

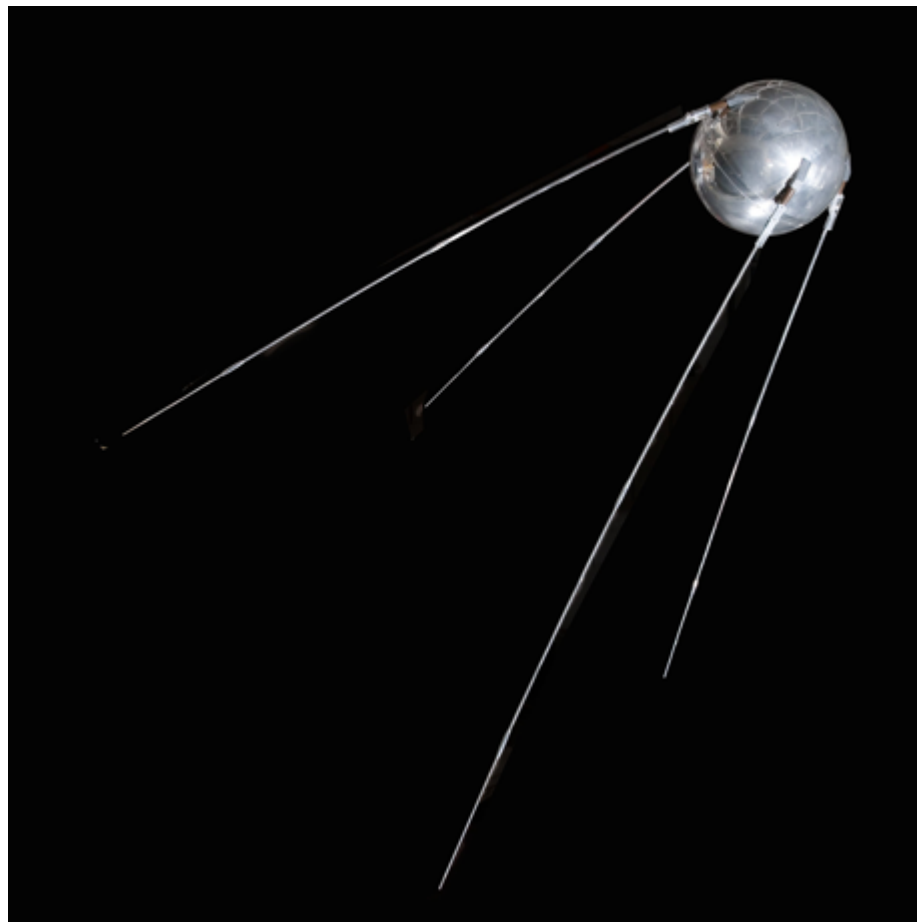
# History of U.S. Human Space Program And Lessons Learned

3 Sept 2019

# German V2 Rocket



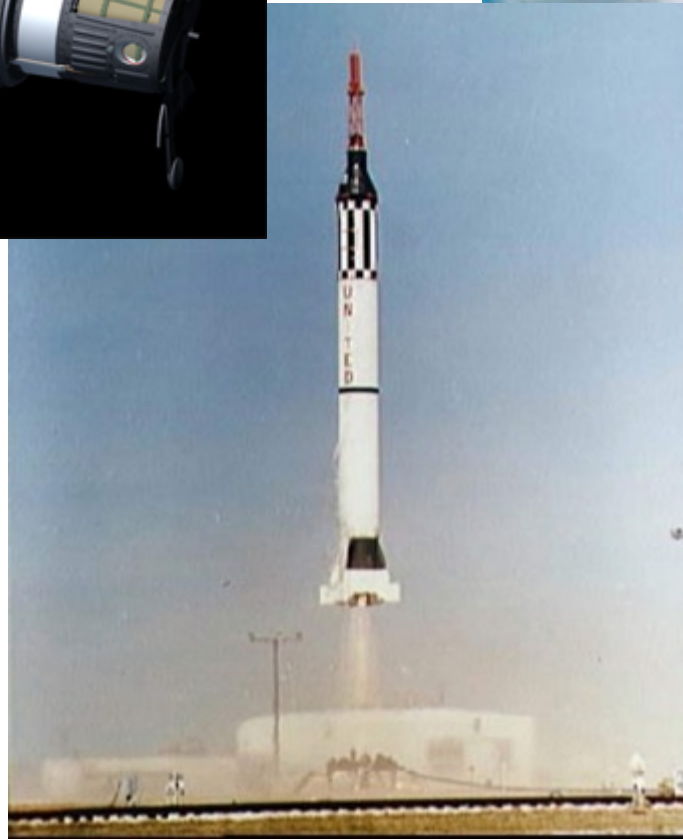
# Sputnik



# Explorer 1



# Mercury Spacecraft





# Kennedy's speech at Rice Univ., 12 Sept. 1962

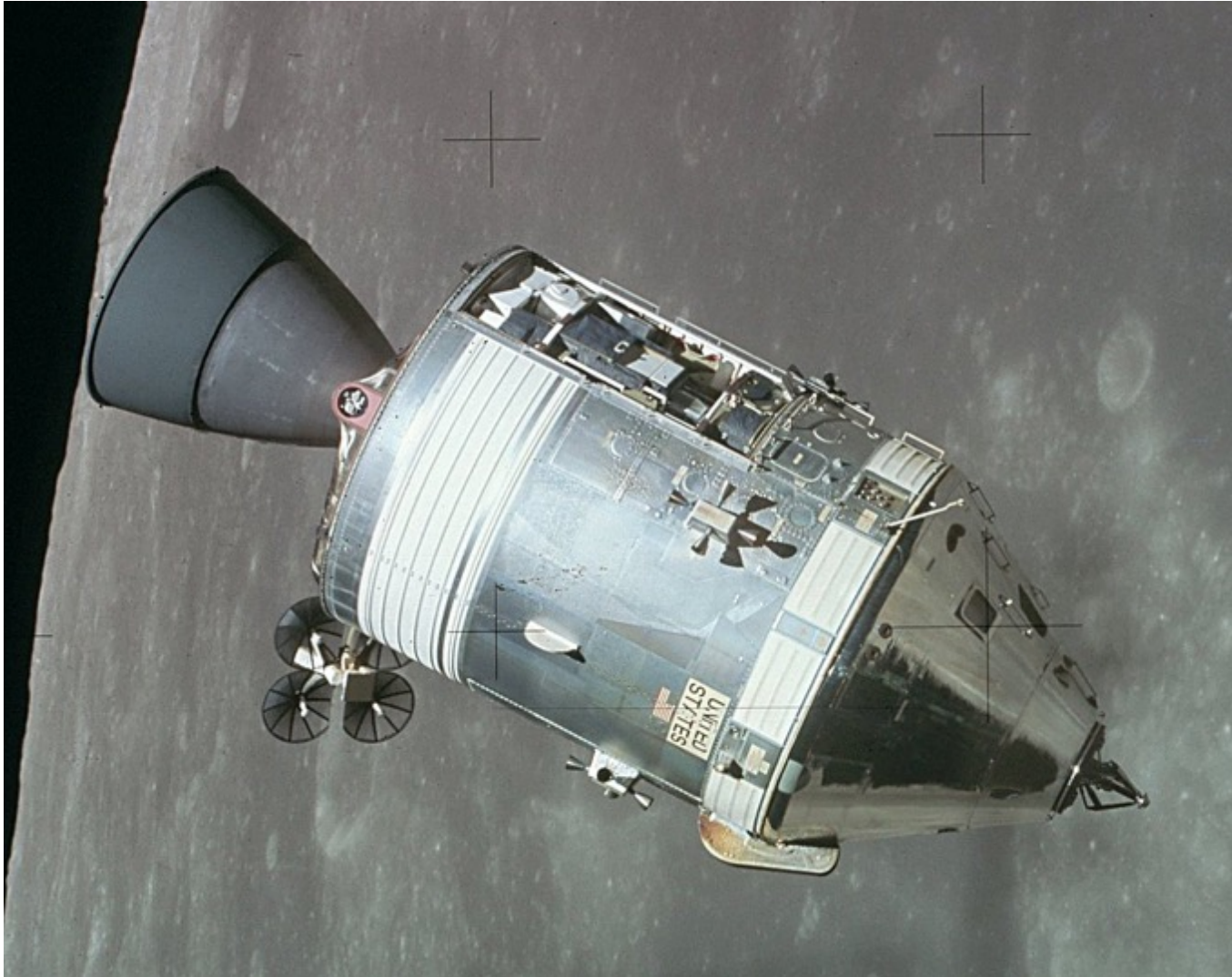
“There is no strife, no prejudice, no national conflict in outer space as yet. Its hazards are hostile to us all. Its conquest deserves the best of all mankind, and its opportunity for peaceful cooperation may never come again. But why, some say, the Moon? Why choose this as our goal? And they may well ask, why climb the highest mountain? Why, 35 years ago, [fly the Atlantic](#)? Why does Rice play Texas?”

“**We choose to go to the Moon!** We choose to go to the Moon...We choose to go to the Moon in this decade and do the other things, not because they are easy, but because they are hard; because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one we intend to win, and the others, too.”

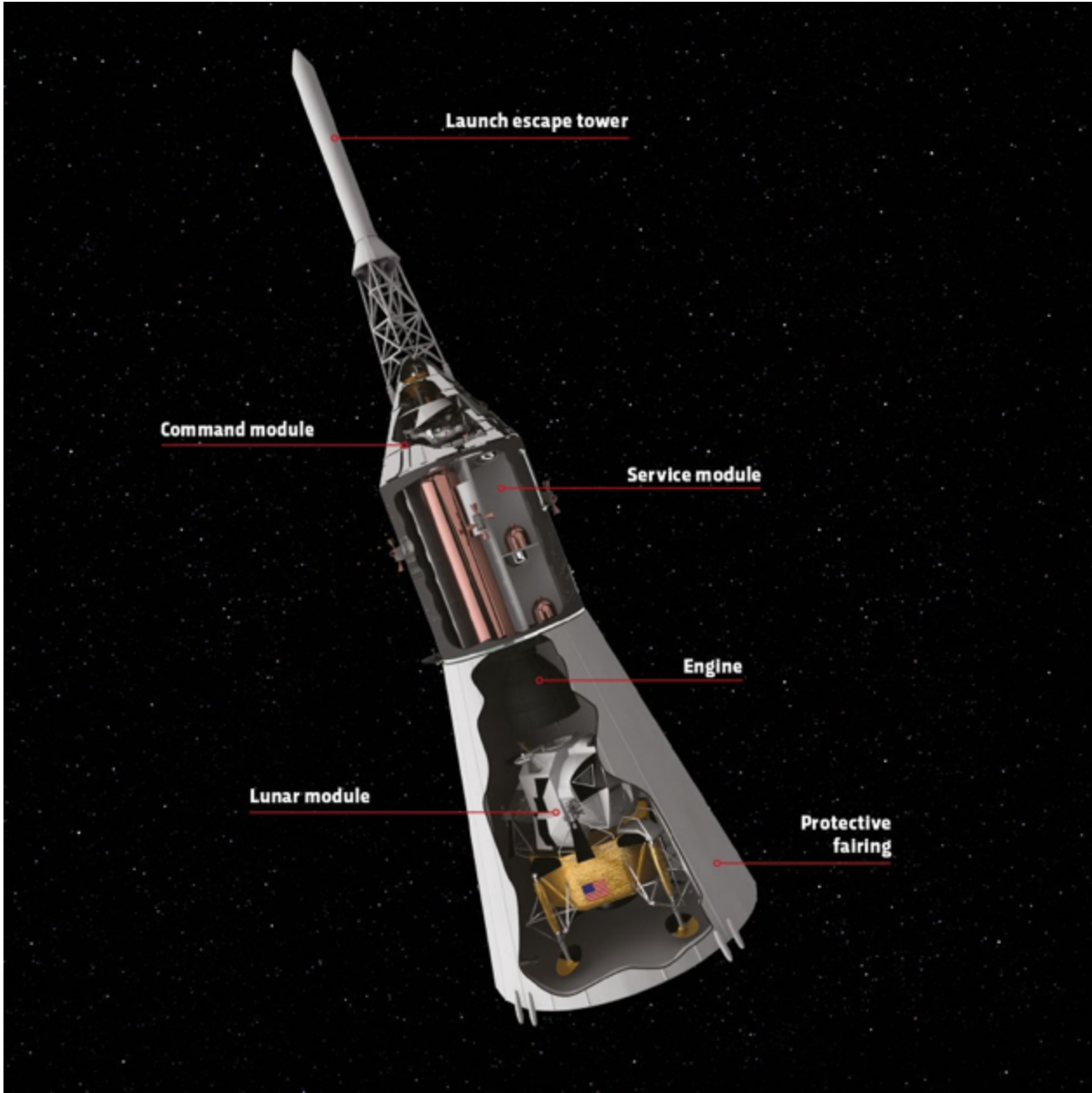
# Gemini spacecraft



# Apollo spacecraft

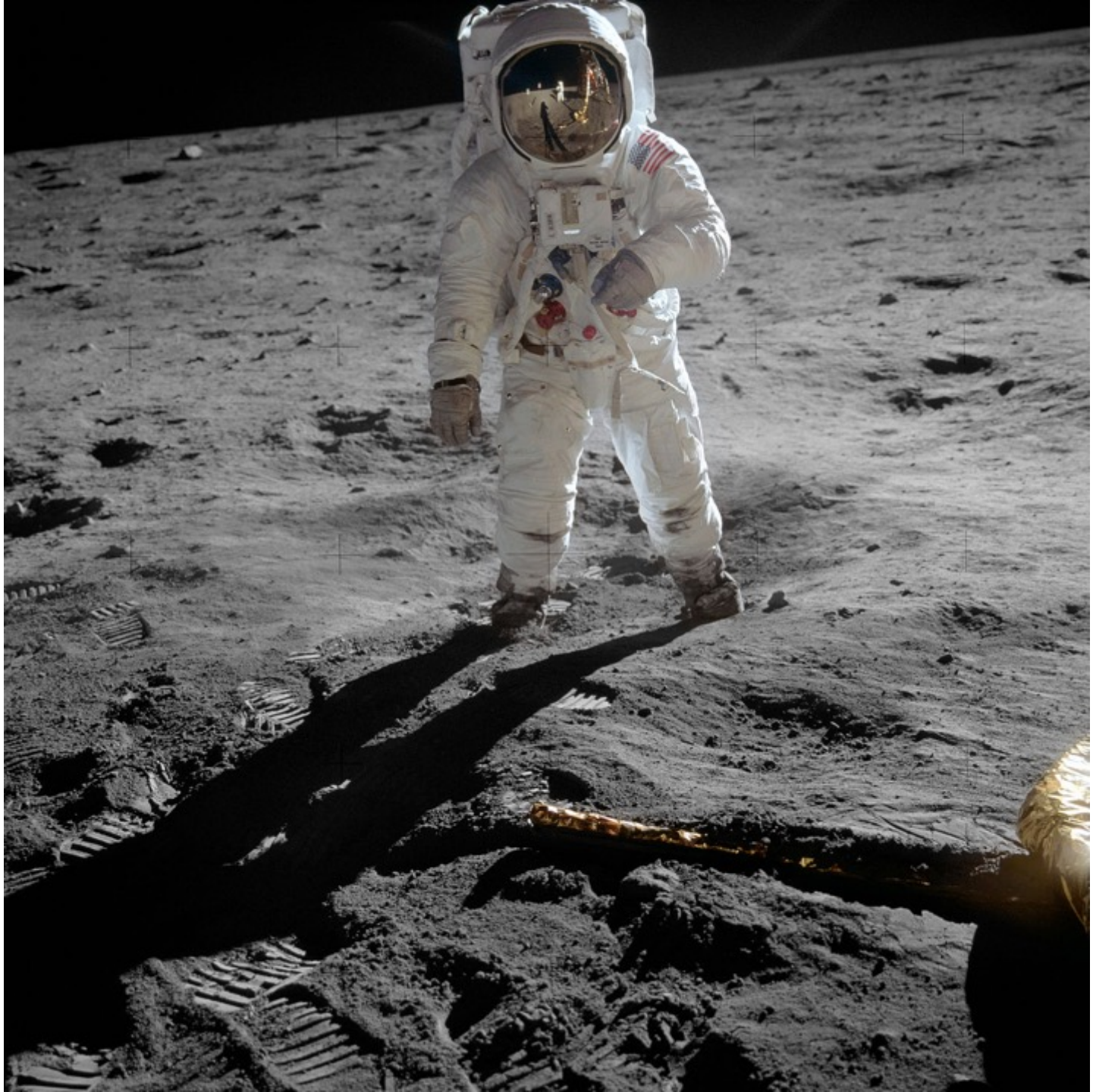






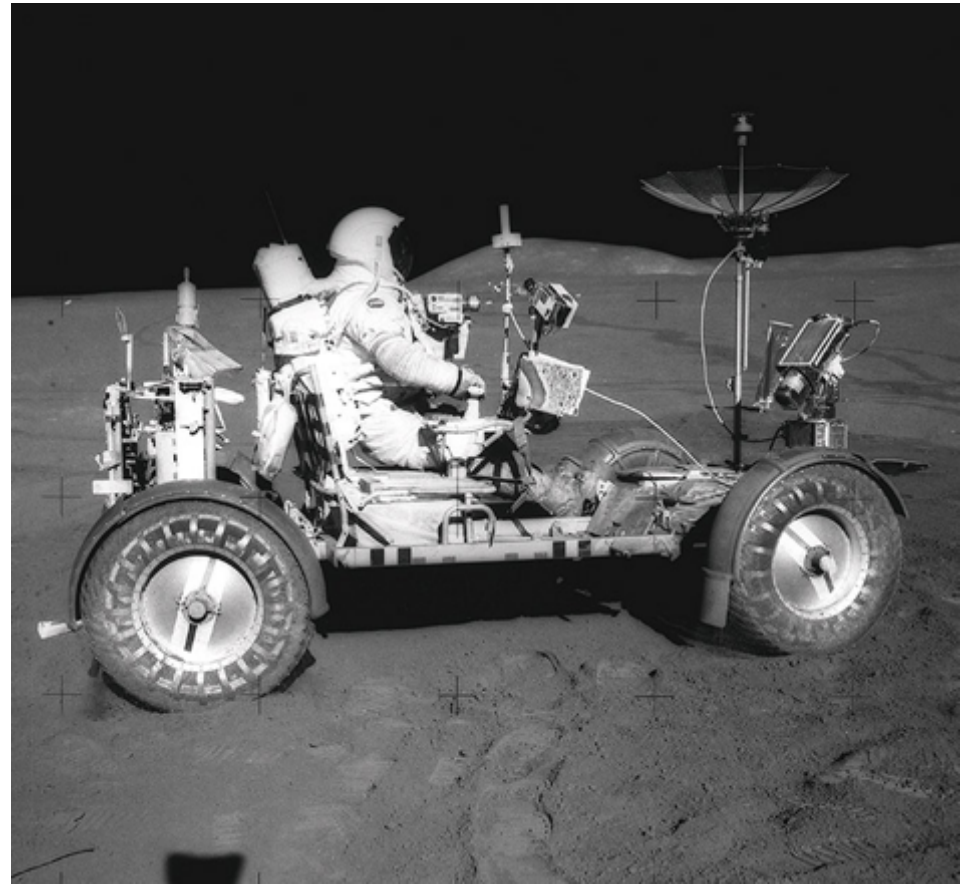




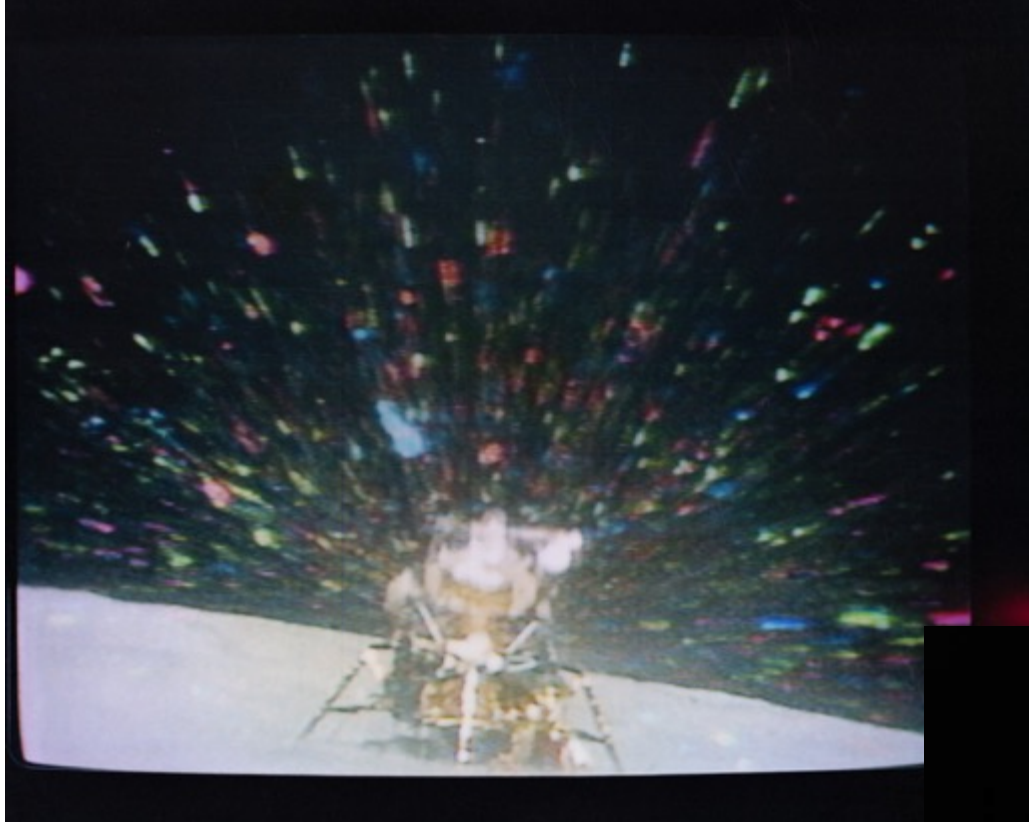
















# Space Shuttle (1981-2011)





Endeavour



ENDEAVOUR

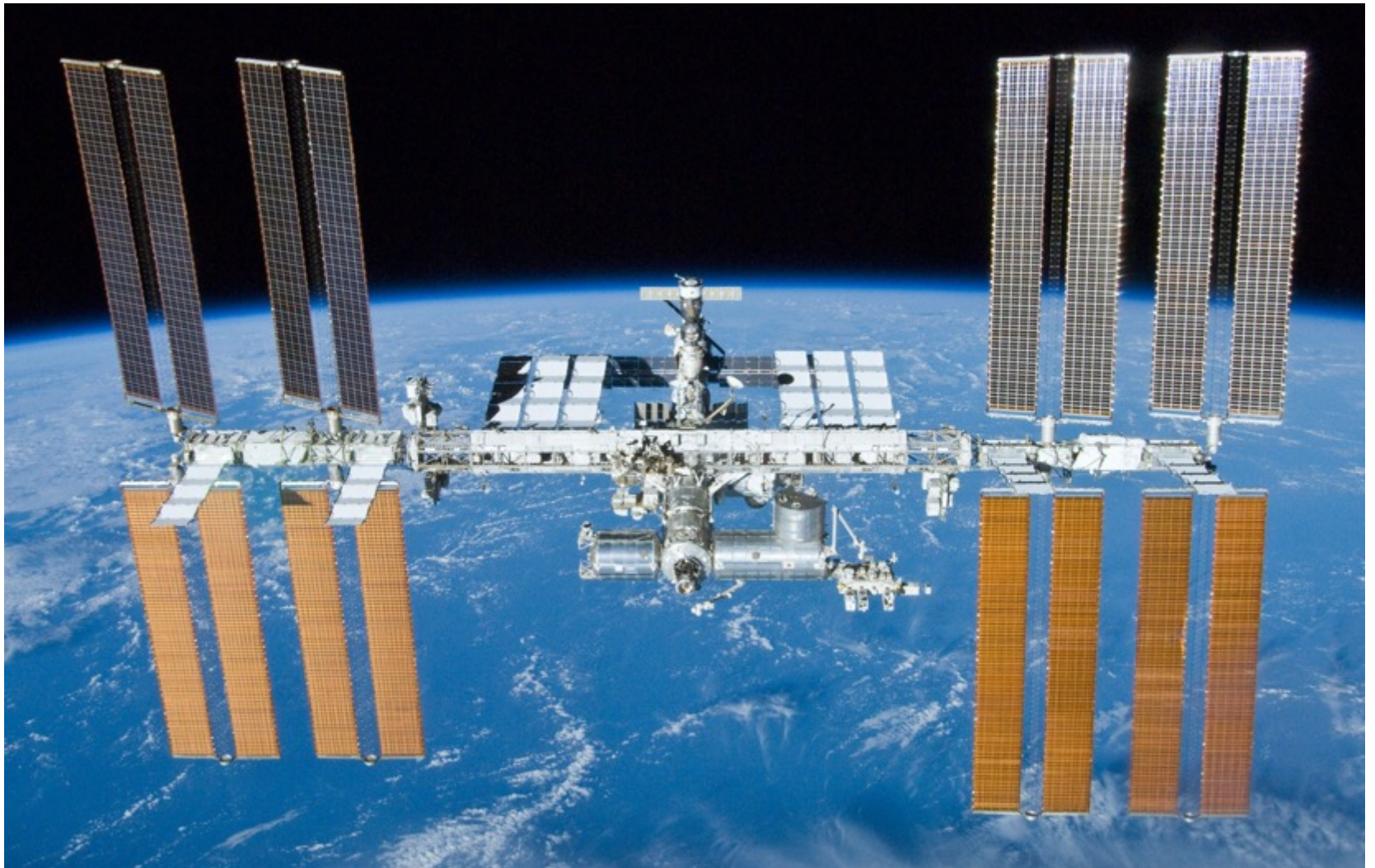
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# Challenger and Columbia Shuttle Losses



# International Space Station (beginning 1998)















# Key issues and lessons learned (?)

- Difficulty of working in space (for example, hundreds of spacewalks to assemble ISS)
- Maintenance of hardware in a harsh space environment
- Ramifications of hardware failure in space
- Moving toward reusable spacecraft and components
- Requirement for precursor missions to test everything wherever possible
- Be prepared for things to go wrong
- Be prepared for loss of life:
  - 536 astronauts in space to date
  - 18 died during missions (3 actually in space)
  - 11 died during training
  - 5.4 % death rate

IF WE COULD LAND A MAN ON  
THE MOON, WHY CAN'T WE—

—LAND A MAN  
ON THE MOON?

...OK, FAIR. BUT WE'RE  
WORKING ON IT, OK?

