestones ongoing throughout the upcoming year
- **Sierra Nevada Corporation:**
 - Dream Chaser - Scheduled to complete three milestones under Space Act Agreement



To view video, see Media 1 on metadata page,
or <https://www.kaltura.com/tiny/pgujb>

