Return to the Moon

Jay Trimble
July 20, 2019
Apollo 11 50th Anniversary
1960's
NASA JSC Intern
NASA Johnson Space Center

1981
Space Radar Lab 1
NASA Jet Propulsion Laboratory

1989
Science Ops
Voyager Neptune

1994
Lead Ops Director
Space Radar Lab 1

Now
Lunar Rover MOM
HLS Operations
Lunar Catalyst

NASA Ames Research Center
50 Years ago today

Neil and Buzz took the first human steps on another world

Do you remember the moment?
Since that day in 1969

Robotic explorers have visited every planet in the solar system.
Since that Day in 1969

Spaceborne observatories have opened the universe to us

We have extended our senses farther than they’ve ever been, giving us new perspectives on our place in the Universe

However...
No crewed mission has left Earth orbit since the last Apollo mission, in 1972.
Our Best Days?

Apollo
A look back

Artemis
A look forward
May 25, 1961, a young president, John F. Kennedy, challenges the nation to do the impossible

“I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth”

When JFK challenged the nation, in front of the world, the United States total crewed space flight experience was 15 minutes
Mission Accomplished

July 20, 1969

American Astronauts walk on the Moon
Saturn 5
The Apollo Command-Service Module
The Apollo Lunar Module
Six Crews Explored the Surface

The first crewed lunar surface explorations, 1969 - 1972
What did we accomplish?

“We went there to find the Moon but instead we found the Earth” - Bill Anders, Apollo 8

The first Earthrise seen by human eyes, Christmas Eve, 1968
What did we accomplish?

Science, Knowledge, Perspective, Inspiration

Look up at the Moon, notice the heavily cratered areas vs. the sparsely cratered areas
The Way Back - Artemis

It’s time to return to the Moon, this time to stay.

Public-private partnerships

Robotic missions as early as next year

Human landings mandated by 2024
A New Way of Working

Commercial Lunar Payload Services

NASA buys a service

Building a commercial capability

Three winners selected for the first missions

Astrobotic, Intuitive Machines, Orbit Beyond

Astrobotic Peregrine Lander

Image Courtesy Astrobotic
An Artemis HLS Reference Architecture
Orion

- Flies the crew from Earth to the Lunar Gateway
- Crew capacity
- Mission duration
- Reuse
The Lunar Gateway will provide staging, logistics, launch flexibility and global lunar surface access for landings.
The Human Landing System

Picks up the crew at the Lunar Gateway and takes them to the lunar surface
The Human Landing System supports the crew on the surface and returns them to the Gateway.
Reuse

Apollo - each vehicle used once

Artemis - reuse, refueling, eventual use of in-space resources
Why Go Back?

Knowledge - Science, astronomy, resources

Perspective - I can blot out the Earth with my thumb, a multi-planetary species
Managing for Success

Failure is not an option

TRL

Risk posture and human behavior
The Light Speed Constraint

- Neptune: ~8 hours
- Jupiter: ~80 Min
- Mars: ~14 - 40 Min
- Earth-Moon: ~6 - 25s
Mission Control Famous Calls
Perspectives

Earth from the Moon

The Earth-Moon system

Pale Blue Dot

Earth from the surface of Mars

Earth from Saturn
Apollo 11 in real time -

Apollo 17 in real time -

images.nasa.gov

photojournal.jpl.nasa.gov

My favorite space movies and documentaries on Apollo

Apollo 11

Mission Control: The Unsung Heroes of Apollo

In The Shadow of the Moon

For All Mankind
Tours

Mission Control Restored