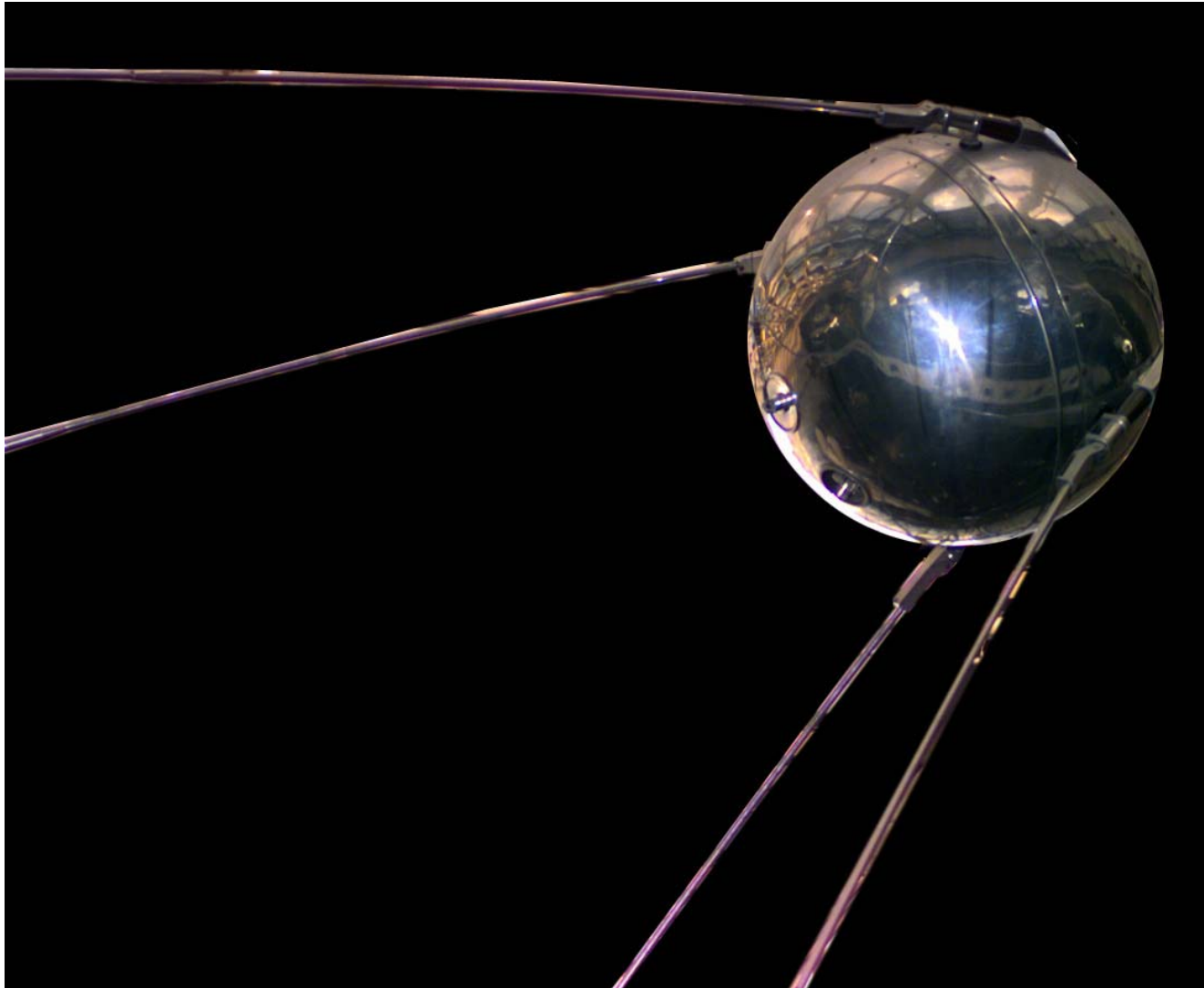


# Introduction to Astronautics

AE 1350



# Sputnik 1: October 4, 1957



# Astronautics

- Payload Design and Integration  
(e.g. satellites, space lab, Mars rover, etc.)
- Mission Design and Analysis  
(Including Selection of Trajectories)
- Launch Vehicle Design and Analysis  
(Rockets, space shuttle, etc.)
- Entry Systems

# Important Mission Phases

- Ascent: Getting from the surface of the Earth (or another planet) to the outside of the atmosphere
  - Similar to airplanes (aerodynamics, propulsion, stability & control, etc.) Rocket propulsion typical
- Mission in space: Sometimes called “on-orbit”
  - Methods for stability & control needed
  - Magnetic, gravity, and solar torques become important
  - Complexities of trajectory design
- Entry: Sometimes called “reentry”; getting from space to the surface
  - Similar to airplanes, with heating issues

# Basic Types of Vehicles

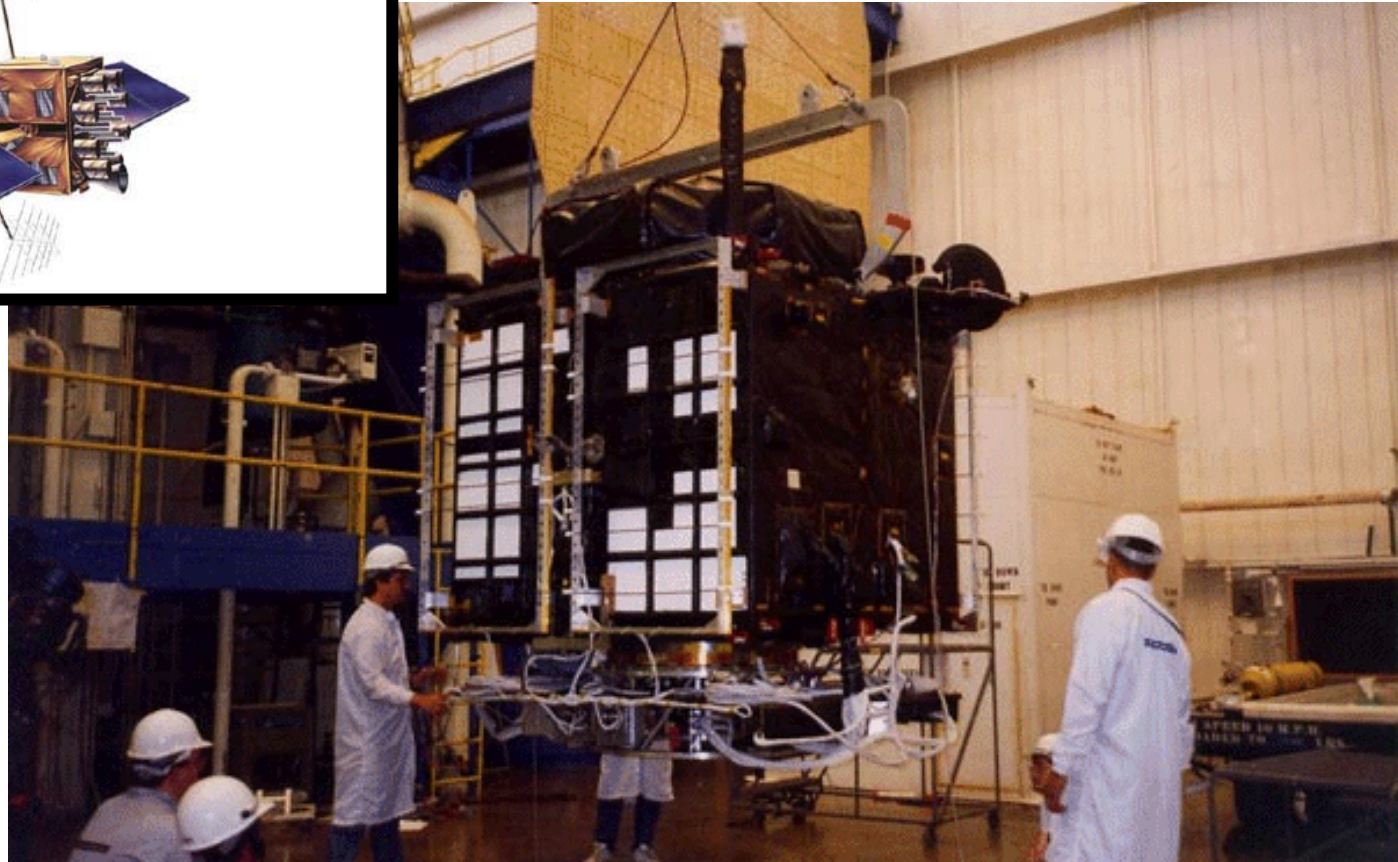
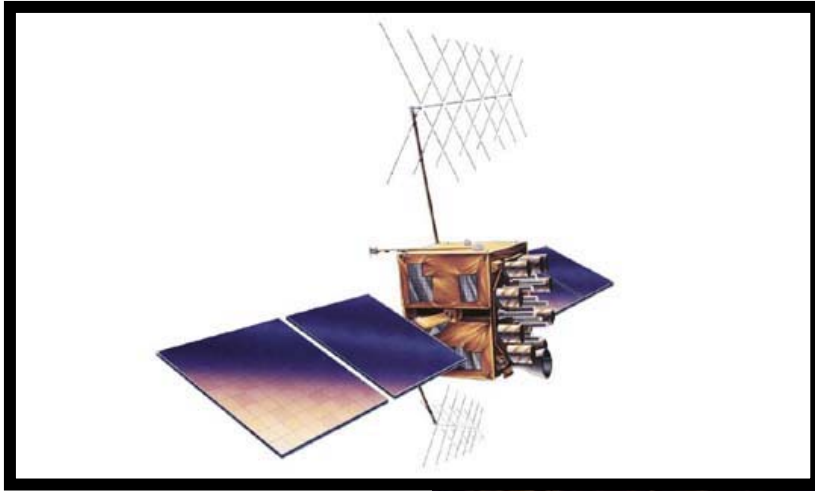
- Satellites
- Interplanetary vehicles
- Launch vehicles
- Entry vehicles

# Earth Satellite (Weather)



GOES-8

# Earth Satellite (Navigation)



GPS-IIR

# Earth Satellite (Space Station)



S116E07153

ISS

# Interplanetary Spacecraft (Exploration)

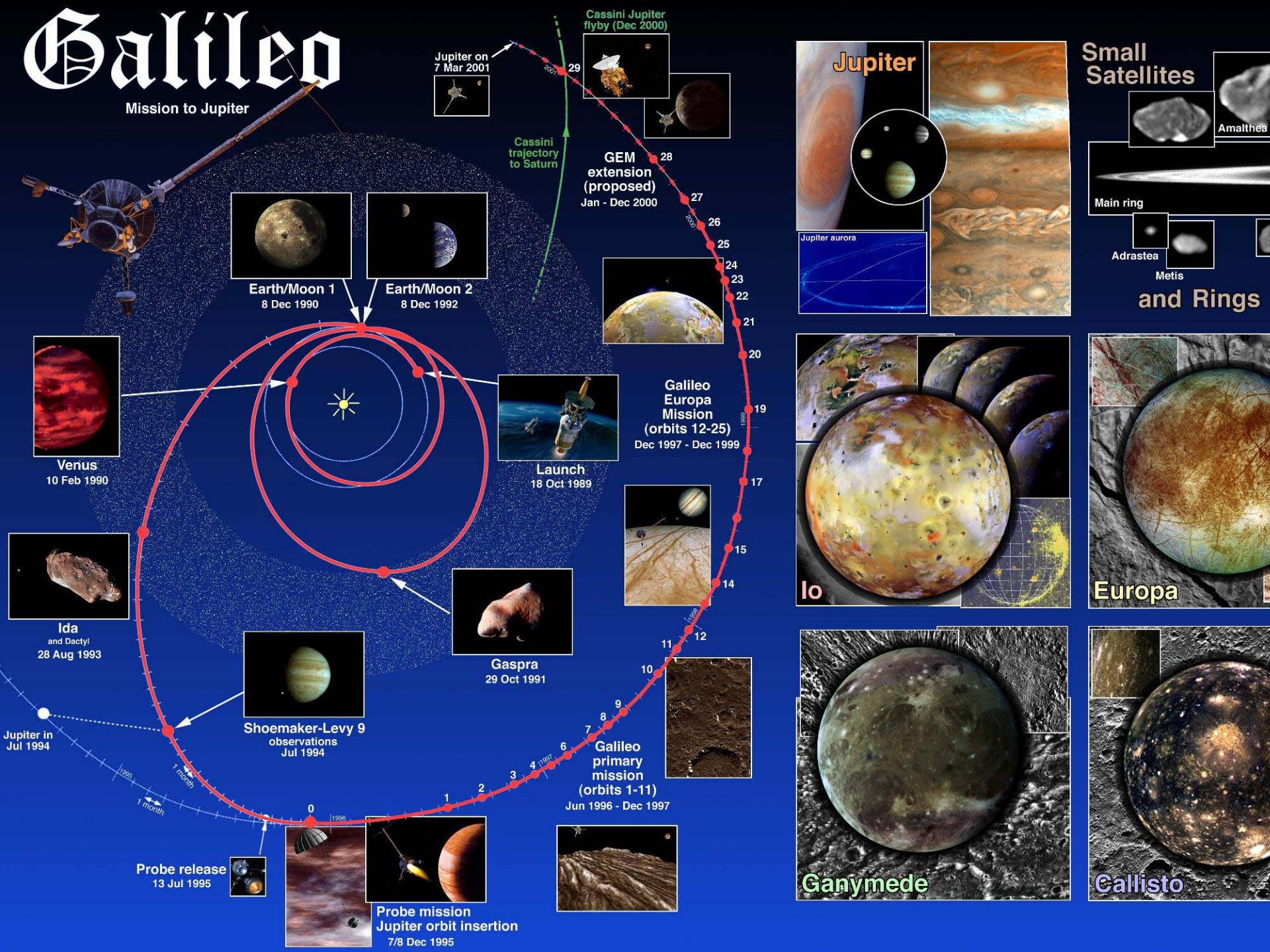


Galileo



# Galileo

Mission to Jupiter



# Interplanetary Spacecraft (Exploration)



MER

# Launch Vehicle (Expendable)



Ariane 5

# Launch Vehicle (Partially Reusable)

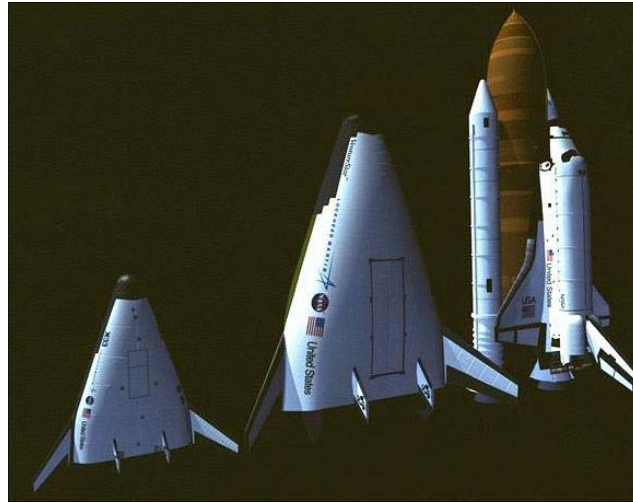


Space Shuttle

# Launch Vehicles (Other Ideas)



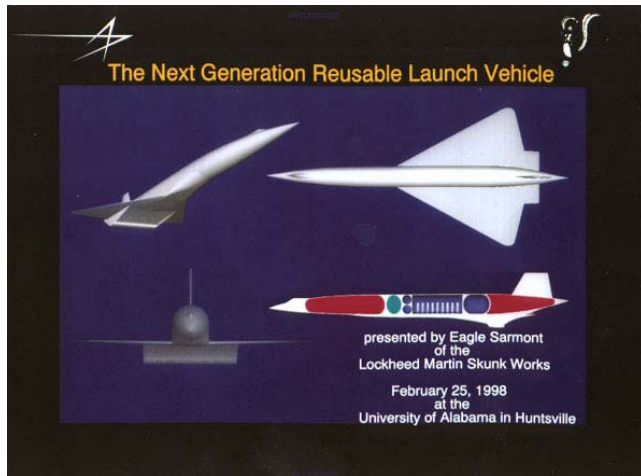
Kistler K-1



X-33/RLV



Rocketplane



Scramjet/SSTO



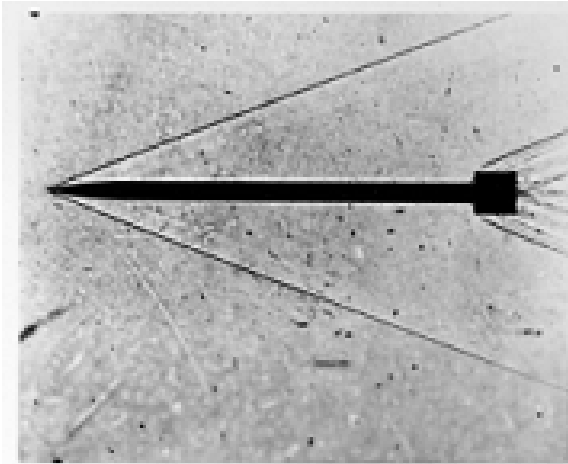
WK/SpaceShipOne

# Launch Vehicle

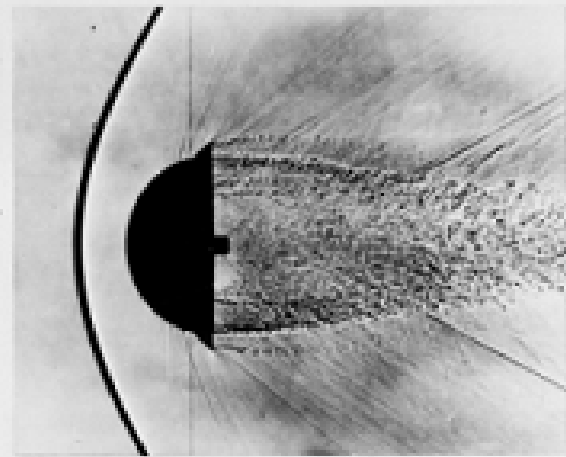


A proposed CLV

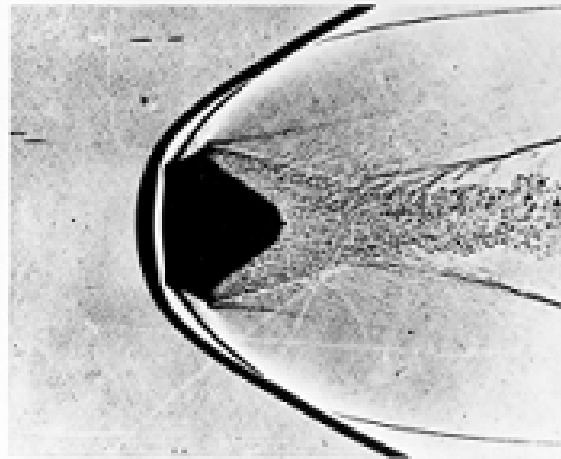
# Entry Aerodynamics



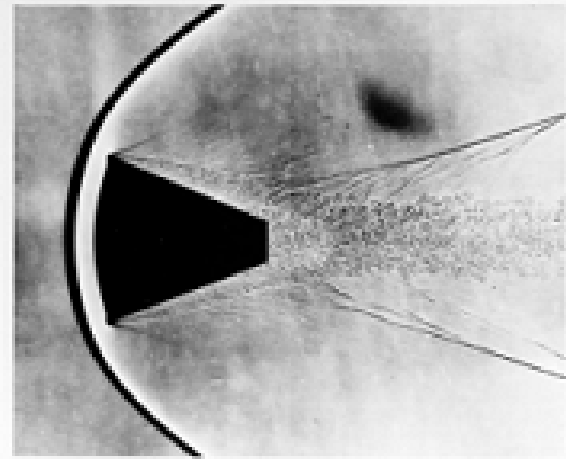
**INITIAL CONCEPT**



**BLUNT BODY CONCEPT 1953**



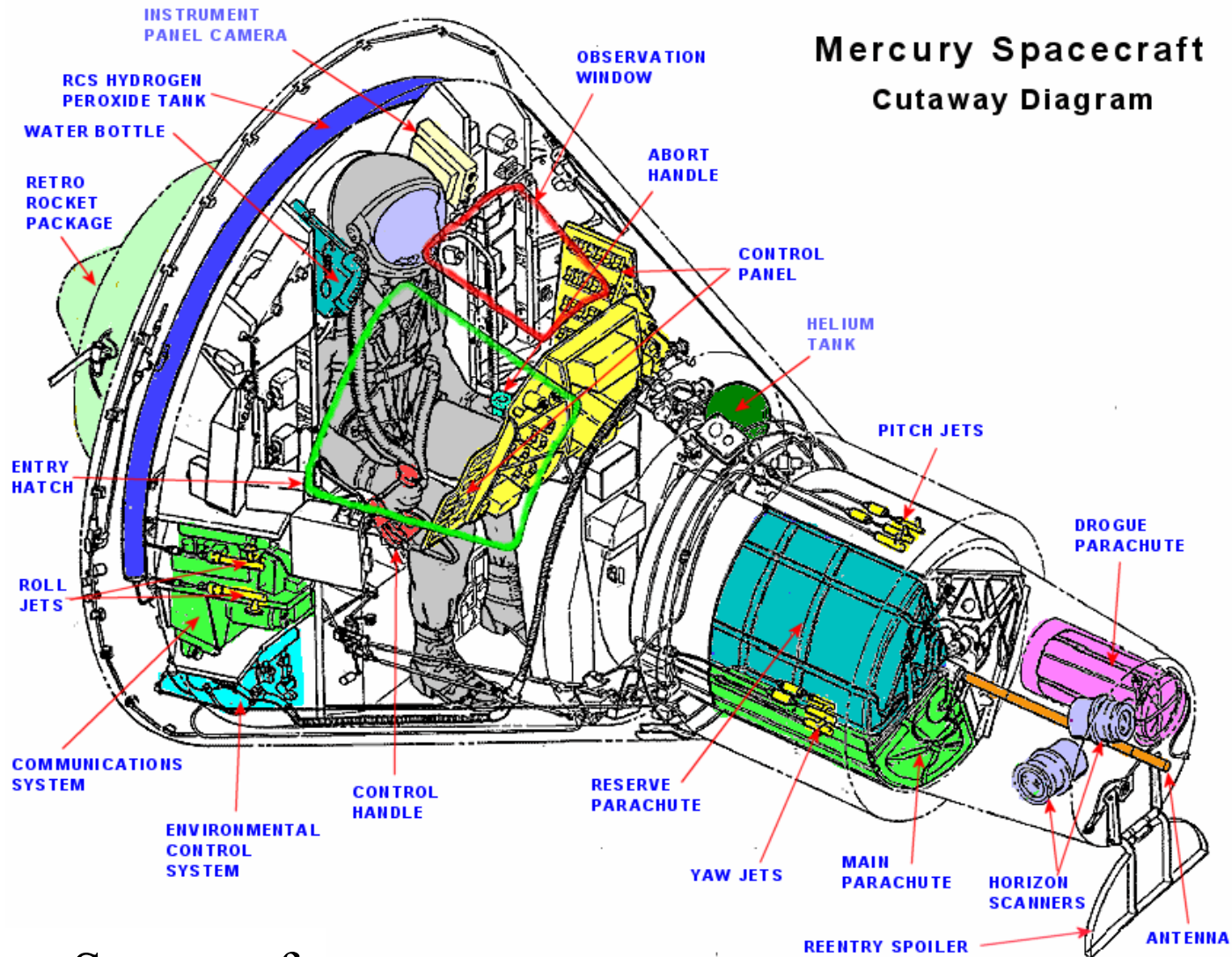
**MISSILE NOSE CONES 1953-1957**



**MANNED CAPSULE CONCEPT 1957**

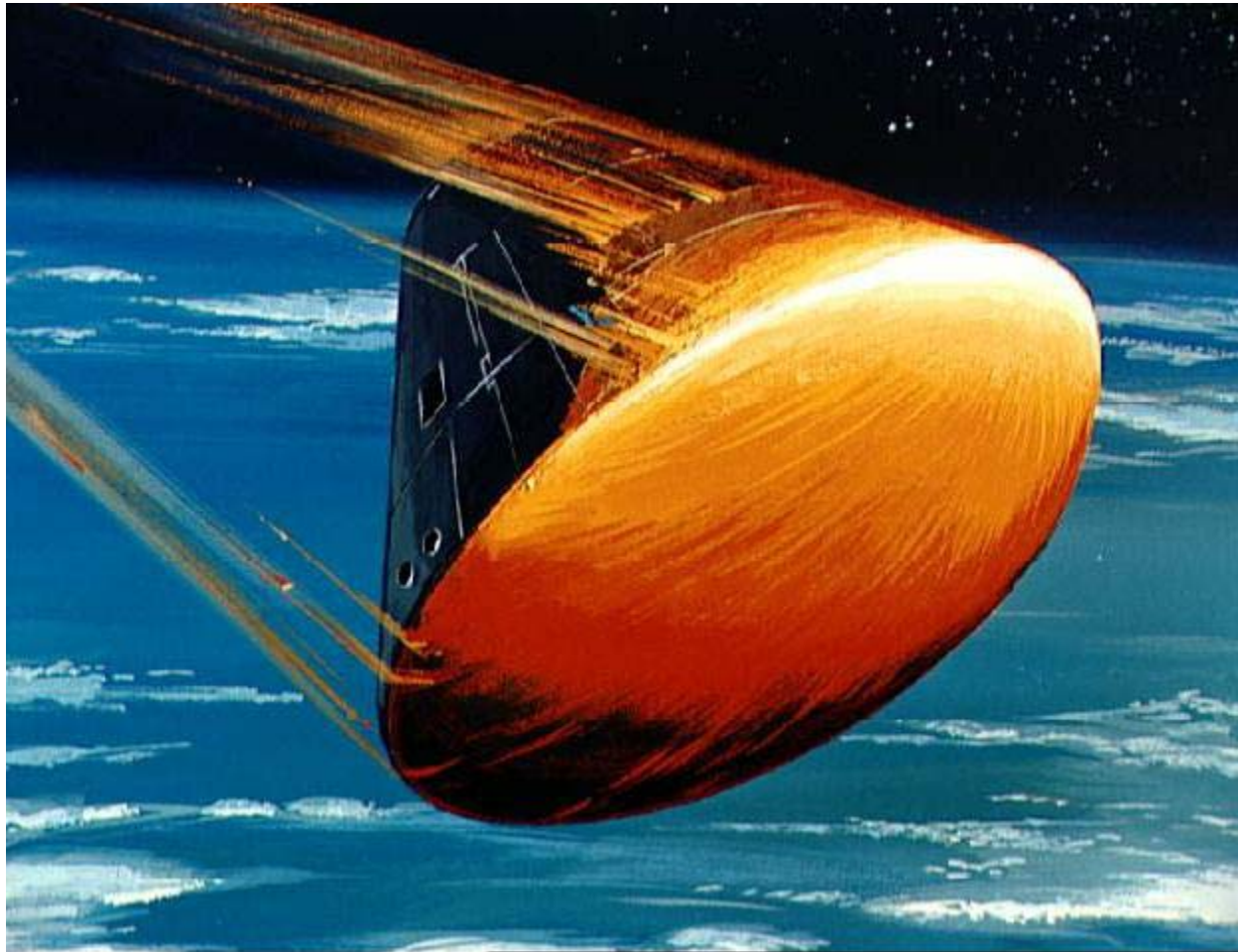
# Entry Vehicle

## Mercury Spacecraft Cutaway Diagram



Mercury Spacecraft

# Entry Vehicle



Apollo Command Module

# Entry Vehicle (Mars)



MER

# Entry Vehicle



Space Shuttle Orbiter