

NASA and Space Exploration: A Journey through the Solar System



Recap from Last Week

- Space begins at roughly 50 miles, but there is no clear boundary.
- The United States and the Soviet Union compete to have the most advanced spaceflight technology. This was the space race.
- You learned about Laika, and Yuri Gagarin.
- NASA had project Mercury and Gemini which brought humans into space.
- Who has watched The Right Stuff?



The Apollo Missions

Car!



The first car was brought to the moon with Apollo 15

This image is not from the first moon landing, why do we know this?

First Humans on the Moon

This picture was taken after they already walked on the moon



This is Buzz Aldrin, the second man on the moon



First Human on the Moon

The quality of this image is so bad because it was taken from a small camera outside the lander.

Also, this is how cameras looked in 1969



Neil Armstrong taking his first step on the moon





The Apollo Program

- The Apollo program started in 1960 with the goal of bringing the first man on the moon.
- There are 17 Apollo missions
 - 6 Landed on the moon
- In this lecture will focus on these 4 missions:



Apollo 1



First Apollo mission

Apollo 7



First time using the Saturn V rocket

Apollo 11



First human on the moon!

Apollo 13



Houston

Apollo 1 - The First Crewed Mission



- The goal of Apollo 1 was to test the rocket by flying into a low Earth orbit.
- A fire broke out during a launch rehearsal because they used only oxygen in the cabin.
- This failure highlighted many mistakes in the current design which needed to be corrected.
- Learning from this mistake, all other missions had strong safeguards.
- Apollo 2, 3, 4, 5, and 6 had no humans on board.



Apollo 7 - Testing the Saturn V



- The first Saturn V was launched in 1967
- Apollo 7 was the first manned flight using the Saturn V rocket.
- Apollo 1 used a Saturn I rocket.
- Saturn 2, 3, and 4 were never built.

Lunch of a Saturn V rocket



Image credit: NASA

A photograph of a Saturn V rocket launching from the launch pad. The rocket is white with black and red markings. A large plume of white smoke and yellow fire is visible at the base. To the left of the rocket is a red service structure. The background is a clear blue sky and a green field.

Saturn V

Apollo 7 - Testing the Saturn V



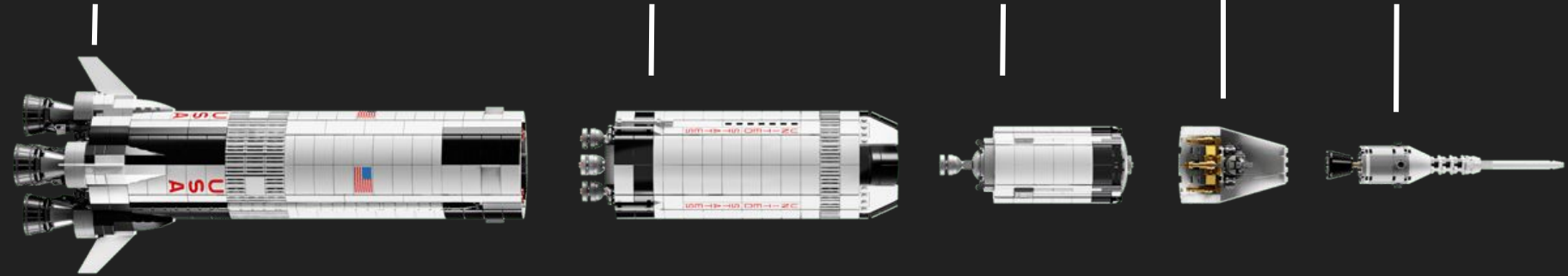
Around the Moon

Getting off the Ground

Into Earth orbit

To the Moon

Back to Earth



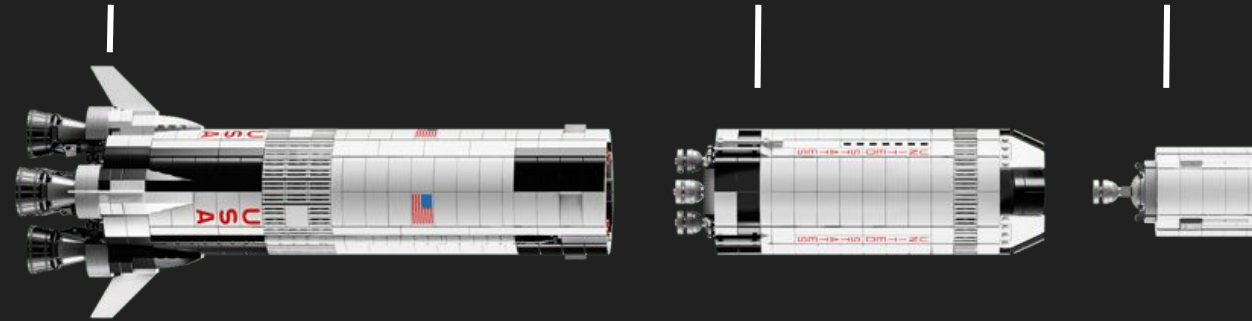
- The first Saturn V has 5 stages which are labeled above
- The rightmost stage is the first, the leftmost is the last.
- The image shown here is from a LEGO set!

Apollo 7 - Testing the Saturn

Getting off the Ground

Into Earth orbit

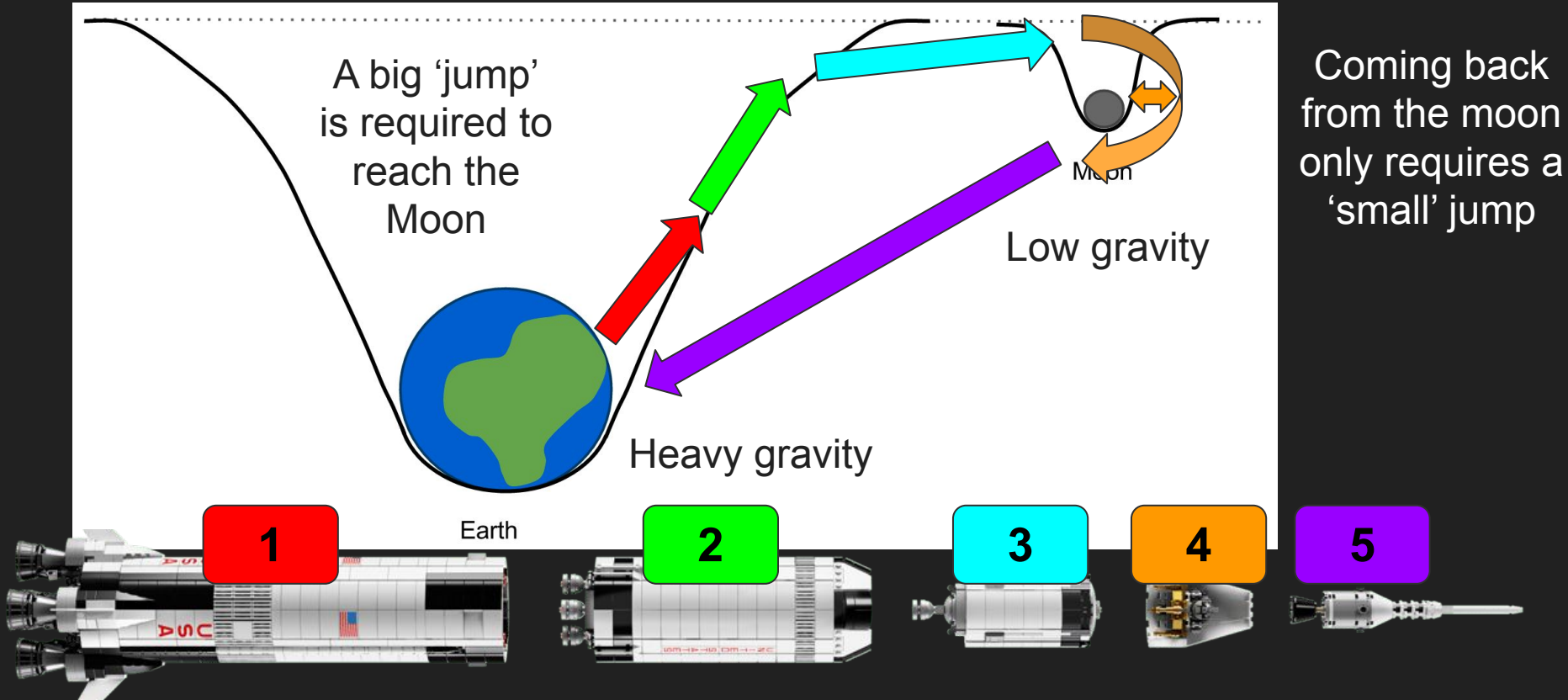
To the Moon



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Apollo 7 - Testing the Saturn V



Apollo 7 - Testing the Saturn V



- The first Saturn V was launched in 1967
- Apollo 7 was the first manned flight using the Saturn V rocket.
- It takes the most fuel to get off the ground
- It takes a lot of fuel to get into Earth orbit
- It takes less fuel to get to the Moon
- It takes a little bit of fuel to go back to Earth
- The last Saturn V was launched in 1973

Lunch of a Saturn V rocket



Image credit: NASA

Apollo 11

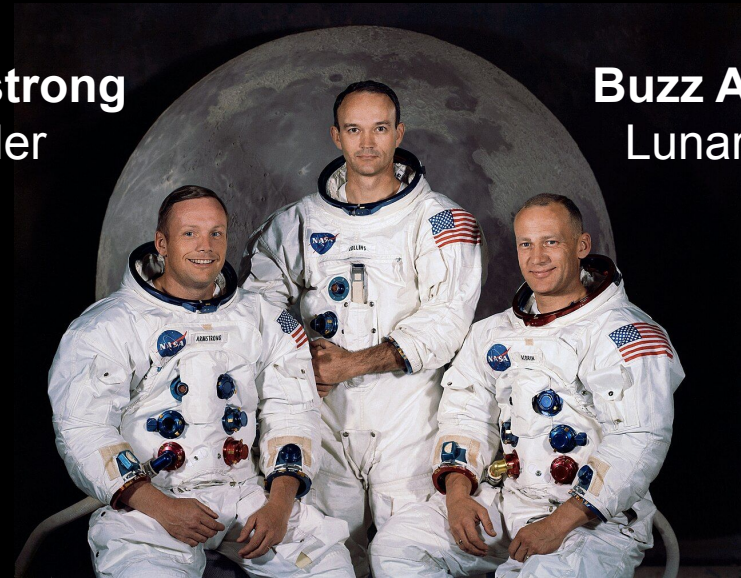


- Apollo 11 launched in 1969
- Onboard were:

Michael Collins
Module Pilot

Neil Armstrong
Commander

Buzz Aldrin
Lunar Pilot



Apollo 11



- Apollo 11 launched in 1969.
- Onboard were: Neil Armstrong, Buzz Aldrin, and Michael Collins.
- The command Center is in ???

Houston Texas!

Apollo 11



- Apollo 11 launched in 1969.
- Onboard were: Neil Armstrong, Buzz Aldrin, and Michael Collins.
- The command Center is in Houston TX and can be visited!
 - They show what happened during the moon landing!
- It took 4 days to reach the moon.
- Apollo 11 arrived on the 20 July 1969.
- Next Tuesday, this will be 57 years ago.



Image credit: NASA

Apollo 11 - The Landing



Apollo 11 - The Lander



Apollo
**Lunar
Module**
Inside



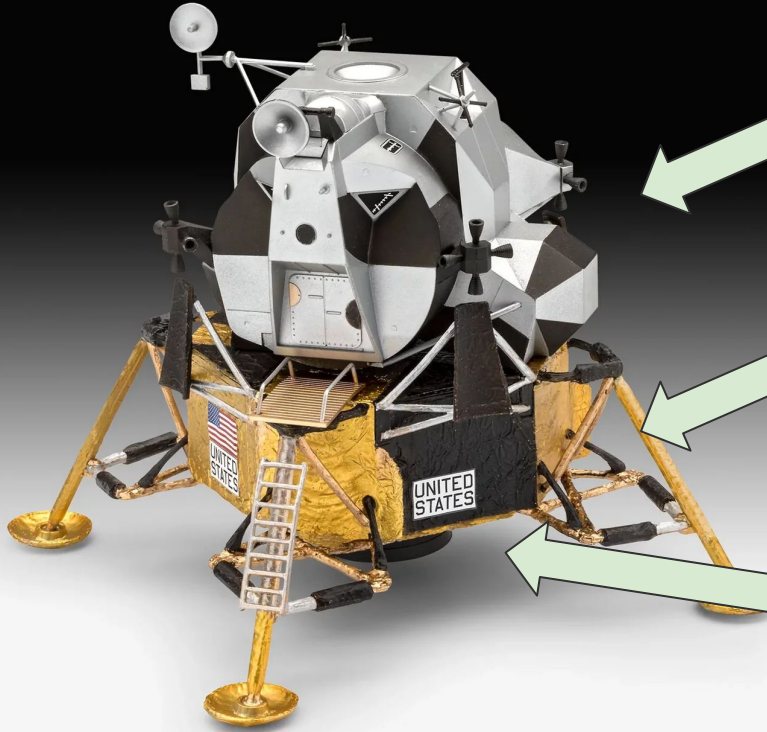
Apollo 11 - The Lander



Cabin for the Astronauts

Legs to land on uneven surfaces

Rockets to slow the fall

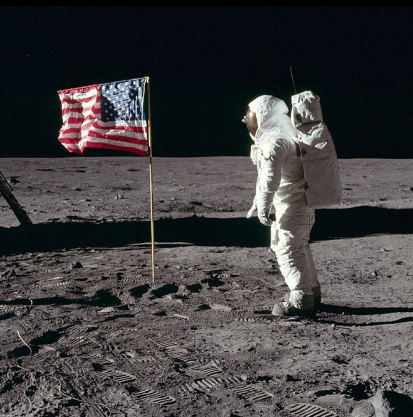


Apollo 11 - First Human on the Moon



- 7 hours after landing, Neil Armstrong step onto the Moon
- Neil and Buzz stayed on the Moon for 2 hours and 31 minutes
- They collected 47 lbs of stones (one full checked bag at the airport!)

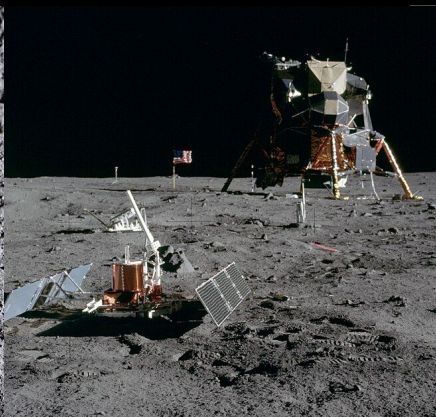
Buzz on the Moon



Footprint of Buzz



Lunar lander



Neil's first step onto the Moon



Apollo 11 - Back to Earth



- It took 4 days to return to Earth.
- The astronauts fell back onto earth with a capsule and large parachutes
- The capsule landed in the pacific ocean because it is far away from land.
- The astronauts were quarantined for 21 days to make sure no life form on the moon reaches earth

The heat shield protects the astronauts



The parachutes ensure a soft landing



Landing in the ocean is softer than on land



Apollo 13



Which line made Apollo 13 famous?

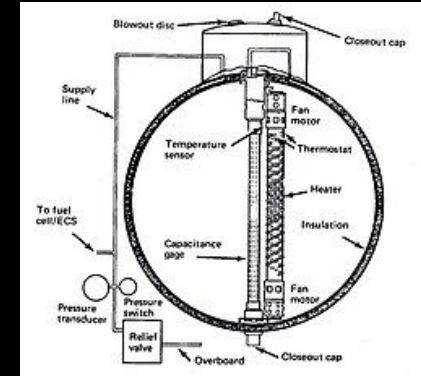
Houston, we have a problem

Okay, Houston, we've had a problem here

Houston, we have a Problem



- The astronauts heard a loud bang
- After the bang, the electricity became weaker
- The spaceship was losing fuel
- The only goal was getting the astronauts home
- The original plan was to turn around if anything goes wrong.
- There was not enough fuel left to do this.
- So what's the solution?
 - Use the Moon as a slingshot!



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DIRECT RETURN MODE FOR TL COAST

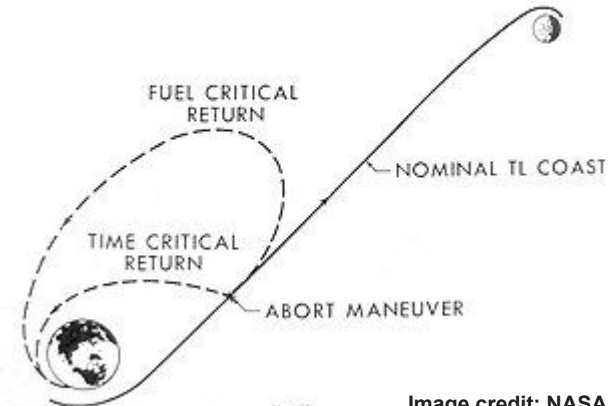


FIG. 20

Image credit: NASA

Apollo 13

- The crew used the lander as a lifeboat, but it did not have enough Air so they also used the control module.
- They used duct tape to improvise an air filtration system.
- It got as cold as 38 F
- The crew made it back in four days.
- The crew landed safely in the pacific ocean.

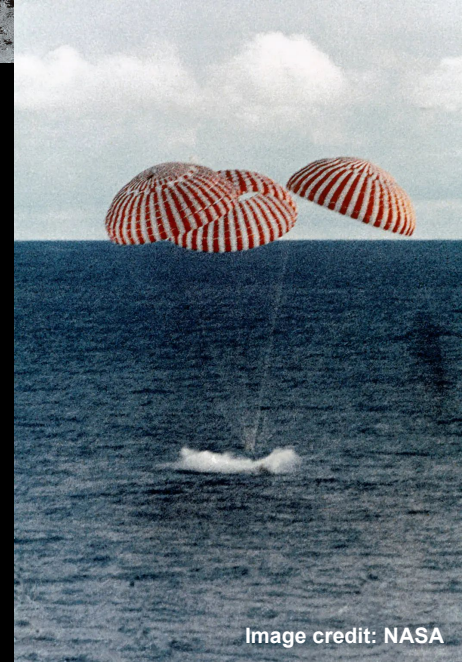
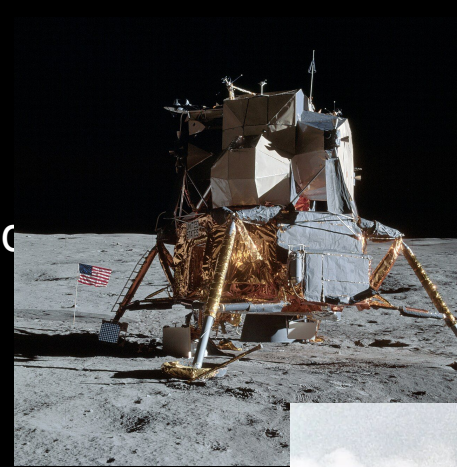
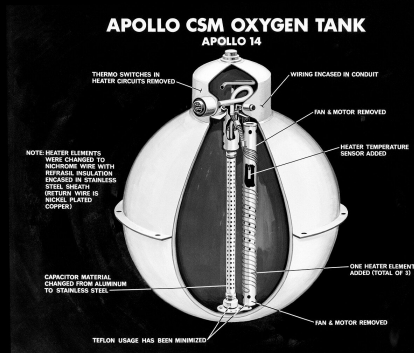


Image credit: NASA

Apollo 13 - The Movie

- If you want to have a dramatic telling of the events around Apollo 13, watch the movie!
- And of course: Astronauts learn from mistakes!
- They improved the oxygen tank so this mistake will not happen again



Apollo 12, 14, 15, 16, and 17



- The first Golf swing in space (Apollo 14)
- First car on the Moon (Apollo 15)
- Longest Moonwalk (22 hours, Apollo 17)
- A total of 842 lbs of rocks were brought back!
- 6 different landing sites were explored

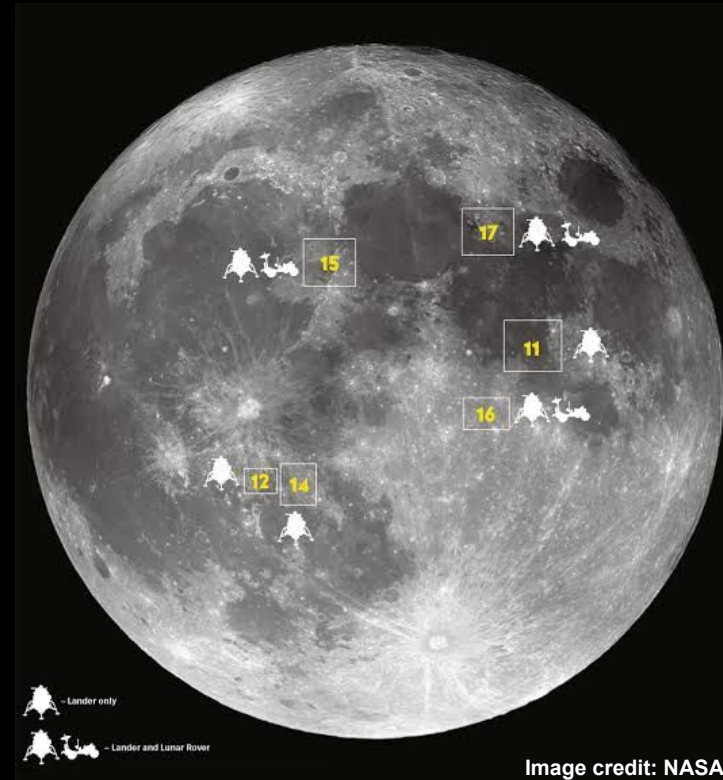
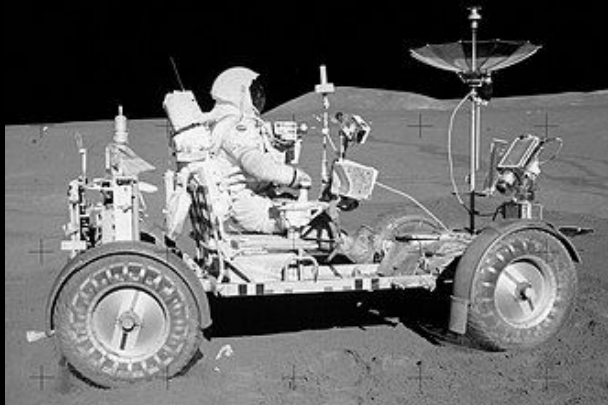


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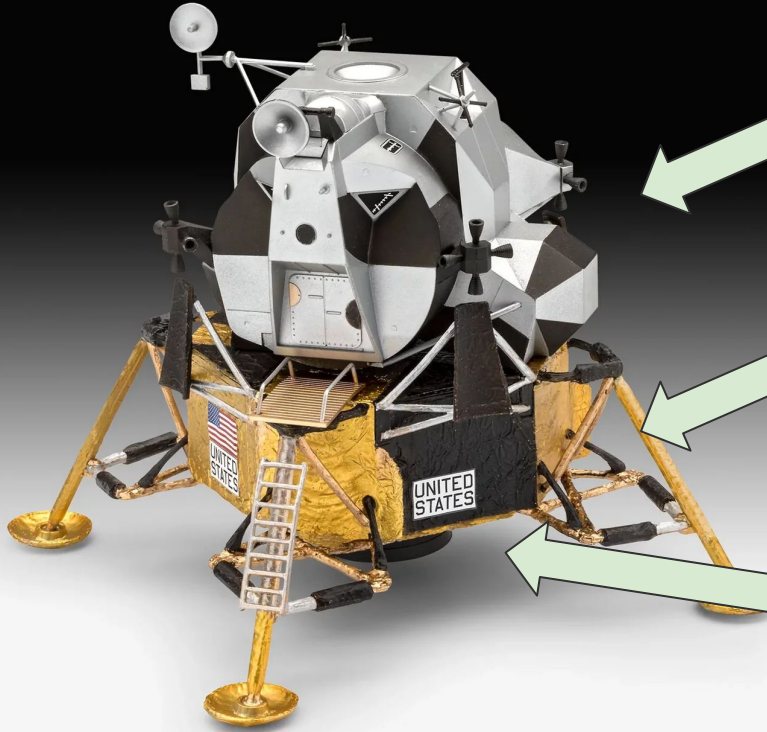
Apollo 11 - The Lander



Cabin for the Astronauts

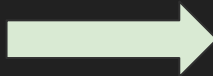
Legs to land on uneven surfaces

Rockets to slow the fall



Today's Activity: Build a Lunar Lander!

- Pick an egg. This is your crew that needs to land on the moon.
- The goal is for the crew (the egg) to not break
- After you built your lander, we will drop it from increasing height
- People online, work together with a volunteer to build a lander



Bonus: Walking on the Moon is hard

