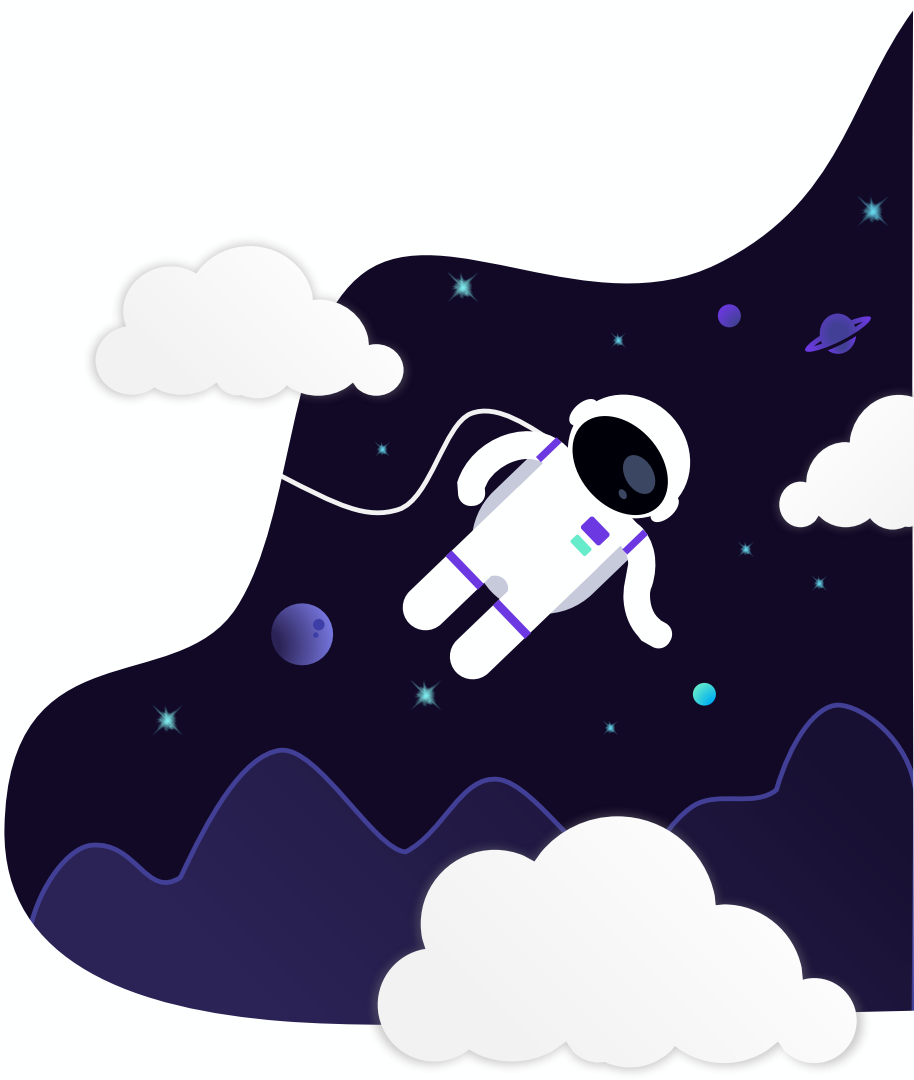
History of Space Exploration



What do you already know about space exploration?

Intro to NASA

https://vimeo.com/54683000

Happy unofficial NASA Day!

NASA

National

Aeronautics

(and)

Space

Agency

- *“An Act to provide for research into the problems of flight within and outside the Earth’s atmosphere, and for other purposes.”*
- Created by an act of Congress on October 1, 1958
- Basically to make the Russians mad and scared of us

What does NASA do?

Pretty much anything to do with airplanes, space or technology

- Satellites
- Weather
- Probes
- The solar system
- Sending humans into space
- Air travel
- Research into new technologies
- Etc.
- And yes, they literally search for aliens

I don’t care about space. What has NASA done for me?

- CAT scanners
- Computer microchips
- Cordless tools
- Ear thermometers
- Freeze-dried food
- Insulation
- Invisible braces
- Enriched baby food
- The joystick
- LED lights
- Memory foam
- Scratch resistant lenses
- Shoe insoles
- Smoke detectors
- Solar energy
- The swimsuit material
- The water filter
- Land mine removal
- The super soaker
- Flame-resistant textiles
- Work-out machines
- Long distance communication
- Highway safety grooving
- And a lot more....

NASA’s Spaceflight Programs

Mercury

From 1958 to 1963 with the mission to put man into Earth orbit and return him safely (ideally before Russia does it)

Gemini

From 1965 to 1966 with the mission of developing techniques for space travel and to support Apollo missions

Apollo

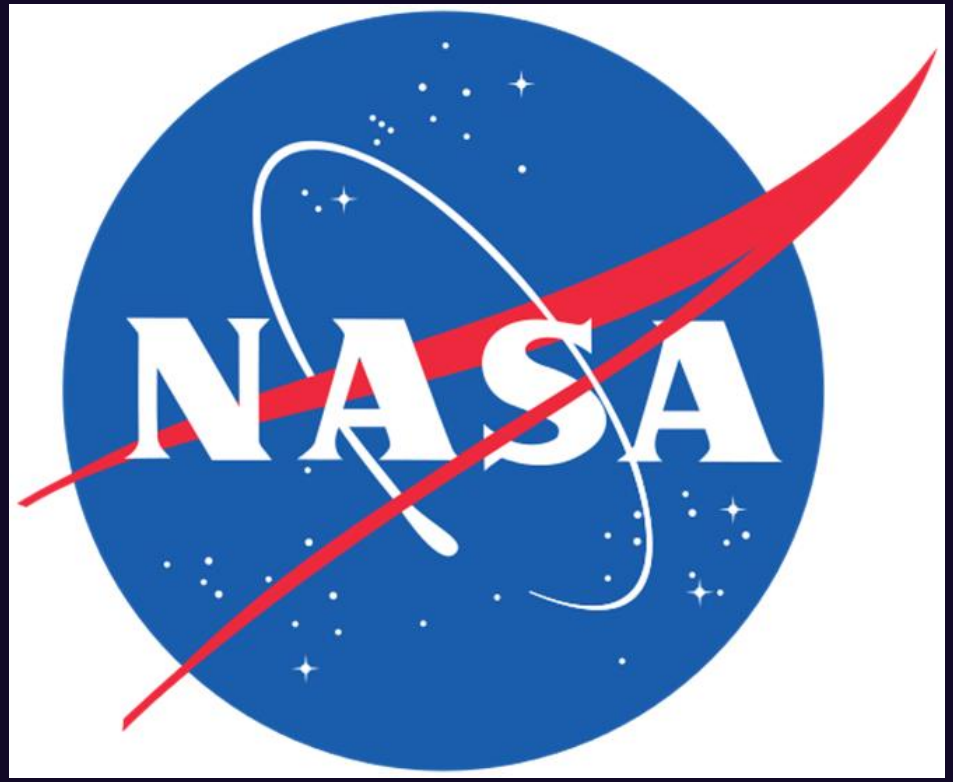
From 1968 to 1972 with a mission to land and return humans from the moon

Shuttle

From 1981 to 2011 with six space shuttles to help establish routine transportation for an Earth-to-orbit course

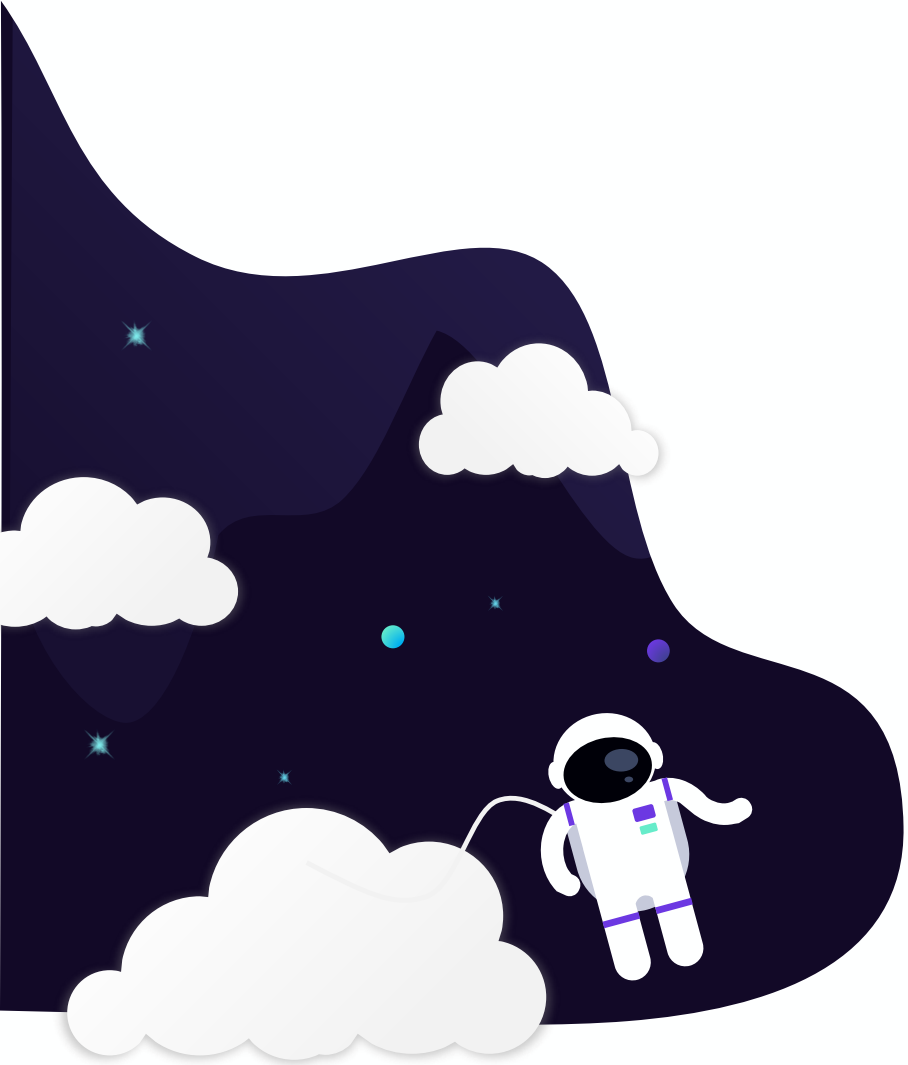
ISS

From 1998 to now with the mission of long-term space exploration and research onboard a permanent artificial satellite


NASA

Space Race

Goal: Beat the Russians



The Cold War

At the end of World War II, both the US and Russia wanted to be the world super power.

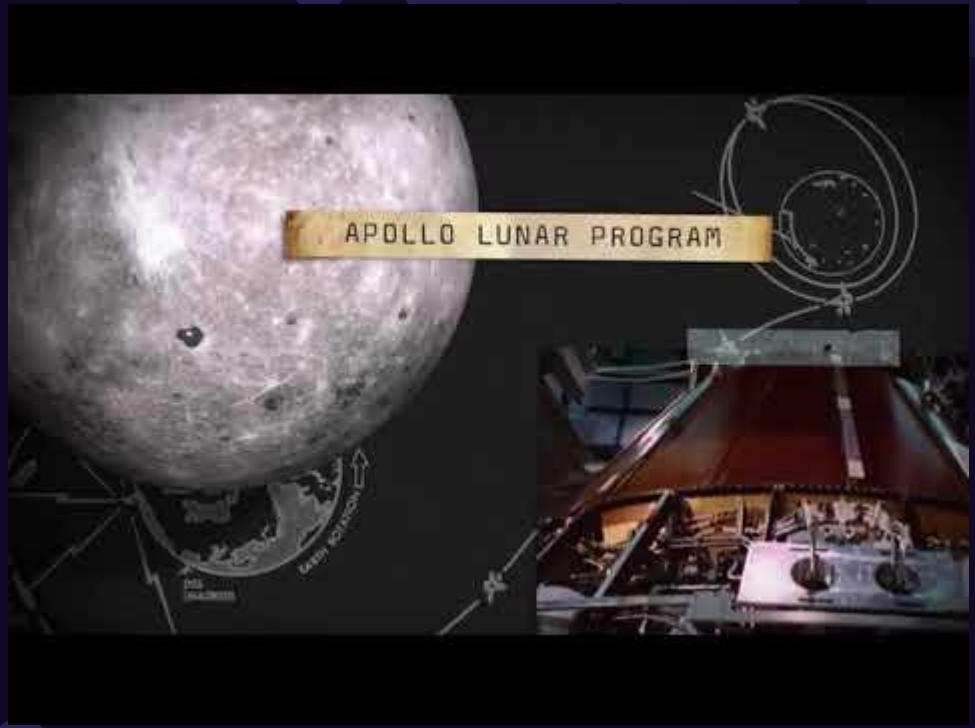
So began the “Cold War” where there wasn’t any battles, but both sides were super interested in winning and becoming dominate.

Space Race!

- Whoever wins has the better country and way of government!

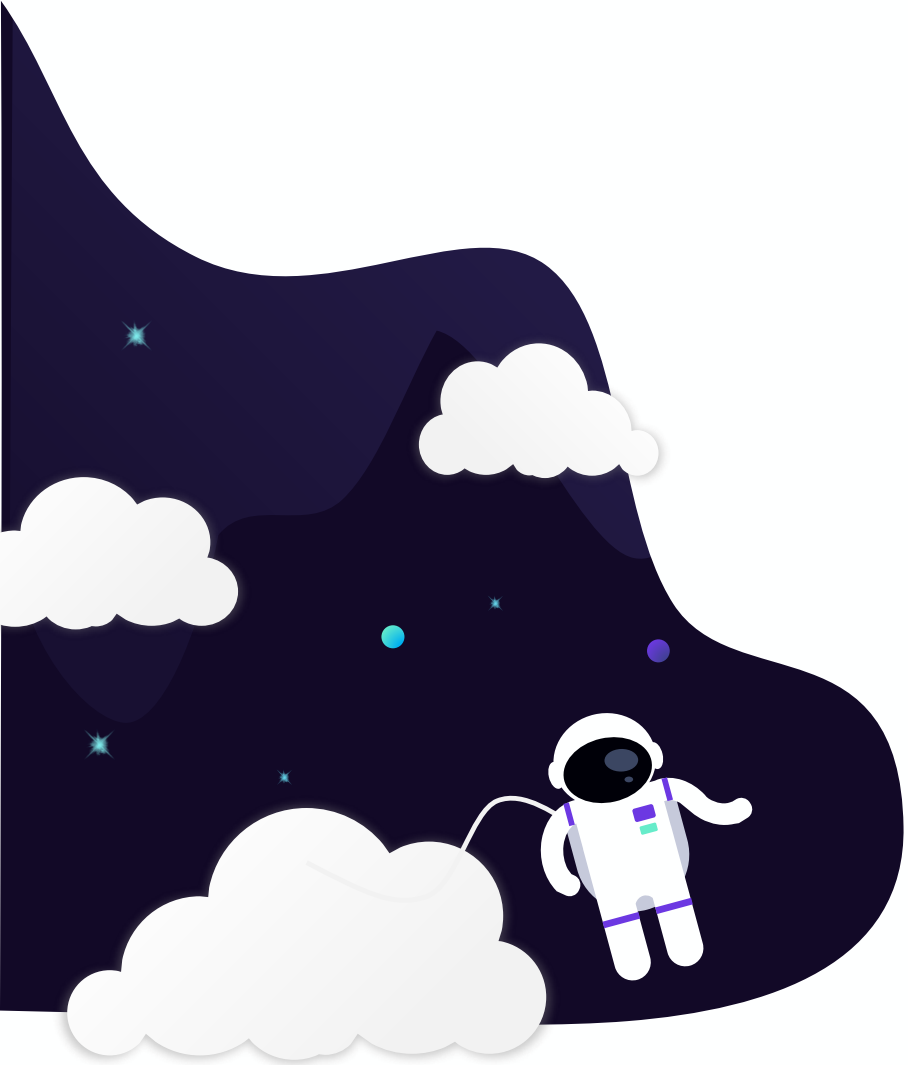
Space Race

https://www.history.com/topics/cold-war/space-race



Space Race

Air Travel and the Space Race



Space race

Check out these links and videos to learn more about the race to become the best in space!

- https://www.history.com/topics/cold-war/space-race
- http://inspacewetrust.org/en/
- https://www.pbs.org/wgbh/americanexperience/features/moon-space-race/

https://www.youtube.com/watch?v=abQZiU0L5dA&authuser=0

https://www.youtube.com/watch?v=klUb28Wa4Zw&authuser=0

https://www.youtube.com/watch?v=QhU

Vocab

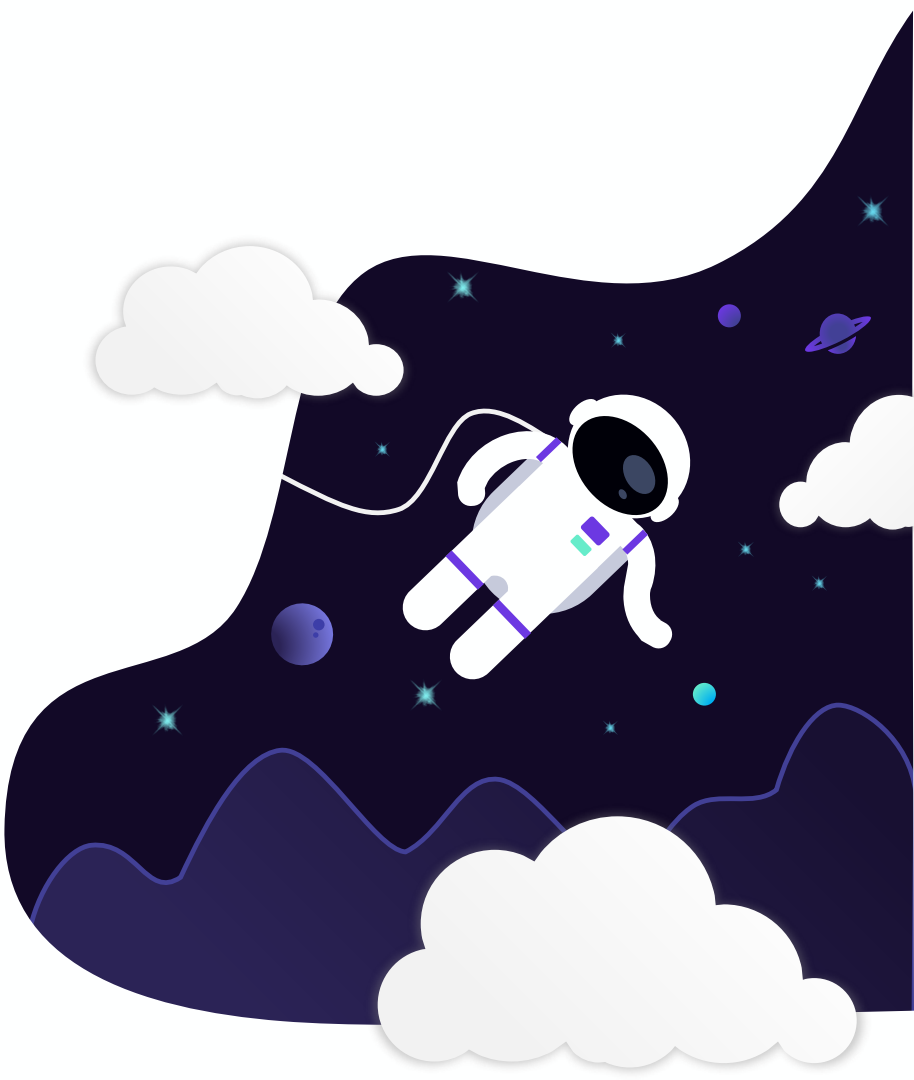
Space Race

A competition between the Soviet Union (Russia) and the United States to achieve better and more advanced spaceflight capability and missions.

Why was it called the Space Race?

Not really how it goes...

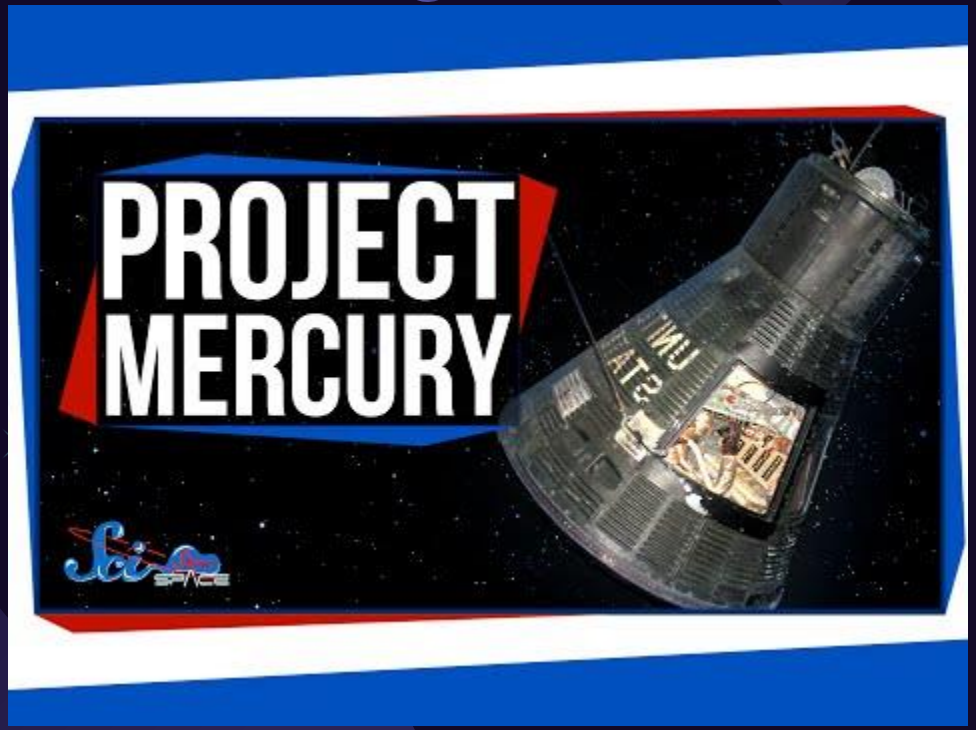
NASA
Space Missions

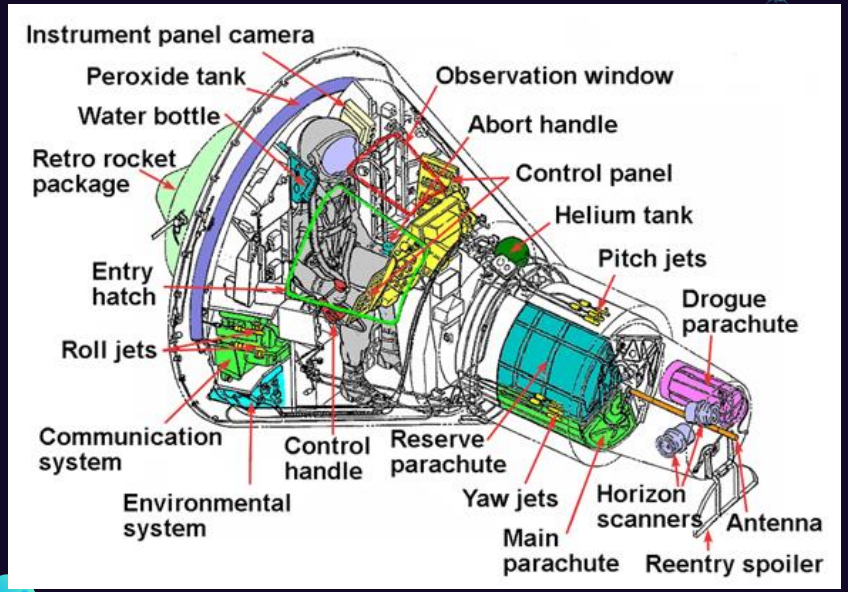


Mercury Missions

First shot at space

Overview of Mercury Missions

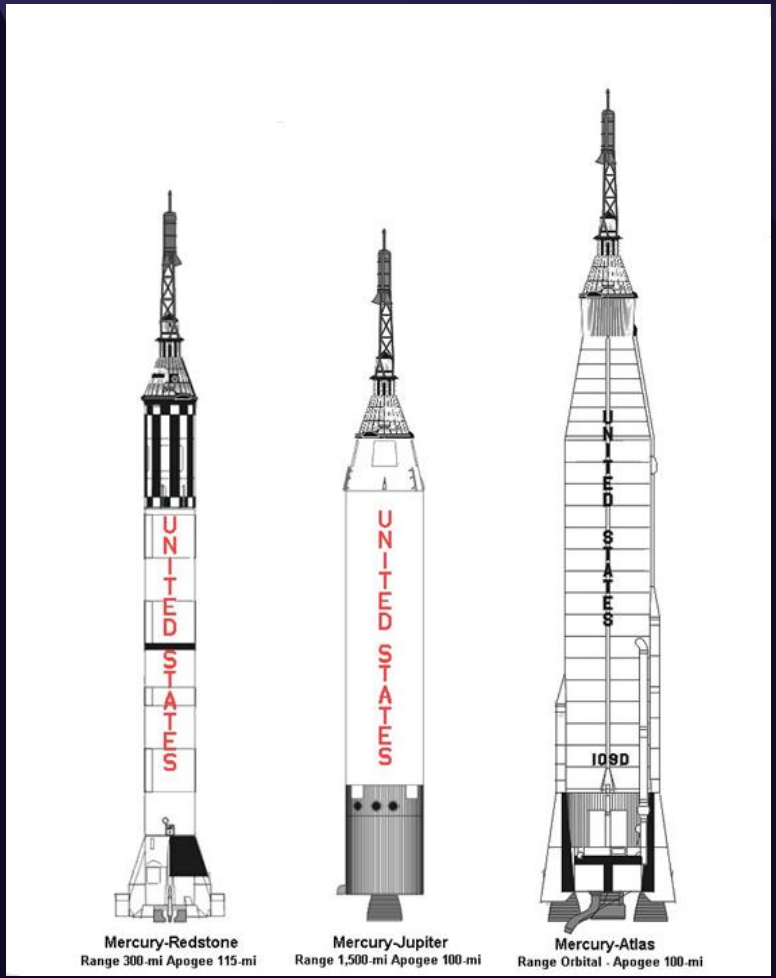


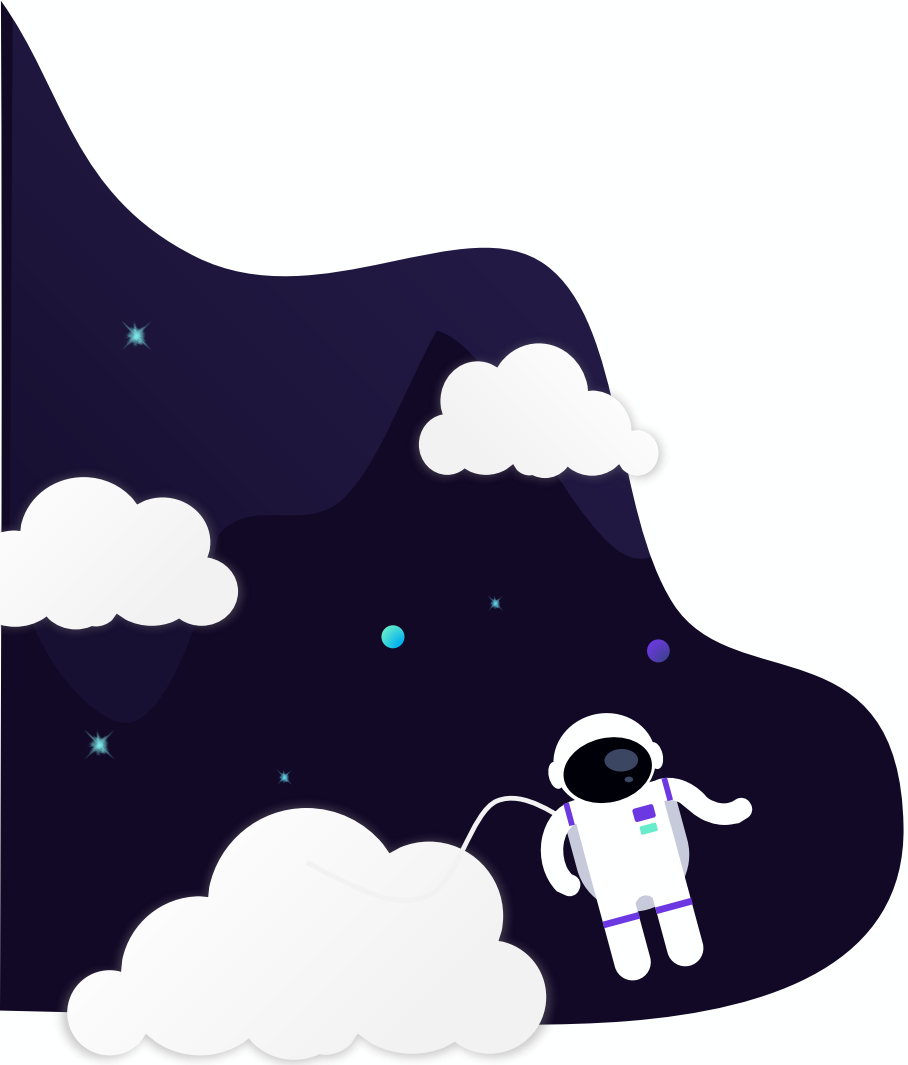


The Mercury Capsule

The Mercury Capsule

The Mercury Rockets





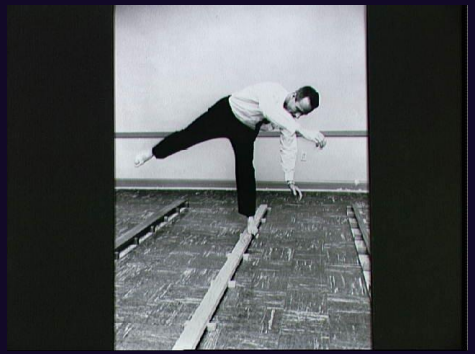
Why the name Mercury?

Originally Called Project Astronaut, President Eisenhower said to change it because it gave too much attention to the pilot instead of the mission.

Mercury was chosen based on classic mythology as a messenger to the gods.

The Mercury 7

Qualifications for being one of the Mercury 7



“Each must be: the graduate of a navy or air force test pilot school, 1,500 hours of flight time, qualified in jet aircraft, and engineering background, and 5’11 or less.”

What about women astronauts?

https://www.nasa.gov/missions/highlights/f_mercury13.html

https://history.nasa.gov/flats.html

https://www.space.com/mercury-13.html

While the Mercury 7 were being tested and approved for space flight, women were also being tested.

Thirteen women were tested and passed all of the men's testing qualifications (and even more) but the program was shut down.

The first women in space from the US wouldn't come until 1983.

https://www.nasa.gov/mission_pages/mercury/index.html

Vocab

Mercury Missions

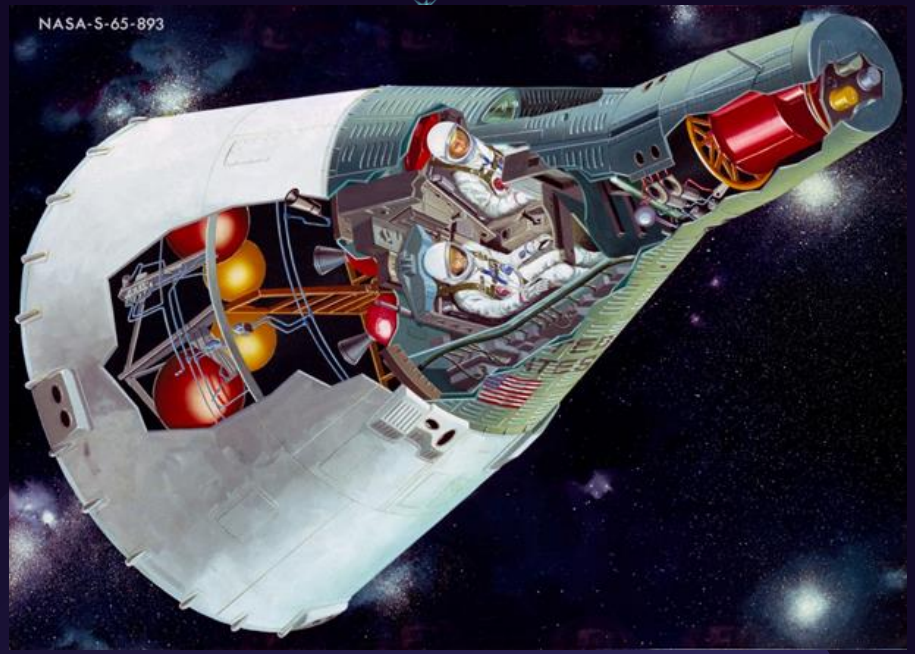
America’s first missions into space that helped us understand how to keep humans alive while in space.

Gemini Missions

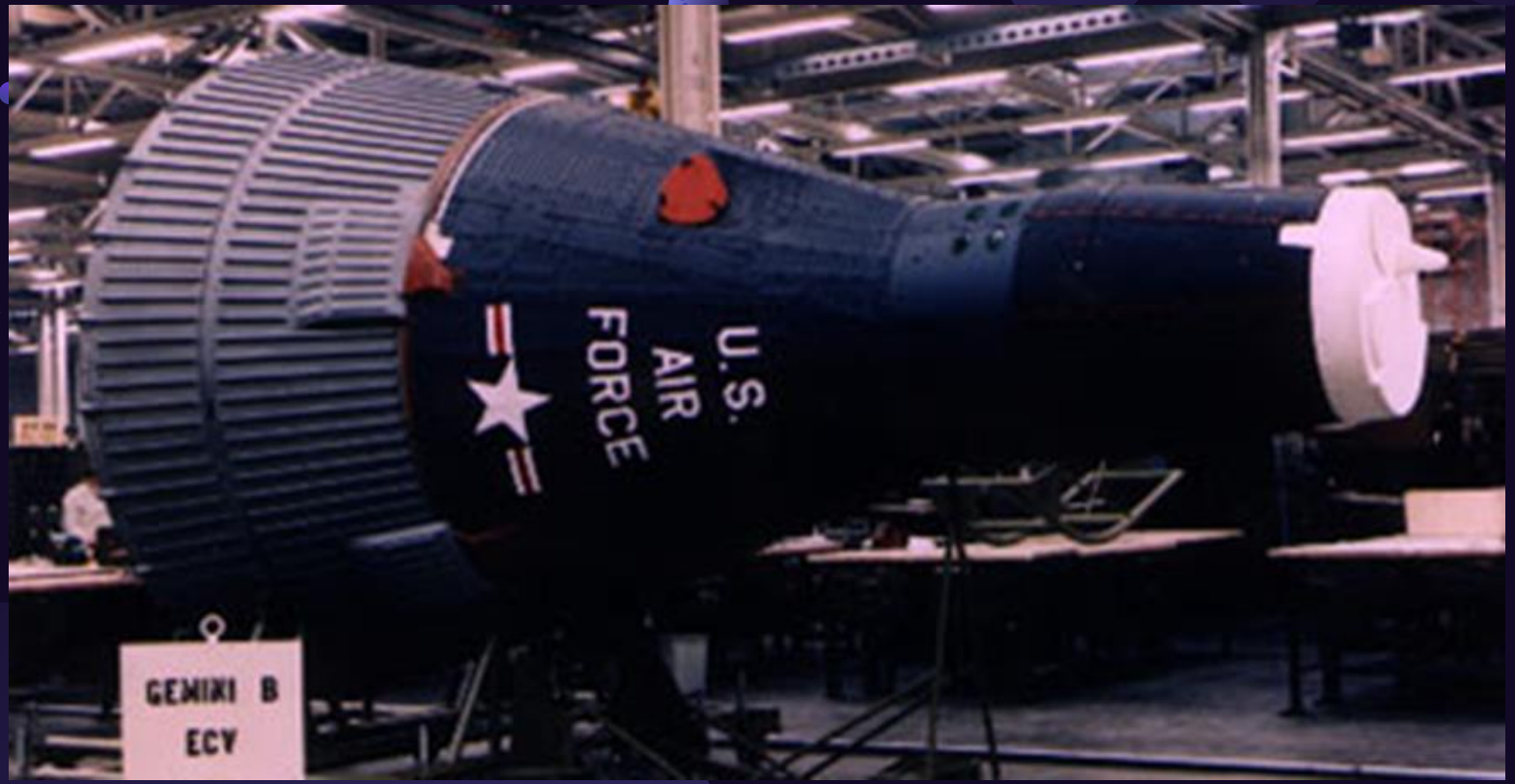
Two people are better?

Overview of the Gemini Missions

Gemini Capsule



Gemini Capsule



Gemini Rocket

Gemini Pilots

https://www.nasa.gov/mission_pages/gemini/index.html

Vocab

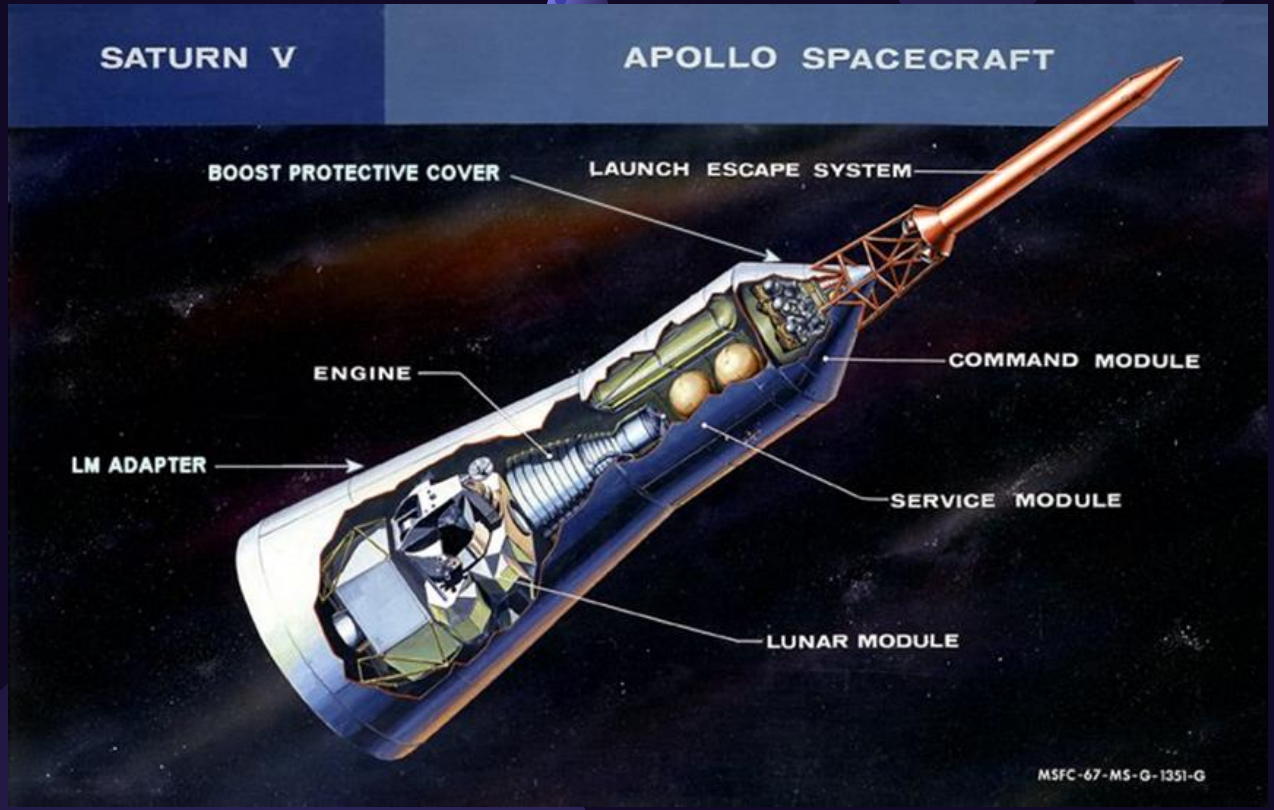
Gemini Missions

Missions to better understand spaceflight and to get ready for the Apollo program.

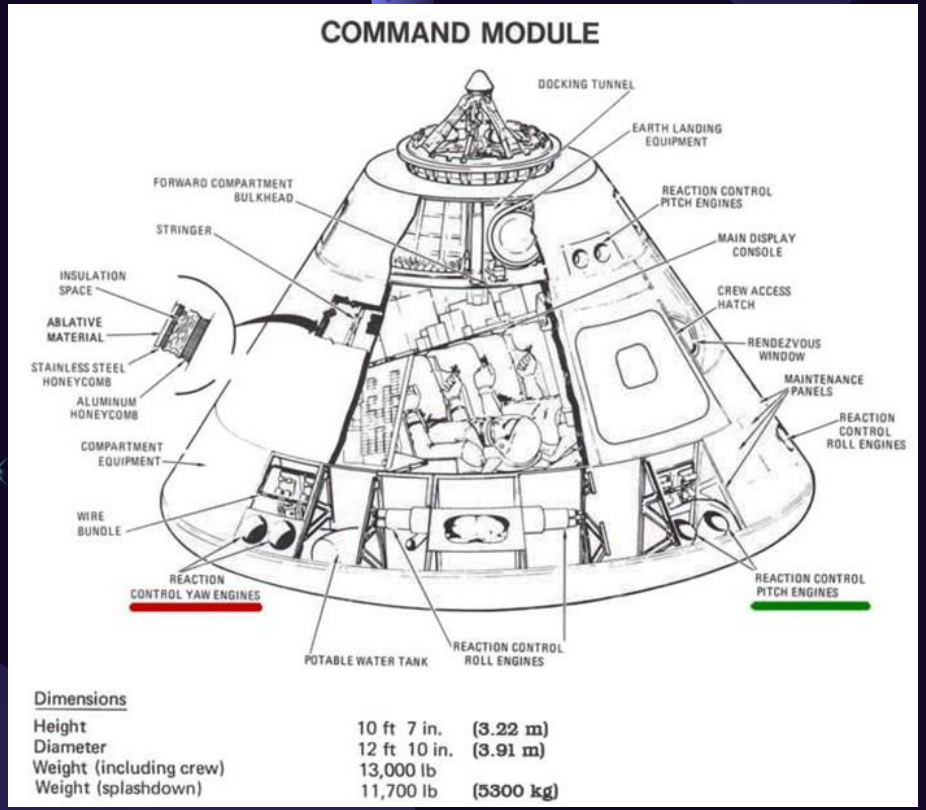
Apollo Missions

To the moon!!!

Apollo Capsule



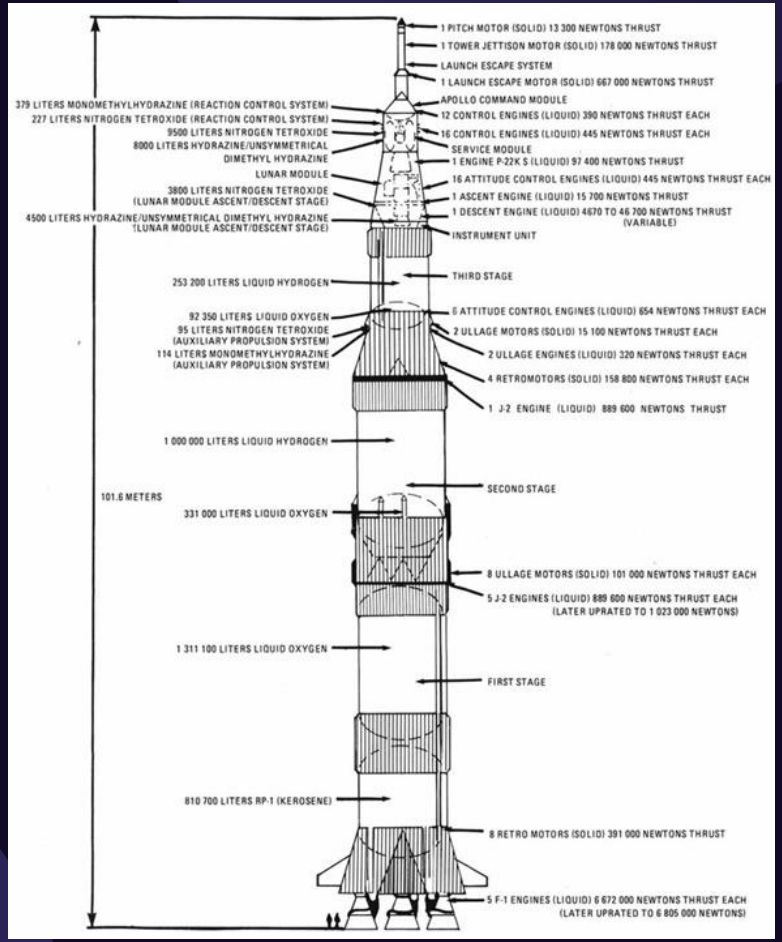
Apollo Capsule



Apollo Capsule

Apollo Rocket

Comic about it here



Saturn V Rocket

And the LEGO version...

Saturn V Rocket

Video

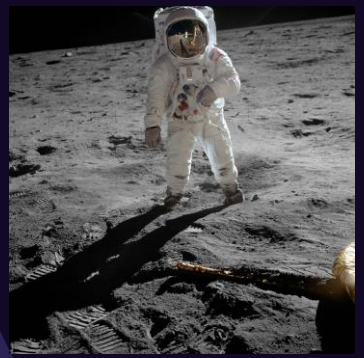
Three Apollo missions you hear about

Apollo 1

Ended in disaster after an accident killed all three Apollo 1 astronauts

Apollo 11

First landing on the moon and first steps of humans on another planetary body

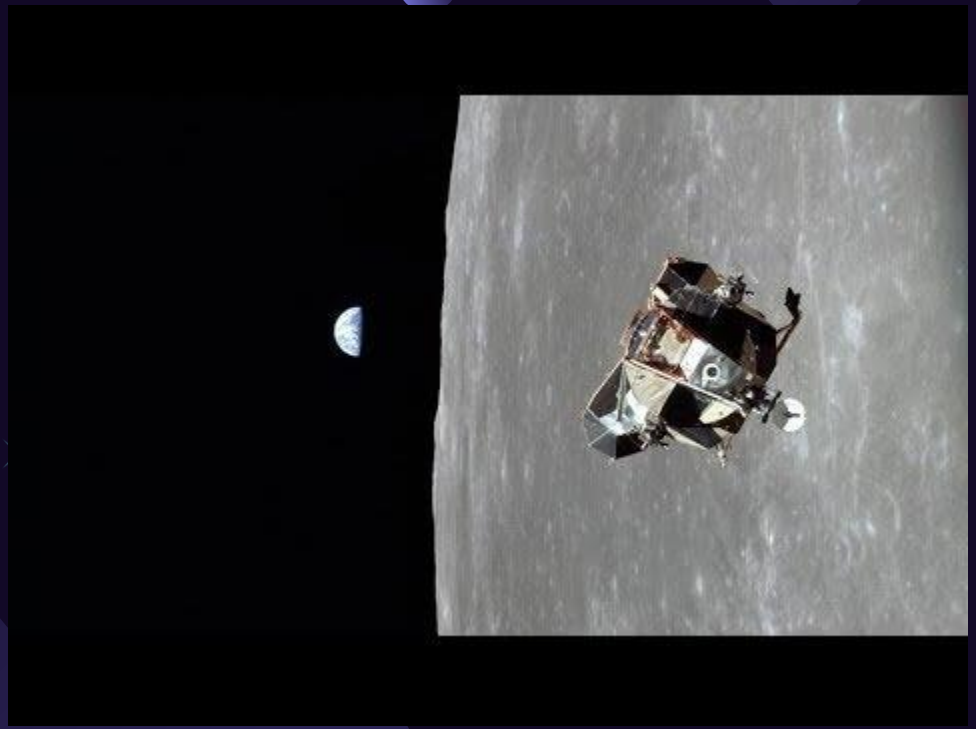


Apollo 13

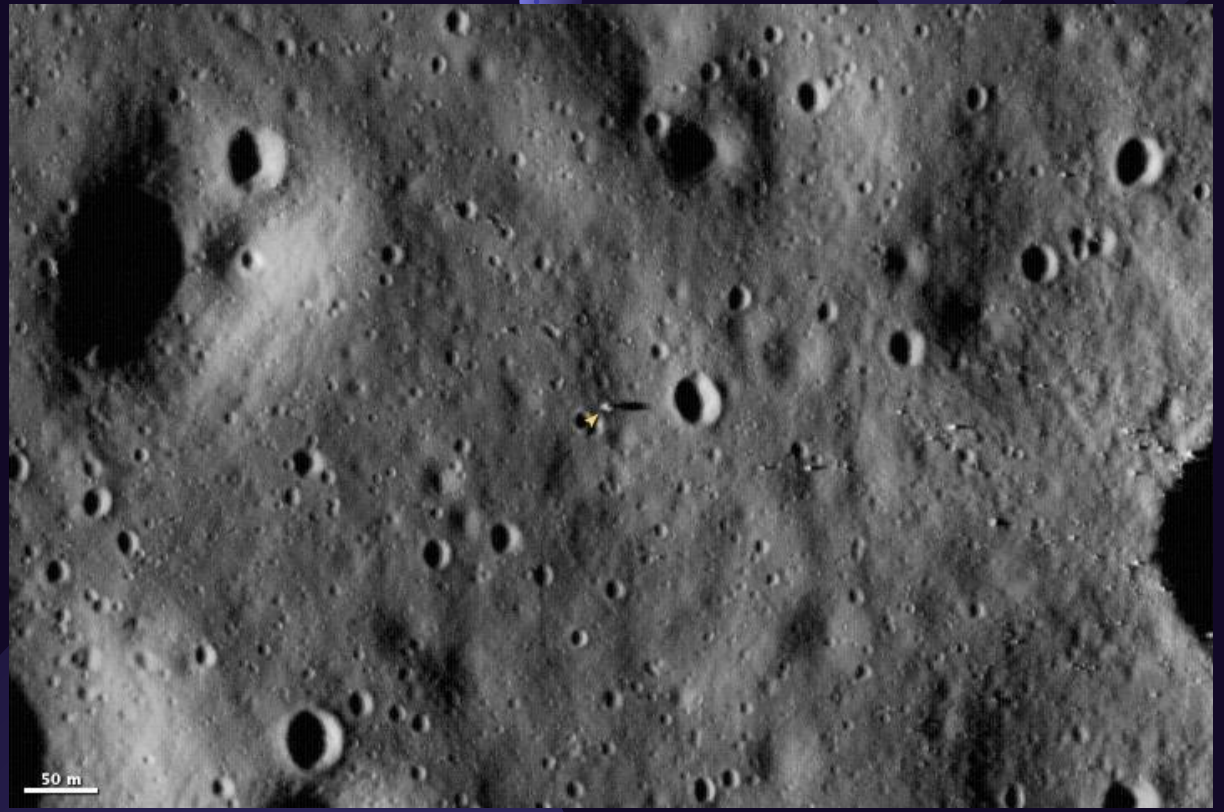
Was meant to go to the moon, but disaster struck and NASA had to work to get the three men back to Earth safely

Apollo 1 - Problems lead to tragedy

Apollo 11 - History being made

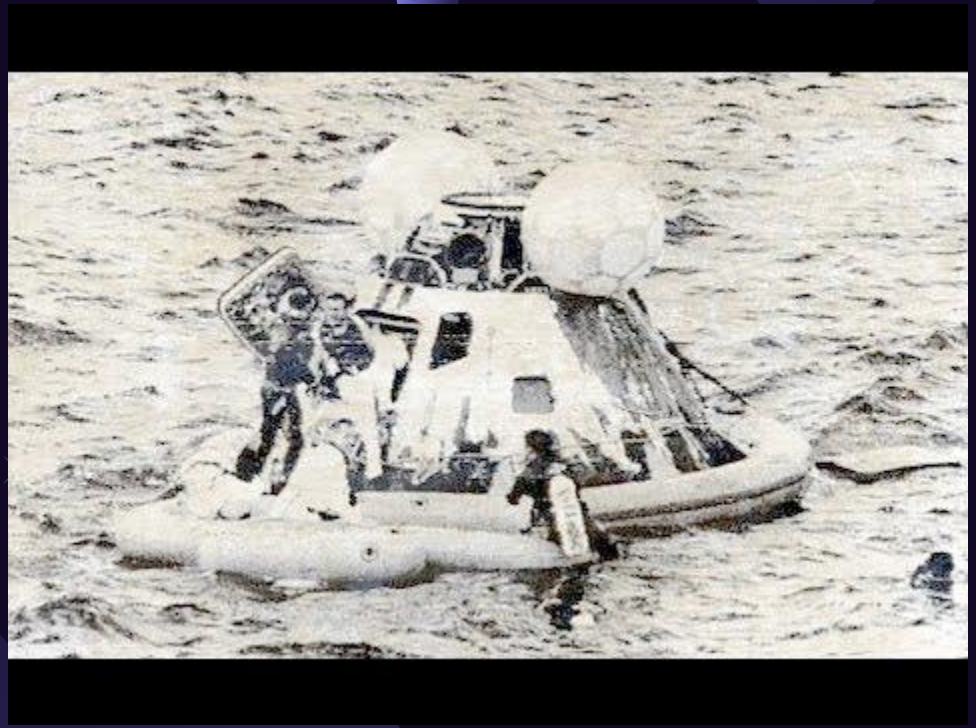


Landing site of Apollo 11



What if they didn't make it?

Apollo 13 - Back from certain death



Actual hack from Apollo 13

Clip from movie about the hack

Other Apollo Missions

Apollo 7

Apollo 8 - first to orbit Moon

Apollo 9

Apollo 10 - test run of Apollo 11

Apollo 12 - landed on the Moon

Apollo 14 - landed on the Moon

Apollo 15 - landed on the Moon (first to use Lunar Roving Vehicle)

Apollo 16 - landed on the Moon

Apollo 17 - landed on the Moon

Vocab

Apollo Missions

Focused on landing humans on the Moon, doing experiments on the Moon, and getting safely back home.

https://www.nasa.gov/mission_pages/apollo/missions/index.html

More links about the Apollo Missions

In case letter for Apollo 11 link

How the Apollo spacecraft worked link

List of missions to the moon link

Timeline of Apollo missions link

Moon landing couldn’t be faked link

Timeline of all missions link

NASA’s page on the moon link

Mission Links

Mercury links

- https://www.nasa.gov/mission_pages/mercury/index.html
- https://www.space.com/mercury-13.html and https://history.nasa.gov/flats.html
- https://mosaicnc.org/space-race/project-mercury

https://www.youtube.com/watch?v=1iL4tPIEME8&authuser=0

Gemini links

- https://www.nasa.gov/mission_pages/gemini/index.html
- https://historicspacecraft.com/Gemini_Capsules.html
- https://www.nasa.gov/specials/gemini_gallery/

https://www.youtube.com/watch?v=rE3sZvYYhcA&authuser=0

Apollo links

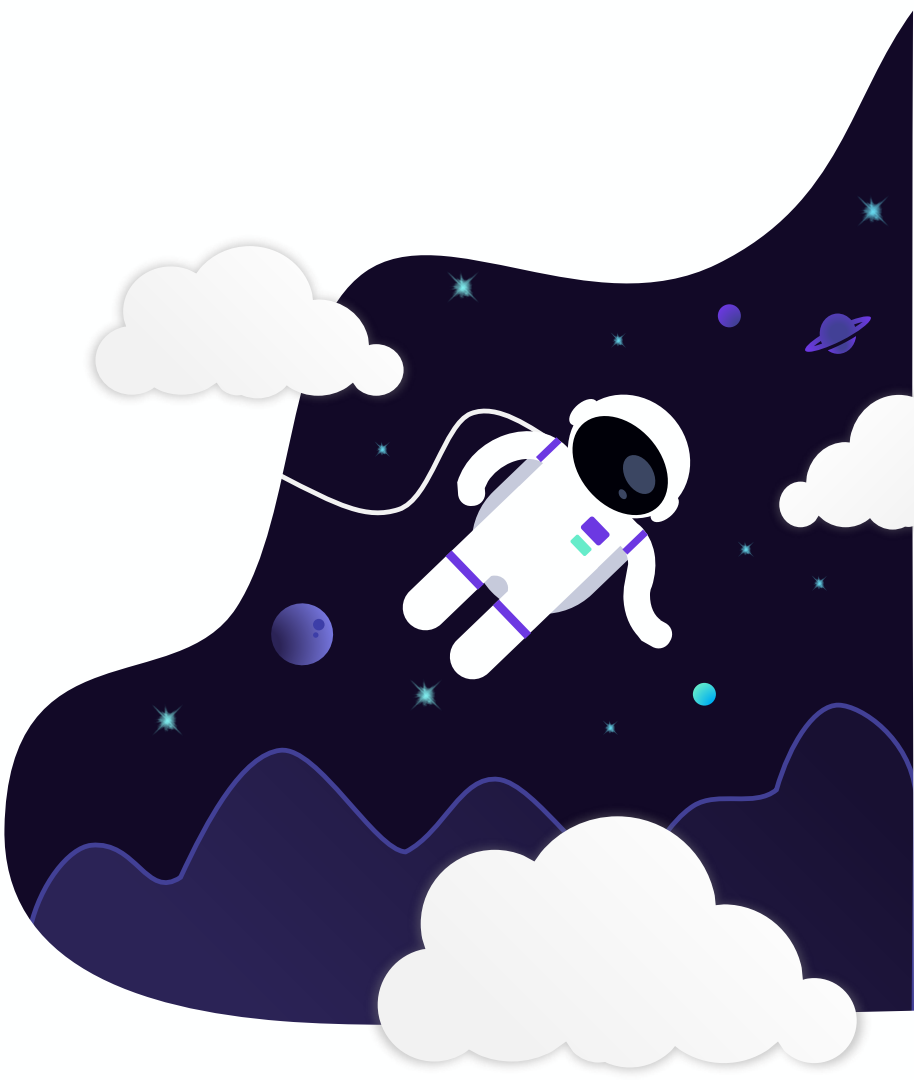
- https://www.nasa.gov/mission_pages/apollo/missions/index.html
- In case Apollo 11 ended badly: https://www.archives.gov/files/presidential-libraries/events/centennials/nixon/images/exhibit/rn100-6-1-2.pdf
- https://science.howstuffworks.com/apollo-spacecraft.htm
- https://padlet.com/gallery/apollo_missions

Information on all missions: https://nssdc.gsfc.nasa.gov/planetary/chrono_astronaut.html

55

Compare and contrast the three mission types.

After Apollo



True or False: The Apollo capsules were reusable.

Space Shuttle Missions

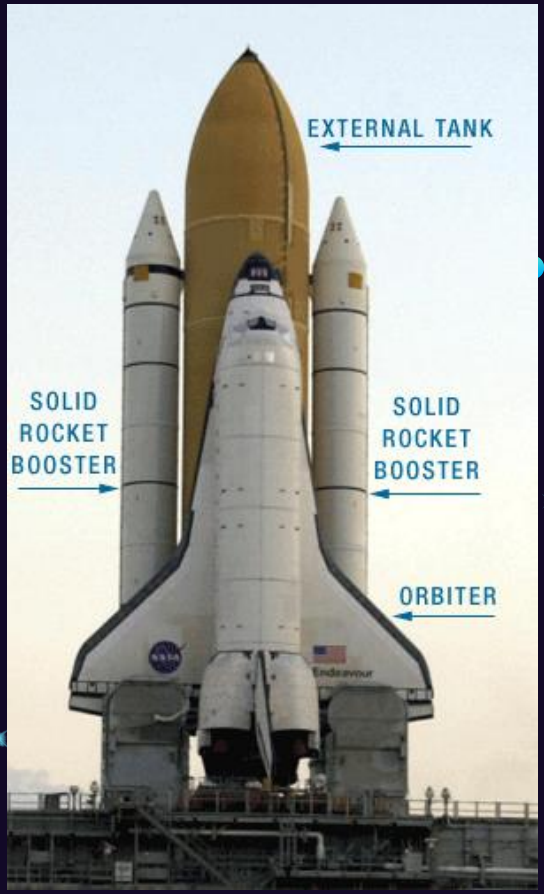
When going to space becomes routine...

Space Shuttle Missions

From 1981 to 2011 there were 135 missions using 5 reusable shuttles:

1. Columbia
2. Challenger
3. Discovery
4. Atlantis
5. Endeavour


COLUMBIA
CHALLENGER
DISCOVERY
ATLANTIS
ENDEAVOUR



Space Shuttle Basics

On the launch pad

Space Shuttle Mission Gone Wrong

Challenger accident of 1986

On liftoff the morning of January 28th, the morning was unusually cold. Launch went as scheduled and 23 seconds after liftoff the Challenger space shuttle blew up.

It was later determined that the rubber O-rings that sealed the joints of the shuttle's solid rocket boosters failed due to the low temperatures.

Space Shuttle Mission Gone Wrong

Columbia accident of 2003

On February 1st, 2003 the crew of Columbia were 16 minutes away from landing when their space shuttle broke apart in the sky.

It was determined that a piece of foam had weakened the wing's edge at launch, which lead to massive structural damage upon reentry after their mission was completed.


BBC

End of an era - Why the space shuttle missions were ended

Transporting the Shuttle

Vocab

Space Shuttle Mission

To carry objects into space and the ISS, to ferry people to and from space, and to further explore space.

More links about the Space Shuttle Missions

NASA’s Space Shuttle Mission page link

Current locations of the space shuttles link

Space Shuttle fact sheet link

Step aboard the Discovery Shuttle with VR link

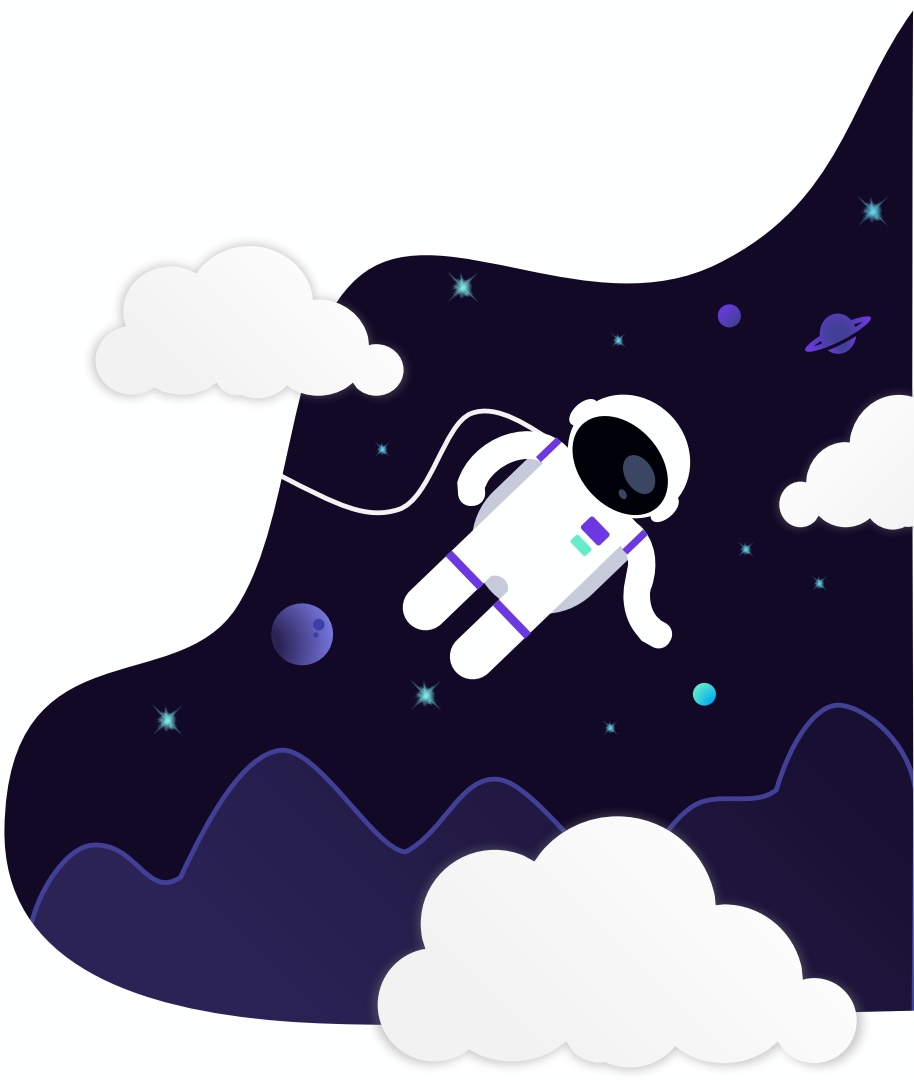
List of Space Shuttle missions link

Map of the moon link

Why did the space shuttle missions stop?

True or False: Humans are orbiting in space right now.

The ISS



The ISS

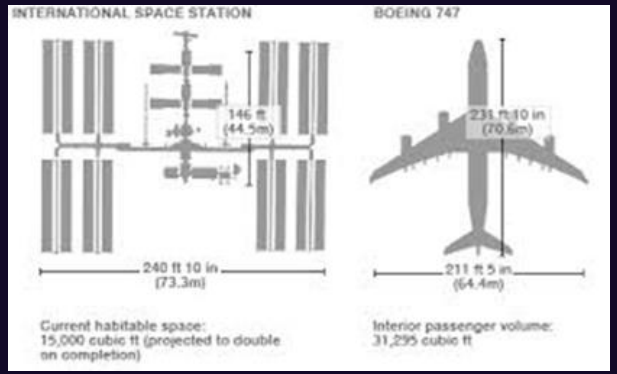
Orbiting Science Playground

The ISS

The International Space Station

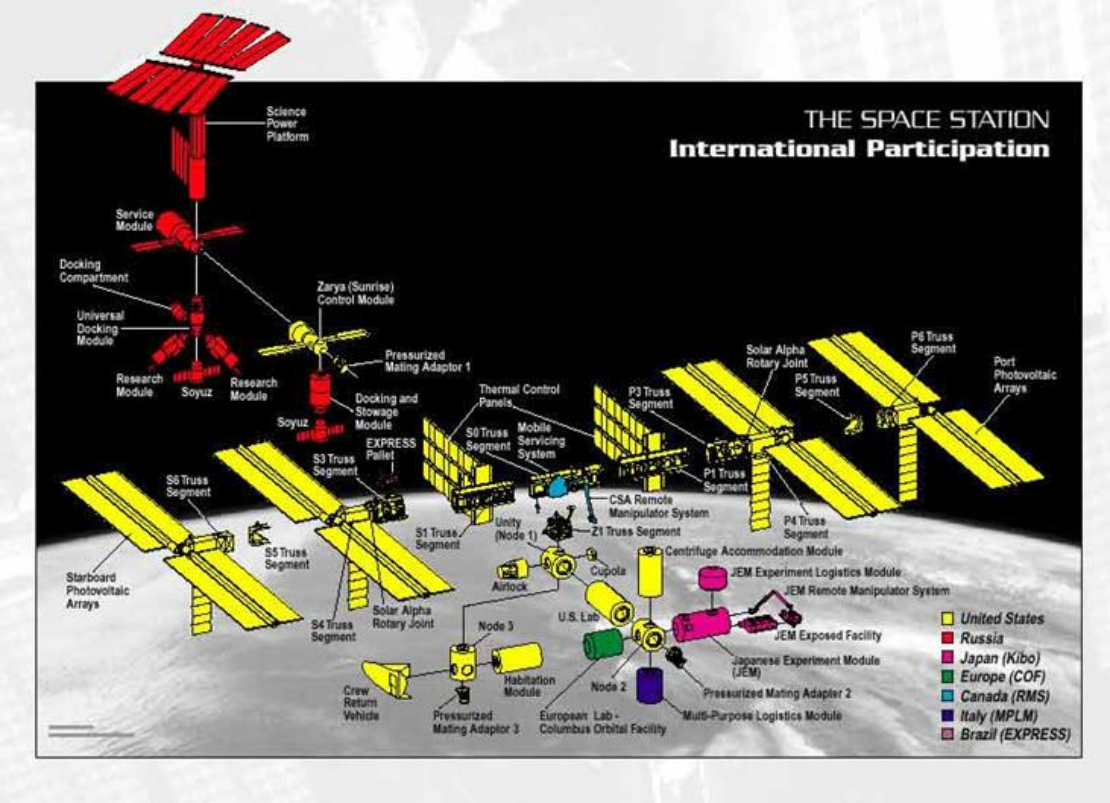
- In-orbit assembly of the station began on Nov 20th, 1998
- Construction was officially completed in 2011 (although stuff is still being added all the time)
- Continuously occupied since Nov 2nd, 2000
- Main contributors:
  - NASA / Russia / Canada / Japan / Brazil / and 11 members of the ESA (European Space Agency)

Size of the ISS

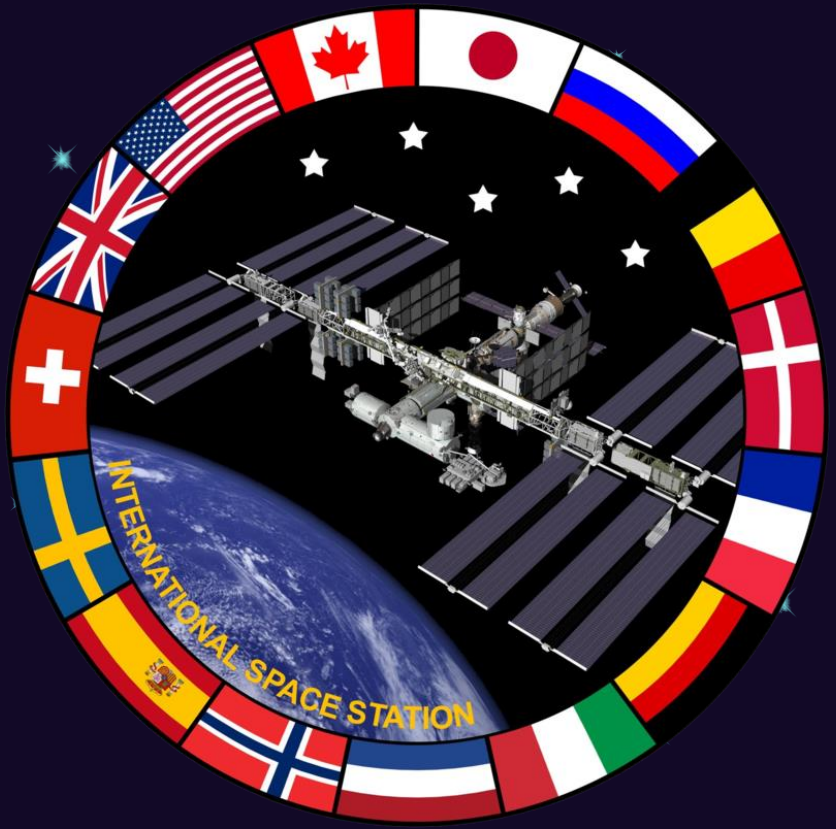


Incredible Collaboration of the ISS

Components of the ISS



Builders of the ISS



It’s the INTERNATIONAL Space Station for a reason

Vocab

ISS Mission

An international orbiting science lab to help us better understand life in space.

Fun things with the ISS

The Twin Study

Scott and Mark Kelly are identical twins who went through a whole range of testing for nearly a year.

Super interesting results came from this and help pave the way for longer space trips. Link here.

Interactives To Do

Explore the ISS on your own using this virtual field trip link and this link.

Try to dock with the ISS using this virtual simulation.

Random Others

Paper model of the ISS instructions here.

3D printer is used to “email” supplies here.

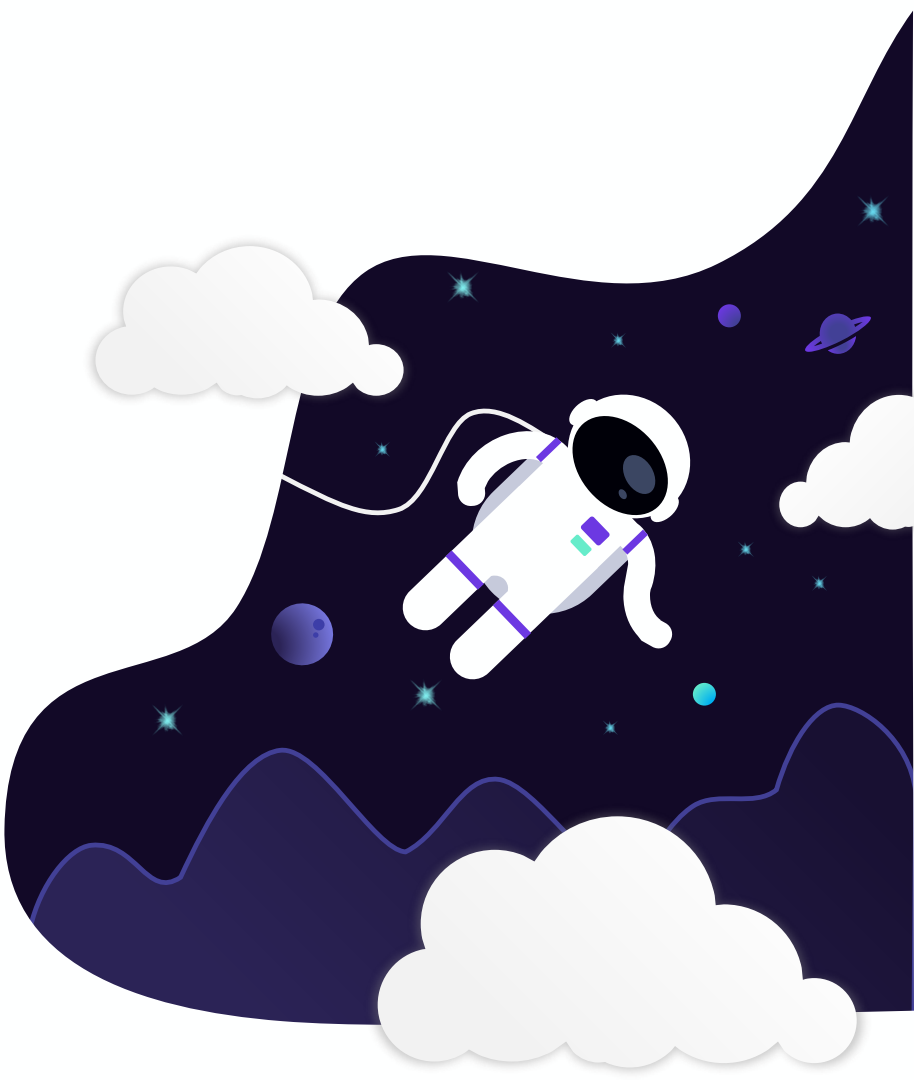
Good info on the history of space flight here.

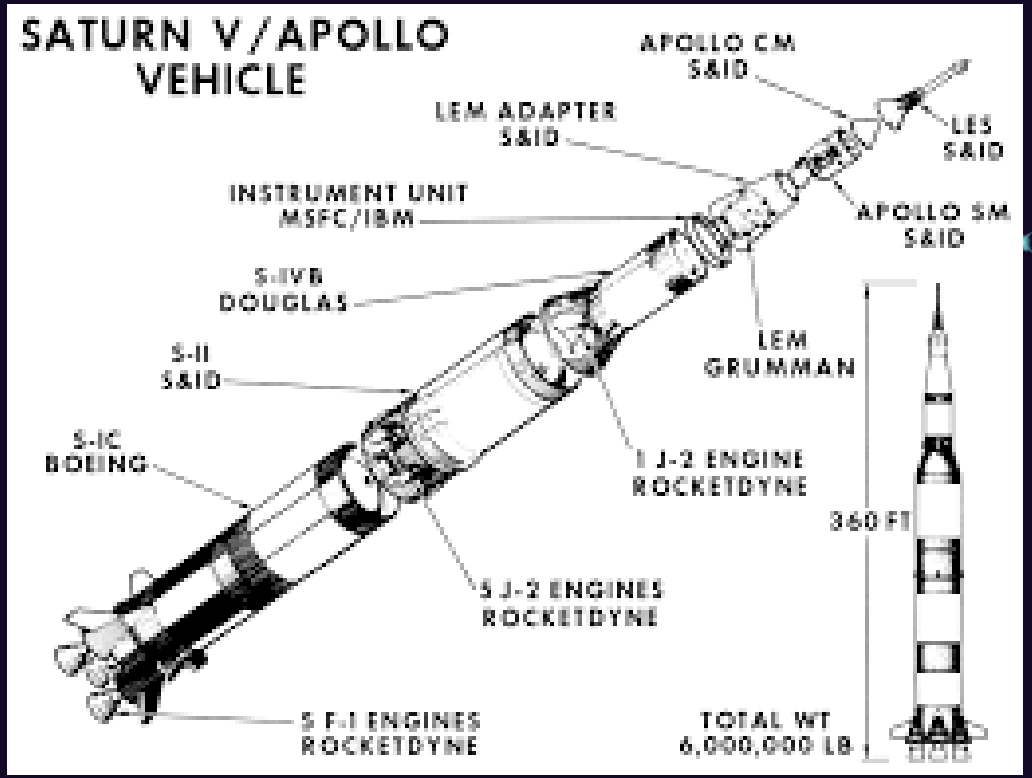
Podcast about day in the life here.

In your opinion, should we keep the ISS or just have a base on the moon?

If you can get to YouTube, this is a great video series about space travel history!

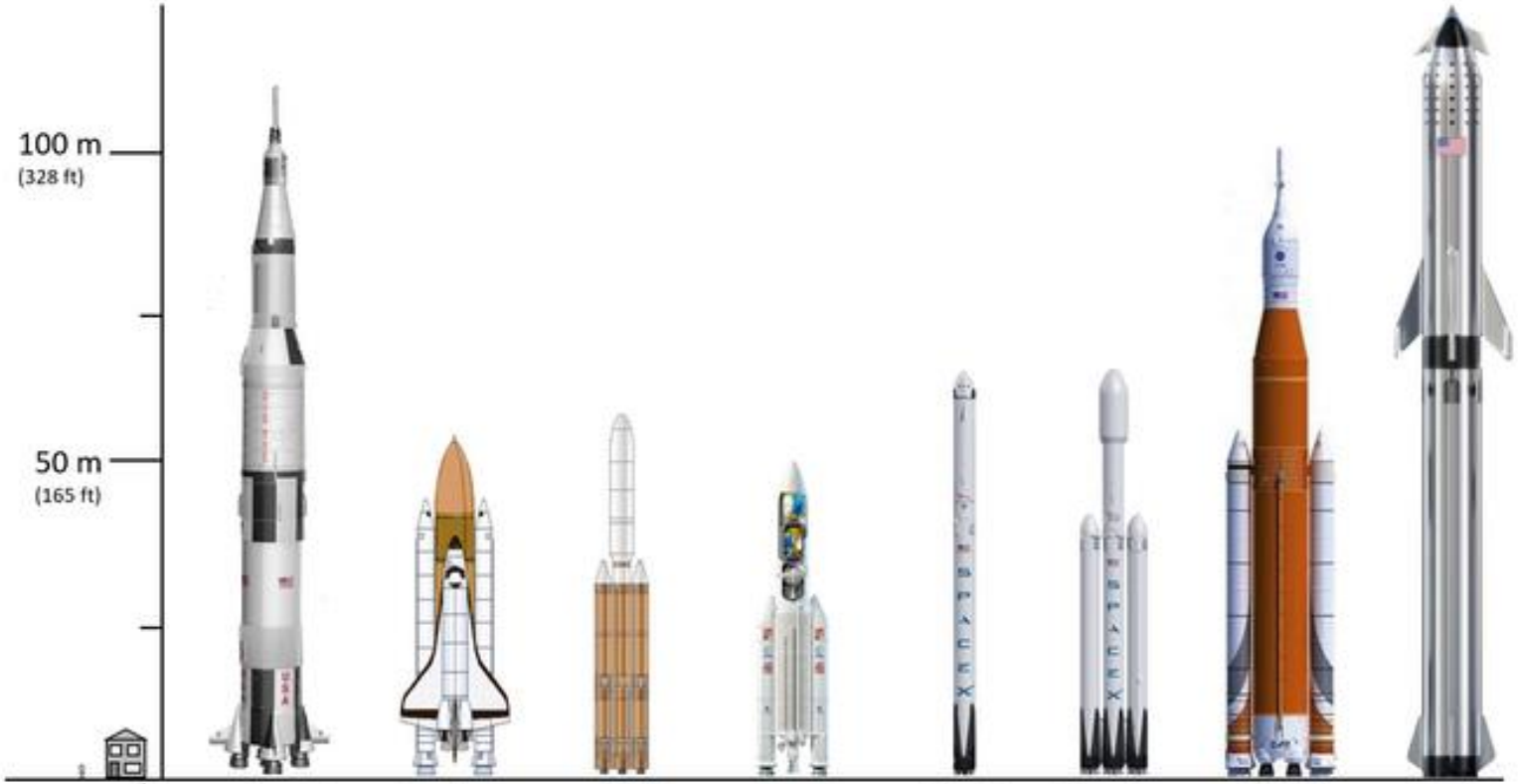
Space Rockets





We've talked about the Saturn V Rocket


ROCKET
SIZE
USA



Name:	Saturn V	Space Shuttle	Atlas V	Ariane-5	Falcon-9	Falcon-Heavy	SLS – B1	Starship
Cost per launch (Adjusted to 2021):	$1.3 Billion	$1.65 Billion	$120 Million	$223 Million	$62 Million	$150 Million	~$2 Billion	Unknown*
Mass to low Earth orbit:	140 tonnes	27 tonnes	20 tonnes	20 tonnes	13 tonnes	63 tonnes	95 tonnes	100 tonnes

Link

Check out different rockets using the link given.

What are your thoughts?

Let’s Make Our Own Now!

Materials Needed

- Film canister
- Water
- Alka Seltzer tablets
- Glasses or sunglasses (for eye protection)

The film canister and tablets are from your KDA lab supply bag.

Film Canister Assignment

- Go outside if possible (or do this in a bathtub so the mess is contained)
- Start with half a canister and half a tablet to see the reaction
- Then change ONE thing (either the water OR the tablet but not both) and see the reaction
- Keep playing with the formula to try to get the rocket to go the highest until you are out of tablets
- Record your results on the Padlet so I know what happened!

Safety alert!!!

Wear either glasses or sunglasses when doing this to protect your eyeballs!

Want to do a more advanced version? Check this out!


Film Canister
Rockets

What questions do you have about this assignment?

What happened?