the space transportation system for a new generation of explorers
NASA’s Plan for Space Exploration

Safely fly the Space Shuttle and complete the International Space Station

Develop and fly the Orion crew exploration vehicle by 2015

Return to the moon by 2020

Promote international and commercial participation in exploration
Components of the Constellation Program

- Orion Crew Module
- Altair Lunar Lander
- Ares V Cargo Launch Vehicle
- Ares I Crew Launch Vehicle
- Earth Departure Stage
- Constellation Space Suit System
- Orion Crew Module

National Aeronautics and Space Administration
Launch Vehicle Comparisons

Saturn V
- Height: 361 ft (110m)
- 119 tons to Low Earth Orbit
- 45 tons to the moon

US Space Shuttle
- Height: 184 ft (56m)
- 25 tons to Low Earth Orbit

Ares I
- Height: 322 ft (98m)
- 22 tons to Low Earth Orbit

Ares V
- Height: 358 ft (109m)
- 175 tons to Low Earth Orbit
- 63 tons cargo to moon

Legend:
- Crew
- Lunar Lander
- S-IVB
  - 1 J-2 engine
  - 110 tons
  - Liquid Oxygen / Liquid Hydrogen
- S-II
  - 5 J-2 engines
  - 450 tons
  - Liquid Oxygen / Liquid Hydrogen
- S-IC
  - 5 F-1 Engines
  - 1770 tons
  - Liquid Oxygen / Liquid Hydrogen
- Upper Stage
  - 1 J-2X engine
  - 127 tons
  - Liquid Oxygen / Liquid Hydrogen
- 5-segment solid rocket booster
- Core Stage
  - 6 RS-68B engines
  - 1590 tons
  - Liquid Oxygen / Liquid Hydrogen
- 2 5.5-segment solid rocket boosters
- Earth Departure Stage (EDS)
  - 1 J-2X engine
  - 253 tons

National Aeronautics and Space Administration
Constellation Systems

ISS
Initial Capability

Moon
Lunar Capability

Ares I
Launch Vehicle

Launch Suit

Orion
Crew Vehicle

Ground
Operations

Mission Operations

Surface Systems

Ares V
Launch Vehicle

EVA

Altair
Lunar Lander

National Aeronautics and Space Administration
The successful test firing of the 5-segment Ares I solid rocket motor, Development Motor-1 (DM-1), was conducted September 10, 2009.

Engineers will use the measurements collected from 650 sensors to evaluate the performance of the motor.

Factors baselined in the test include:
- Acoustics
- Structural loading
- Internal pressure variations, plotted over the course of the burn
Status: Ares Parachute Drop Test
Status: J2-X Engine Test
Second Stage Engine for the Ares Rocket
Status: J2-X Engine Test
A-3 Test Stand – Transfer Docks Completed
Ares I-X Rollout
Ares I-X Launch
Ares I-X Launch
Orion Crew Module

Transport 4 crew on Orion for crew rotation

210 day stay time

Emergency lifeboat for ISS crew

Deliver pressurized cargo for ISS resupply
Status: Orion Crew Module
First Weld – Orion Ground Test Article
Status: Orion Crew Module

Post-landing Orion Recovery Test
Orion’s Launch Abort System provides a safe, reliable method to move the crew out of danger in the event of emergency.

**The Pad Abort 1 Test demonstrates:**

First in-flight of the Launch Abort System solid rocket motors, a coordinated operation

Parachute landing system

Successful pathfinder for Orion system integration and ground operations procedures
Status: Launch Abort System

Pad Abort Test 1 (PA-1)
Status: Launch Abort System
Crew Module Mockup being transported to White Sands for Pad Abort I Test
Constellation Space Suit System
Status: Suit Progress
Ground Operations

Processing and testing of launch vehicles
Launch and logistics services
Post landing and recovery services
GO Elements:
- Solid Rocket Processing (SRPE)
- Spacecraft Processing (SPE)
- Spacecraft Recovery & Retrieval (SRRE)
- Command Control & Communications (CCCE)
- Mobile Launcher (MLE)
- Vertical Integration (VIE)
- Operations Support (OSE)
- Launch Pad Element (LPE)
Status: Ares Firing Room
Status: Launch Pad 39B

Lightning Protection System for Ares/Orion Launches
Status: Launch Pad 39B
Conversion as the launch site for Constellation Program’s Ares I-X
Status: Ares Mobile Launch Platform

Construction is under way at KSC
Status: Ares Mobile Launch Platform
Construction is under way at KSC
Mission Operations

Operations infrastructure
- Facilities, simulators, trainers, workstations, networks, software, documentation

Operations products
- Flight procedures
- Flight rules

Operations Teams
- Mission Control Center
- Constellation Reconfiguration
- Constellation Training Facility
- Neutral Buoyancy Lab
- Space Vehicle Mockup

MO Elements
- Mission Control Center
- Constellation Reconfiguration
- Constellation Training Facility
- Neutral Buoyancy Lab
- Space Vehicle Mockup
Status: Virtual Mission
Lessons learned to refine processes for real Constellation missions
Status of Key ISECG Working Groups

NASA is leading a key ISECG working group, the International Architecture Working Group (IAWG)

NASA is Co-lead (with JAXA) of the ISECG International Objectives Working Group
Lunar Architecture Field Testing
2009 Desert RATS (Research And Technology Studies) activity
Lunar Architecture Field Testing
2009 Desert RATS (Research And Technology Studies) activity

National Aeronautics and Space Administration
The **Next** Giant Step

We must build to go beyond low Earth orbit.

We are designing new vehicles using lessons learned to minimize cost, technical, and schedule risks.

To reach for Mars and beyond we must first return to the Moon.

The team is making good progress.
We leave as we came and, God willing, as we shall return, with peace and hope for all mankind.

Eugene Cernan,
Commander of the last Apollo Mission