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## CST-100 STARLINER: Boeing's Commercial Crew Program

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**STARLINER**



# CST-100 **STARLINER**

**Boeing's Commercial Crew Program**  
John Mulholland,  
Vice President and Program Manager

2018 Space Congress

# SYSTEM DESIGN



## CST-100 Starliner Spacecraft

- Flight-proven systems with high-technology readiness level
- Re-usable crew module, expendable service module
- All test and flight spacecraft fielded or in build



## United Launch Alliance Atlas V Rocket

- 75 successes and counting!
- Proven rocket significantly reduces system risk; unparalleled schedule assurance; 100% mission success
- Human-rating of Space Launch Complex 41 at Cape Canaveral Air Force Station nearing completion



## Mission Operations

- Integrated with the world's experts on mission control: NASA Flight Operations Directorate



## Ground Processing Operations

- Commercial Crew and Cargo Processing Facility modernized at NASA's Kennedy Space Center
- Lean production based on Boeing's commercial approach
- Integration testing and quality processes based on space shuttle and International Space Station approaches



**BUILDING:** Flight crew modules and service modules in production at NASA's Kennedy Space Center.

**TESTING:** Subsystem and system testing at Boeing and supplier facilities across the U.S.

**TRAINING:** Mission simulations and training taking place at NASA's Johnson Space Center.

**INTEGRATING:** With NASA's existing operational model for spacecraft visiting the International Space Station.



**BUILD**

**TEST**

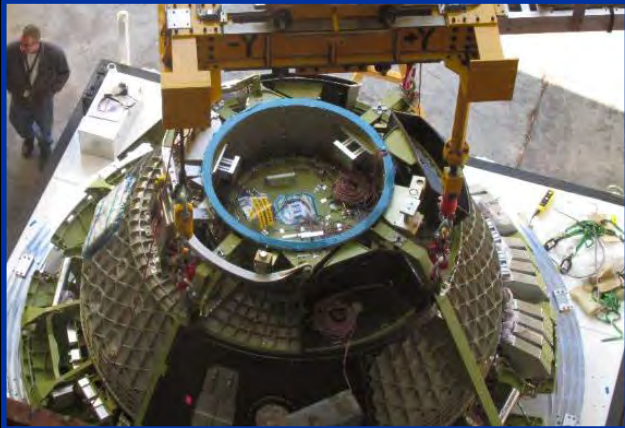
**TRAIN**

**INTEGRATE**



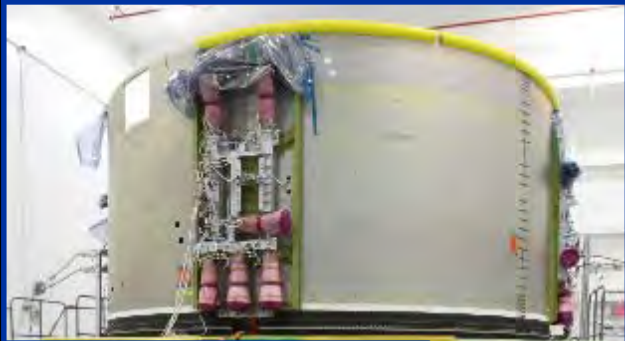


# SPACECRAFT INTEGRATED BUILD AND TEST



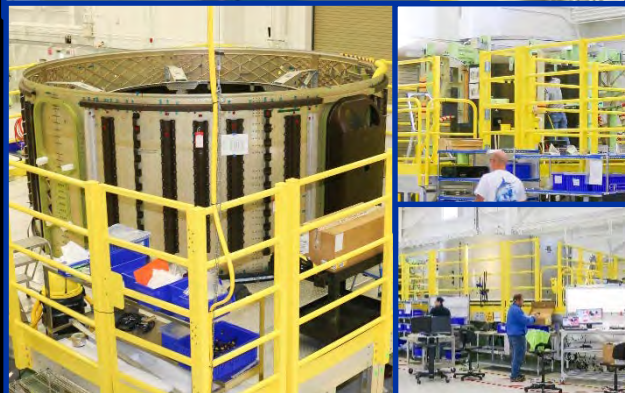
## Structural Test Article

- Modal survey; FEM validation
- Structural integrity
- Separation system performance



## Service Module Hot Fire Test Vehicle

- Demonstrate integrated propulsion system performance and system dynamics



## Three Flight Test Service Modules in Build



## Pad Abort Test Vehicle

- Ground Verification Testing
- Demonstrate the abort system performance



## Orbital Flight Test Vehicle

- Demonstrate complete orbital mission to International Space Station
- Processed for Post Certification Mission-1



## Crew Flight Test Vehicle

- Electromagnetic compatibility
- Thermal vacuum and acoustic environment
- Demonstrate complete orbital mission to International Space Station with crew on board
- Processed for Post Certification Mission-2



# LAUNCH VEHICLE AND INFRASTRUCTURE

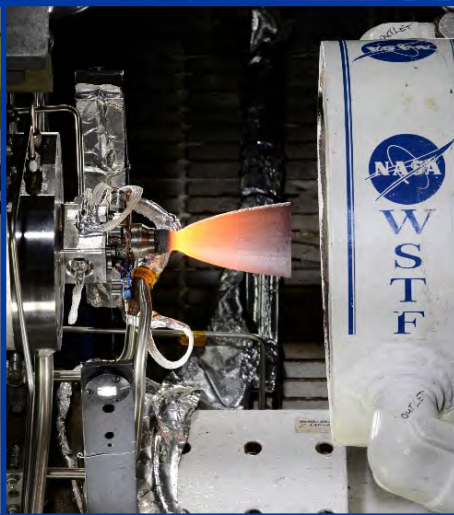
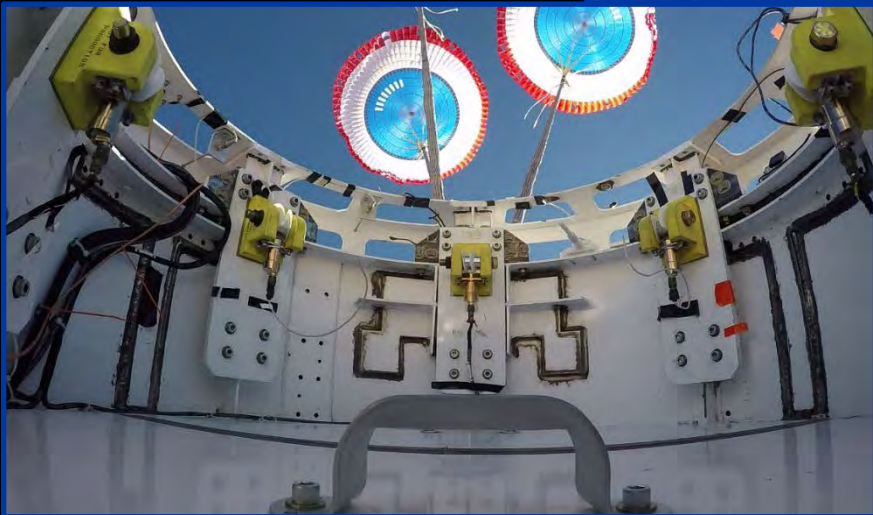
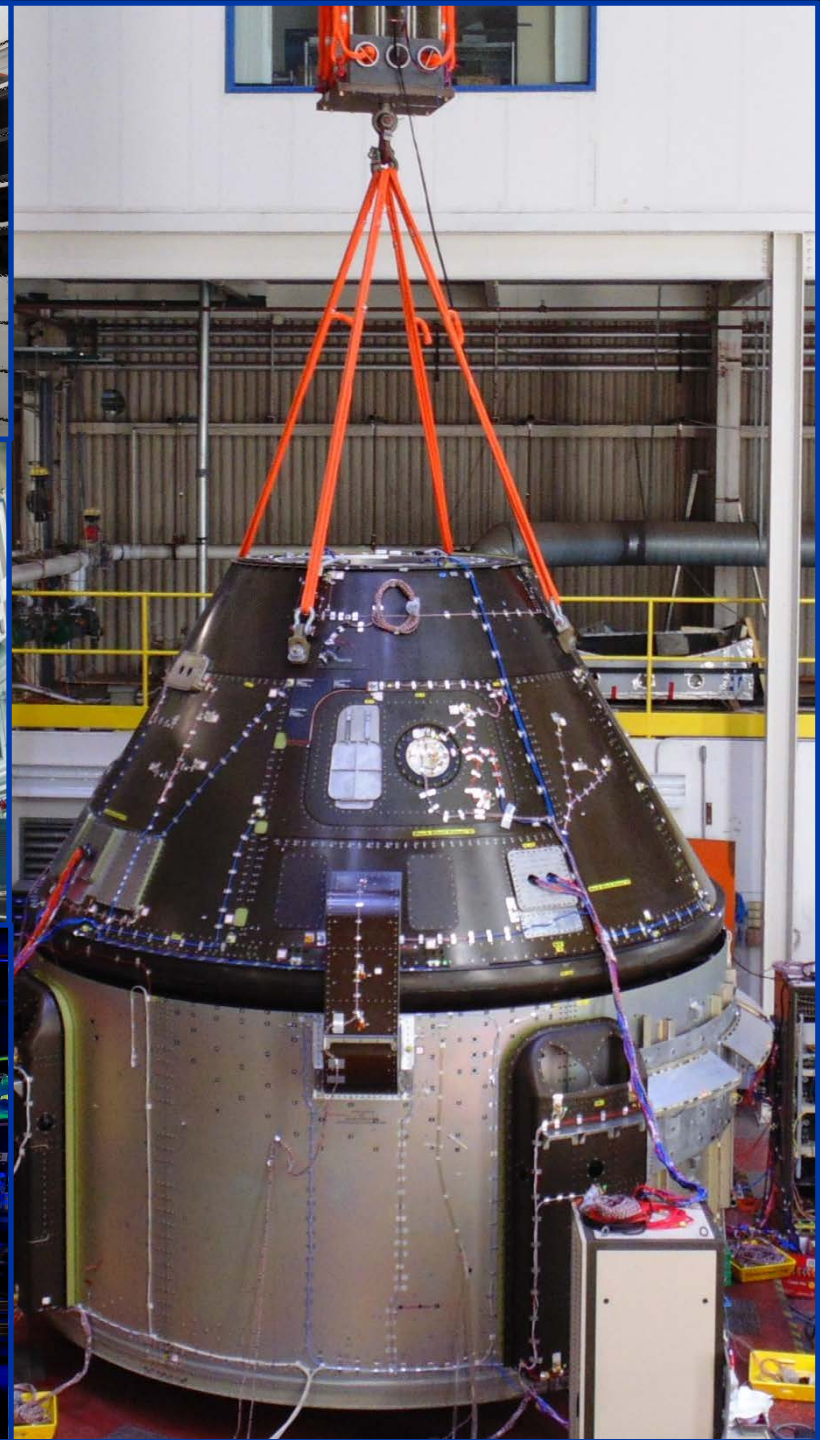
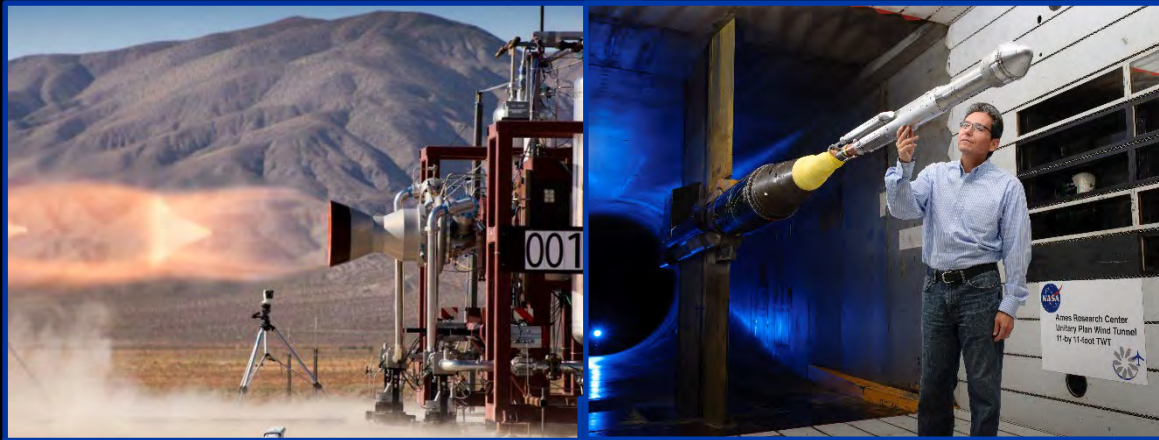
- Major components for test flights and missions in production
- Crew Access Tower, Crew Access Arm and Emergency Egress System installed at launch site





# TESTING

- Structural verification
- Wind tunnel
- Rescue and recovery
- Contingency water landing
- Land landing qualification
- Launch abort and reaction control system
- Parachute and deployment sequence
- Starliner docking system
- Autonomous docking and software





# TRAINING

- Rehearsal simulations of all mission phases with NASA Flight Ops and Astronaut Corps
- Spacesuit production and testing
- Training system development, installation and implementation
- Paper and on-console simulations





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FUTURE: Passenger flights to and from low-Earth orbit destinations, carrying international and corporate astronauts, scientists, researchers, educators and tourists







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