Deep Space Exploration Systems

EM-1 MISSION OVERVIEW
Exploration Systems Development
JOURNEY TO MARS

TECHNOLOGY

EXPLORATION

SCIENCE
JOURNEY TO MARS

HUBBLE SPACE TELESCOPE

INTERNATIONAL SPACE STATION

EXPLORATION

SCIENCE

TECHNOLOGY

COMMERCIAL CARGO AND CREW

MISSIONS: 6-12 MONTHS
RETURN: HOURS
EARTH RELIANT

NASA
JOURNEY TO MARS

- HUBBLE SPACE TELESCOPE
- INTERNATIONAL SPACE STATION
- SPACE LAUNCH SYSTEM
- ORBITERS
- LANDERS
- DEIMOS
- PHOBOS
- MARS TRANSIT HABITAT
- MARS TRANSIT HABITAT
- ORION CREWED SPACECRAFT
- DEEP SPACE HABITAT
- SOLAR ELECTRIC PROPULSION
- ASTEROID REDIRECT MISSION

MISSIONS: 6-12 MONTHS RETURN: HOURS
- EARTH RELIANT

MISSIONS: 1-12 MONTHS RETURN: DAYS
- PROVING GROUND

MISSIONS: 2-3 YEARS RETURN: MONTHS
- EARTH INDEPENDENT
ORION SPACECRAFT

LAUNCH ABORT SYSTEM
CREW MODULE
SERVICE
MODULE
SPACECRAFT
ADAPTER
JETTISON PANELES
SPACE LAUNCH SYSTEM
EM-1 is our first exploration mission in THE PROVING GROUND.

While far away, Mars is a goal within our reach. We are closer to sending humans on a journey to Mars than at any point in NASA’s history. We will journey in phases, leveraging our experience on the space station to step out into the Proving Ground—the volume of space around the moon featuring multiple stable staging orbits for future deep space missions.
EM-1 Vehicle Configuration

- **Core Stage and Vehicle Avionics**
- **Launch Vehicle Stage Adapter**
- **Orion Stage Adapter**
- **Launch Abort System**
- **Crew Module**
- **Service Module**
- **Interim Cryogenic Propulsion Stage**
- **Solid Rocket Booster**
- **RS-25 Main Engines**

### Configuration Tables

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>CONFIGURATION</th>
<th>SUPPLIER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Launch Abort System</td>
<td>Active Jettison Motor Inert Abort Motor</td>
<td>Lockheed Martin</td>
</tr>
<tr>
<td>Crew Module</td>
<td>Uncrewed</td>
<td>Lockheed Martin</td>
</tr>
<tr>
<td>Service Module</td>
<td>OSA LVSA</td>
<td>ESA</td>
</tr>
<tr>
<td>Adapters</td>
<td>OSA LVSA</td>
<td>NASA MSFC Teledyne Brown</td>
</tr>
<tr>
<td>ICPS &amp; Engine</td>
<td>ICPS (LOX/LH2) with RL-10B Engine</td>
<td>ULA Aerojet-Rocketdyne</td>
</tr>
<tr>
<td>Core Stage</td>
<td>LOX/LH2</td>
<td>Boeing</td>
</tr>
<tr>
<td>Core Stage Engines</td>
<td>Four RS-25’s Engines</td>
<td>Aerojet-Rocketdyne</td>
</tr>
<tr>
<td>Boosters</td>
<td>Two 5-segment</td>
<td>Orbital-ATK</td>
</tr>
</tbody>
</table>

**Specifications**

- Height: 322 feet tall
- Weight: 5.75 million pounds
- Thrust: 8.8 million pounds at lift-off
EM-1 Vehicle Integration at KSC
Although uncrewed, EM-1 will provide the first integrated test of SLS and Orion, including SLS’s launch performance, Orion’s heat shield, and deep-space navigation.
[EM-1 Mission Animation]
Importance of testing
# Building to Exploration Mission-1

Now until launch: 2016–2018

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Location</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/2016</td>
<td>Crew Module Pressure Vessel on Dock at Kennedy Space Center, FL</td>
<td>ORION</td>
<td>SLS</td>
</tr>
<tr>
<td>5/2016</td>
<td>Booster Qualification Motor 2 Test at Promontory, UT</td>
<td>SLS</td>
<td>ORION</td>
</tr>
<tr>
<td>9/2016</td>
<td>Crew Module Propellant Pressure Proof Test</td>
<td>ORION</td>
<td>SLS</td>
</tr>
<tr>
<td>12/2016</td>
<td>RS-25 Flight Engine Deliveries Complete to Michoud, New Orleans, LA</td>
<td>SLS</td>
<td>ORION</td>
</tr>
<tr>
<td>1/2017</td>
<td>European Service Module Delivery to Kennedy Space Center, FL</td>
<td>ORION</td>
<td>SLS</td>
</tr>
<tr>
<td>1/2017</td>
<td>Crew Module Initial Power On at Kennedy Space Center, FL</td>
<td>ORION</td>
<td>SLS</td>
</tr>
<tr>
<td>3/2017</td>
<td>Vehicle Assembly Building High Bay 3 Construction Complete</td>
<td>GSDO</td>
<td>ORION</td>
</tr>
<tr>
<td>3/2017</td>
<td>Launch Pad Flame trench Construction Complete</td>
<td>GSDO</td>
<td>ORION</td>
</tr>
<tr>
<td>5/2017</td>
<td>Mobile Launcher Ground Support Equipment Installation Complete</td>
<td>GSDO</td>
<td>ORION</td>
</tr>
<tr>
<td>7/2017</td>
<td>Crew Module and Service Module Mate at Kennedy Space Center, FL</td>
<td>ORION</td>
<td>SLS</td>
</tr>
<tr>
<td>8/2017</td>
<td>Core Stage Integration Complete at Michoud, New Orleans, LA</td>
<td>SLS</td>
<td>ORION</td>
</tr>
<tr>
<td>9/2017</td>
<td>Crew/Service Module Ship to Plum Brook Station for Thermal Vacuum Testing</td>
<td>ORION</td>
<td>SLS</td>
</tr>
<tr>
<td>10/2017</td>
<td>Core Stage Shipped to Stennis Space Center, MS</td>
<td>SLS</td>
<td>SLS</td>
</tr>
<tr>
<td>11/2017</td>
<td>Core Stage Green Run Hotfire Test at Stennis Space Center, MS</td>
<td>GSDO</td>
<td>SLS</td>
</tr>
<tr>
<td>1/2018</td>
<td>Booster Stacking in Vehicle Assembly Building</td>
<td>GSDO</td>
<td>SLS</td>
</tr>
<tr>
<td>4/2018</td>
<td>Core Stage stacking with Boosters in Vehicle Assembly Building</td>
<td>GSDO</td>
<td>SLS</td>
</tr>
<tr>
<td>6/2018</td>
<td>Orion mating with SLS in Vehicle Assembly Building</td>
<td>GSDO</td>
<td>SLS</td>
</tr>
<tr>
<td>8/2018</td>
<td>Wet Dress Rehearsal at Launch Pad</td>
<td>GSDO</td>
<td>SLS</td>
</tr>
<tr>
<td>11/2018</td>
<td>EM-1 LAUNCH</td>
<td>GSDO</td>
<td>SLS</td>
</tr>
</tbody>
</table>
Exploration Mission-1
LAUNCHING IN 2018
EXPLORATION MISSION 1

Download Video at

https://www.dropbox.com/s/gzcbjz060u2vyqa/EM1_Promo_SEQ_04_withTags_HiRes.wmv?dl=0