Destination Moon

Content Document
Destination Moon Objectives

1. Big Idea: Driven by imagination, science and politics, humans have explored the Moon.

2. Historical Argument: The Moon has always fascinated humanity. In the 1960s, building on thousands of years of imagination, an extraordinary combination of motivations, resources, and technologies made it possible for humans to go there. That journey changed our understanding of the Moon and ourselves forever. Exploration resumed in the 1990s with robots, for reasons quite different than during the Cold War. The Moon remains a destination for humanity, both in imagination and reality.

3. Section takeaways:
100: This exhibition tells the inspiring story of how we are exploring our nearest neighbor in space.
200: Humans have dreamed of travelling to the Moon for centuries, but in the 1950s, imagination, technology and Cold War politics began to make an age-old fantasy come true.
300: Driven by the Cold War and the Space Race, in May 1961 President John F. Kennedy challenged the United States to put a man on the Moon by the end of the decade.
400: Responding to President Kennedy’s decision was an enormous challenge, requiring NASA to make complex and managerial and technical decisions on how to go to the Moon.
500: Going to the Moon also required new astronaut equipment for spaceflight and training.
600: There were many steps on road to the first landing. When Apollo 11 succeeded, the whole world watched.
700: After Apollo 11, missions became increasingly complex. New samples and data transformed our understanding of the history of the Moon and the solar system.
800: Although the Cold War Moon race ended, humans continue to explore the Moon.
900: Repeats 100.

4: Educational objectives:
- Content will be presented in a multi-disciplinary approach that weaves STEM, history and culture and art together
- Content will be accessible to a variety of learning styles and preferences
- Visitors will be able to follow a series of STEM-focused “problem/challenge” labels that focus on a specific challenge and explain how NASA addressed it
- Content: Visitors will be able to say when US astronauts went to the Moon (which decades)
- Content: Visitors will understand that the Moon race was a result of the Cold War
- Content: Visitors will be able to articulate that the Apollo program was a massive national program that involved people across the country
- Content: Visitors will learn that humans have always been fascinated by the Moon and scientific research about it is ongoing

5: Visitor experience statement: Through a sensory experience rich in iconic artifacts, historical footage, compelling visuals, and dynamic digital interactions, visitors will uncover the stories behind humankind’s fascination with, and exploration of, the Moon.
DESTINATION MOON

Exhibit Outline

100 Destination Moon

For centuries, humans have dreamed of flying to the Moon. In 1959, our machines actually began to go there. A decade later, twelve humans walked on its surface. This exhibition tells the inspiring story of how we imagined and have explored our nearest neighbor in space. Special attention is devoted to how, in the 1960s, an extraordinary combination of motivations, resources, and technologies finally made it possible for humans to walk on the lunar surface and how, as a result, our understanding of the Moon, ourselves and our capacity to transform visions into reality was changed forever. Since 1972 the moon has been studied through remote instruments and unmanned spacecraft, with a range of possibilities for lunar and other space accomplishments open to future generations.

110 Earth’s Celestial Neighbor

The Moon is our planet’s only natural satellite. It is so large—a quarter the diameter of the Earth—that the two could be considered a double planet. It is large enough, and close enough, that its surface is visible to the naked eye. Its gravitational pull is the major influence on Earth’s ocean tides. Yet it is also far enough away—400,000 km or about a quarter of a million miles—to make it a distant world, a subject for mythology and imagination.

200 Fly Me to the Moon

The Moon has been central to mythology and religion as long as humans have gazed at the skies. Fictional lunar voyages go back two thousand years. But only in the mid-twentieth century did become possible to send our machines there. Imagination and Cold War politics combined to make an age-old fantasy come true. These are two of the answers to: Why go to the Moon?

210 Imaginary Moon Flights

At least since the Roman Empire, writers have imagined flying to the Moon, and what would be found there. But until the late nineteenth century, the purpose of such tales was satire or entertainment. Fanciful lunar inhabitants always hosted or attacked earthly visitors.

As knowledge of the Moon and of technology improved, such imaginary adventures began to incorporate more realistic dimensions, either in the destination or the mode of travel.
Objects: mutoscope machine with Méliès 1902 Moon movie, Goddard flash powder box

220 Selling the Moon

World War II saw the development of rocket technology, radar, atomic weapons and advanced materials. Of notable importance was the Nazi V-2 missile, which heralded a breakthrough in rocket technology. Suddenly, the possibility of a lunar flight seemed much more feasible. Spaceflight advocates set out to sell the public, and governments, on the idea of space travel. The Moon was a natural target—and a subject for a new wave of science fiction books, movies and TV programs.

Video excerpts: Méliès’ Voyage à la lune, Frau im Mond, Destination Moon and other lunar films

Objects: giant Bonestell Moon mural (1957) 10’ x 40’; 1950s space toys
The First Moon Race
The Soviet launch of two Sputniks in fall 1957 produced a space race. Newspapers and politicians demanded to know why the United States had not launched the first satellite. Among the ideas that arose immediately were proposals to send instrumented probes to the Moon as soon as possible to one up America’s enemy. Suddenly, decades of dreaming about going there began to come true, thanks to the Cold War.

In 1958-1959, both the U.S. and the Soviet Union launched spacecraft to the Moon; both eventually succeeded. But the Soviets were much more successful, only adding to the sense that America was behind.

Objects: Pioneer Lunar Orbiter, Soviet Luna 3 atlas
300 The Cold War and the Space Race

With nuclear war too horrible to imagine, competition between the United States and the Soviet Union took other forms. Space spectaculars became a symbol of national prestige and technical capability. Plans for human missions immediately followed the first satellites. In May 1961 President John F. Kennedy challenged the United States to put a man on the Moon by the end of the decade.

310 Humans into Space

When the Soviets orbited the dog Laika in 1957 on Sputnik II, it signaled their ambition to launch a human. Space advocates and science-fiction authors had always imagined people travelling there. Suddenly, with the Cold War space race, the superpowers were willing to throw large sums of money at the problem. The astronaut and cosmonaut became global symbols of their nations and the icons of the Cold War. The propaganda value of human spaceflight is another answer to the question: Why go to the Moon?

Objects: primate capsule, Vostok model, Gagarin memorabilia, Freedom 7, Shepard suit

320 The Decision to Go to the Moon

Within weeks of coming into office on January 20, 1961, President John F. Kennedy confronted several Cold War crises. Two motivated his decision to send humans to the Moon. On April 12, the Soviet Union orbited Yuri Gagarin, the first man in space. Five days later, a CIA-sponsored invasion of Cuba by exiles opposed to the Fidel Castro regime failed miserably at its landing place, the Bay of Pigs. The Kennedy Administration looked weak and needed to find new programs to assert American superiority.

Following the success of Alan Shepard’s Mercury flight on May 5, Kennedy went before Congress on the 25th and challenged the nation “before the decade is out, to land a man on the Moon and return him safely to the Earth.”

Object: Archival documents of Kennedy decision; SSB “Man in Space Report”
Video: Kennedy speeches 5/25/61, 9/62 (Rice)

330 Cold War America in the Early Sixties
The early space race took place against a background of Cold War tensions, nuclear fear and rapid social change. The conformist culture of the 1950s, induced by fear of Communism and the post-World War II economic boom, was wearing off. The civil rights movement, which aimed to give African-Americans the same rights and opportunities as other citizens, was gaining ground. Meanwhile, Cold War crises made the threat of nuclear war seem even more imminent, particularly during the Cuban Missile Crisis of October 1962.

Videos, photos, magazines, nuclear bomb effects computer
400 A Huge Challenge
The initial response to the Kennedy decision required decisions on how to land on the Moon, what spacecraft and boosters were needed to carry it out, and how to mobilize the nation’s aerospace industry to meet the enormous challenge of a human lunar landing in less than ten years.

410 How to Go to the Moon
Immediately after President Kennedy’s May 1961 speech, NASA was confronted with a critical decision: how to land on the Moon. There were several options, including assembling the spacecraft near the Earth, or having a separate lander that would separate in lunar orbit. Making this choice was essential: it could determine how many billions of dollars would be spent and the likelihood of beating the Soviet Union in the space race. The decision also determined what kind of rocket boosters and spacecraft the United States needed to do the job.

Objects: Houbolt letter, LM models

Interactive: the mode decision

420 Mobilizing the Nation
Meeting Kennedy’s challenge also meant mobilizing American industry. In only five years, NASA’s budget rose by a factor of five to nearly $5 billion. At its peak in 1965/66, 400,000 people were employed in agency programs, predominantly Apollo. About 95% of them were contractors at firms all over the country.

The huge expenditure of money had implications for American society as well. Notably in the South, the spending on Apollo coincided with the civil rights movement. Lyndon Johnson, as Vice President and then President, wanted to develop the South’s economy while undermining racial segregation and discrimination.

Interactive: Map interactive will allow visitors to view distribution of Mercury, Gemini, Apollo work around the nation and what was near them.

Objects: A collection of many small objects from different manufacturers in different states, foreign objects (Omega watches, Hasselblad cameras)
430  **Gemini**

Once NASA decided to how to land on the Moon, it needed another human program before Apollo to gain experience. Gemini had three main purposes: 1) develop techniques and equipment for walking in space; 2) perfect rendezvous and docking; and 3) understand the medical effects of human spaceflights of up to 14 days, the maximum length of a lunar mission. Without the ten Gemini missions that astronauts flew in 1965/66, the United States would not have landed on the Moon in that decade.

Objects: Gemini VII spacecraft, White Gemini IV helmet and Handheld Maneuvering Unit

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440  **Building a Giant Rocket**

To send humans to the Moon required a massive scale-up in rocket engines and vehicles. The Saturn V Moon rocket had 100 times the liftoff thrust of the Redstone used to launch Shepard on his 15-minute suborbital hop. To build that rocket required massive new facilities to test it and launch it. New launch pads, assembly buildings and test stands had to be built in Florida, Alabama, Mississippi, Louisiana and California.

Objects: F-1 engine display with mirrors (possibly hanging vertically), Bezos Apollo 11 F-1 objects, rocket model row, 1/34 Saturn V model with launch platform and tower
500 New Equipment and Skills

Meeting the challenge of Kennedy’s goal required the design and manufacture of the wide variety of equipment required to allow astronauts to live and work in space and building skilled crews on the ground to provide essential services and support.

510 Outfitting the Astronaut

One of the initial challenges of human spaceflight was to devise spacesuits to protect astronauts against extreme temperatures, radiation, and high-speed projectiles in space. The astronauts had to complete their work in new and unexplored environments. Experts from NASA its contractors had to translate knowledge of advanced aviation pressure suits into clothing that would protect the astronauts while allowing them to move and work effectively. They also had to develop an assortment of additional items for survival and comfort for daily life in space.

Featured locale: Dover, Delaware: ILC

Objects: worker memorabilia, ILC Sewing Machine (new loan) video interviews of workers, early aviation pressure suit (BFG Mark IV or DCC X-15), Mercury and Gemini spacesuits, early Apollo suit. Space food, survival kits, hygiene items, etc. Norman Rockwell painting “Suiting Up”

520 Simulation and Training

Simulated space missions were an essential tool for training, survival, and success of the Apollo program. Opportunity for actual practice missions in space was extremely limited. Astronauts and the entire mission control team used simulators to practice responding to every imaginable situation, with equipment failures and unexpected events programmed into the simulators by a
creative team of operators. The huge Apollo Mission Simulator system, for example, could provide realistic training for navigating to and from lunar orbit, landing on the Moon, rendezvous and docking, return to earth, and re-entry.

Objects: Control panel from Apollo simulator, star ball, mirror, model of Apollo “train wreck”

Interactive: Star Ball, removed from mount and allowed for remote operation by visitors.

530 Mission Control
The three astronauts on the lunar missions were a tiny fraction of the team required to successfully land on the Moon and return. Beginning with the Mercury program, NASA had gradually assembled a global tracking network to ensure that they knew where the spacecraft were during the missions. NASA engineers also developed the equipment, procedures, and computing power needed on the ground and in the spacecraft to carry out the mission. Mission Control would play a critical role, especially when things went other than planned. The rescue of Apollo 13 is featured in this section.

Objects: Gene Kranz vest, mockup of the lithium hydroxide canister solution for Apollo 13, Mitchell Jamieson painting “Houston”

540 The View from Space (Walk through Command Module replica)
Imagine what would come to mind seeing the Earth rise slowly in the distance over the forbidding lunar surface. Seeing the Earth from the low earth orbit of early human space flight
and beyond provided both the astronauts and those who followed their journey with an entirely new perspective.

600 Humans Reach the Moon

There were many steps (triumphs and tragedies) leading up the Neil Armstrong’s “One small Step...” declaration after stepping onto the lunar surface on July 21, 1969.

610 The Fire and the Early Apollo missions

The fatal fire of Apollo 1 on Jan. 27, 1967, killed three astronauts. As the nation mourned, engineers went to work redesigning the Command Module. They had to design a hatch that would allow the astronauts to escape in an emergency and make the craft fireproof. All this work set the program back and threatened getting a man on the Moon in time. In the end, the design changes were crucial to making the Moon landing possible. In late 1968 and early 1969, four key missions proved that the hardware was finally ready.

Objects: Block I (pre-fire) hatch; Apollo 11 hatch, Apollo 8 artifacts
Finding a Landing Site

Before the Apollo spacecraft could take astronauts to the Moon, planners needed to understand the Moon’s surface and find suitable landing sites. The unmanned Ranger, Surveyor, and Lunar Orbiter programs provided increasingly detailed information about the lunar surface from 1964 to 1968.

The Whole World is Watching!

Ordinary Americans experienced the Moon landing primarily in their own homes through their television sets. At the same time, Americans were witnessing fiery scenes of urban unrest, assassinations, and the Vietnam War in unprecedented visual detail. With all this going on, some people felt that landing on the Moon was extravagant, but many others believed it saved the decade.

First Moon Landing

On July 21, 1969, astronaut Neil Armstrong became the first human being to step onto the surface of another world. The symbolic and human importance was earthshaking. The steps, the words, the equipment, and the procedures remain an inspiration today to do things never done before.

Command Module Columbia

NASA engineers selected Command Module 107, which the astronauts named Columbia, for the Apollo 11 mission. In July 1969, Apollo 11 met President Kennedy’s challenge from 1961 of “landing a man on the moon and returning him safely to the earth” before the end of the 1960s. Columbia is the only portion of the historic spacecraft to survive that momentous mission. Following a triumphant 50 state tour for millions of Americans to see it, NASA gave Columbia to the Smithsonian Institution in 1970 to preserve it and display it to the public.
Interactive Using CyArk funded 3d interior image: Explore the interior of the actual Apollo 11 Command module. Clicking on lockers will reveal a list of what was stowed in them at launch.

642 **Neil Armstrong’s Spacesuit**

These are the major components of Neil Armstrong’s A7-L spacesuit that allowed his to be the direct human to roam freely on another world. This spacesuit is a complex machine comprised of natural and synthetic textiles and metals that kept an artificial atmosphere inside and protected Armstrong from wide variations in temperatures, radiation and fast travelling particles while he worked on the barren surface of the Moon.

643 **Landing on the Moon**

**Lunar Module Cockpit**  This LM training cockpit was used by Astronauts and Technicians at the Grumman facility on Long Island. The right window displays the actual film of the historic landing taken from the LM window. The right window shows a modern recreation of that landing as seen by LM Commander Neil Armstrong based on high resolution images taken from orbit in 2012 by the Lunar Reconnaissance Orbiter Spacecraft.
Destination Moon outline, 7/24/14

Objects: DAC Camera mounted in Right Window; Right window display (enhanced video of final landing sequence as filmed by the LM DAC. Left window display: Synchronized high def modern recreation of landing as seen by Armstrong based on LRO images

650 Apollo 11 World Tour

While Columbia toured the United States, the three astronauts of the Apollo 11 mission went on a world tour, visiting cities on every continent except Antarctica. The people of the world received them, not as representatives of American technological power, but as humanity’s heroes.

Objects: Commemorative items given to the astronauts from around the world.
700 Apollo Explores the Moon

With the safe return of the Apollo 11 astronauts, President Kennedy’s goal was formally accomplished. However, NASA continued with its program of lunar exploration, with five more missions successfully landing astronauts on the lunar surface before the end of 1972. These missions were increasingly complex and scientifically and technically sophisticated. They provided a rich harvest of scientific information and experience with the promise and possibilities for human exploration beyond Earth.

710 Going Back to the Moon

Even before Apollo 11 successfully landed on the Moon, NASA planned for three additional missions. The "H" missions (Apollo 12, 13, and 14) would be missions to other landing sites using equipment similar to Apollo11. In addition to samples from a variety of geological areas, NASA had to demonstrate that crews could achieve pinpoint landings, and that astronauts could work a full day in the stiff suits and walk several kilometers in the lunar dust.

Objects: Surveyor 3 camera recovered by Apollo 12 crew, an assembled Mobile Equipment Transporter (wheelbarrow) with Lunar selection of tools and equipment used on Apollo 14.

720 Apollos 15 to 17: Extending Lunar Exploration

Following Apollo 14, three more missions successfully landed on the Moon. These “J” missions (Apollo 15, 16, and 17) would be visits to the Moon, on which the astronauts traveled much further distances on the lunar surface for scientific research. Substantial design changes to the Lunar Module made it possible to bring a Lunar Roving Vehicle and other more sophisticated equipment. With Lunar Roving Vehicles at their disposal, each of the J-mission crews would visit a variety of geologic features, collect far greater quantities of rock and soil than walking astronauts could hope to carry, and use an impressive number of tools. While the astronauts performed experiments on the Moon’s surface, the Command and Service Modules that remained in lunar orbit used sophisticated cameras and instruments to study the Moon from above.
Objects: Lunar Roving Vehicle 1-G trainer

730 Selecting Landing Sites

An interactive unit that will describe the criteria used in selecting landing sites and comparing the amount of lunar surface covered by each mission. Use will be made LRO images of the Apollo landing sites and overlays on the national Mall to make clear the relative distances involved.

740 Apollo Stories

A carefully selected set of episodes from Apollo landing missions will be described along with illustrative artifacts. The episodes will be selected on the basis of the richness of available artifacts, how well they illustrate the human factors involved in extraterrestrial exploration, and the scientific knowledge and technical advances associated with the Apollo program.
750  Alone in Lunar Orbit
Similarly (to section 730) two or three episodes experienced by the command module pilot and solo orbit around the moon will be selected to illustrate orbital science and the human story of one man alone during one of history’s most thrilling adventures. The Service Module was also fitted with extremely sensitive cameras which, operated by the command module

750  Lunar Samples and the Story of the Moon
Lunar samples and data from Apollo transformed our understanding of the Moon and the solar system.

Objects: 3 Lunar rock samples

On east wall above: Giant photographic mural from Apollo 17, 10’ x 40’, mirroring the Bonestell Mural on the other end of the gallery

800 Return to the Moon
After the Cold War Moon race ended in the mid-1970s, no spacecraft were sent for eighteen years. Yet human fascination with the Moon has continued. Beginning in the mid-1990s, robotic exploration began again. Both science and preparing for possible future human exploration have motivated our return.

810  The Legacy of the First Moon Race
In December 1972 the Apollo program ended. The last Soviet robotic mission came back in 1976 with another small sample. This section will explore why the two nations stopped going to the
Moon, why no humans have been there since Apollo 17, and what Apollo’s culture and inspirational legacy was.

Objects: MTV Moon Man statue and other cultural artifacts, Soviet 1970s robotic lunar artifacts?

820 Lunar Exploration since Apollo
Exploration of the Moon began again with the Clementine mission in 1994. Since then many nations have sent spacecraft back, including the United States, China, India and Japan. Plans continue for a possible human return to the Moon in the 2020s.

Object: Clementine or Lunar Reconnaissance Orbiter spacecraft hanging above, Google Lunar X Prize artifact, models of Orion spacecraft, SLS booster, or other artifacts from the program.

830 The Moon Today
Electronic monitors will allow updates on contemporary lunar travel missions, such as LRO photography and science results, international missions, Google Lunar X lander results and plans for an Orion mission to lunar orbit by American astronauts.

900 Destination Moon
The east entrance will have essentially the same main label as the west entrance, but it will be tweaked to reflect that visitors will be entering from the perspective of contemporary lunar exploration and seeing the exhibit in reverse chronological order.