

# The Space Shuttle Program



# Introduction

- Space Shuttle was a partially reusable low Earth orbital spacecraft
- Operated by **NASA**.
- The Space Shuttle was the most complex space vehicle design of its time.
- Launched from the **Kennedy Space Center** (KSC) in Florida.
- Its official program name was *Space Transportation System* (**STS**).

## History

- Total of 135 missions from 1981 to 2011.
- Launched numerous satellites, interplanetary probes, and the Hubble Space Telescope, also participated in construction and servicing of the International Space Station.
- Total flight duration: 1322 days, 19 hours, 21 minutes and 23 seconds.
- Total 6 orbiters: *Enterprise, Columbia, Challenger, Discovery, Atlantis and Endeavour.*
- Challenger and Columbia were destroyed in mission accidents in 1986 and 2003.

# Space Shuttle Orbiters



# Specifications

## SIZE

- Height 56.1 m
- Diameter 8.7 m
- Mass 2030 tones

## CAPACITY

- Crew 7 (max)
- Payload to LEO 24 400 kg
- Payload to GTO 3810 kg
- Payload to Polar orbit 12 700 kg
- Payload to Landing 14 400 kg



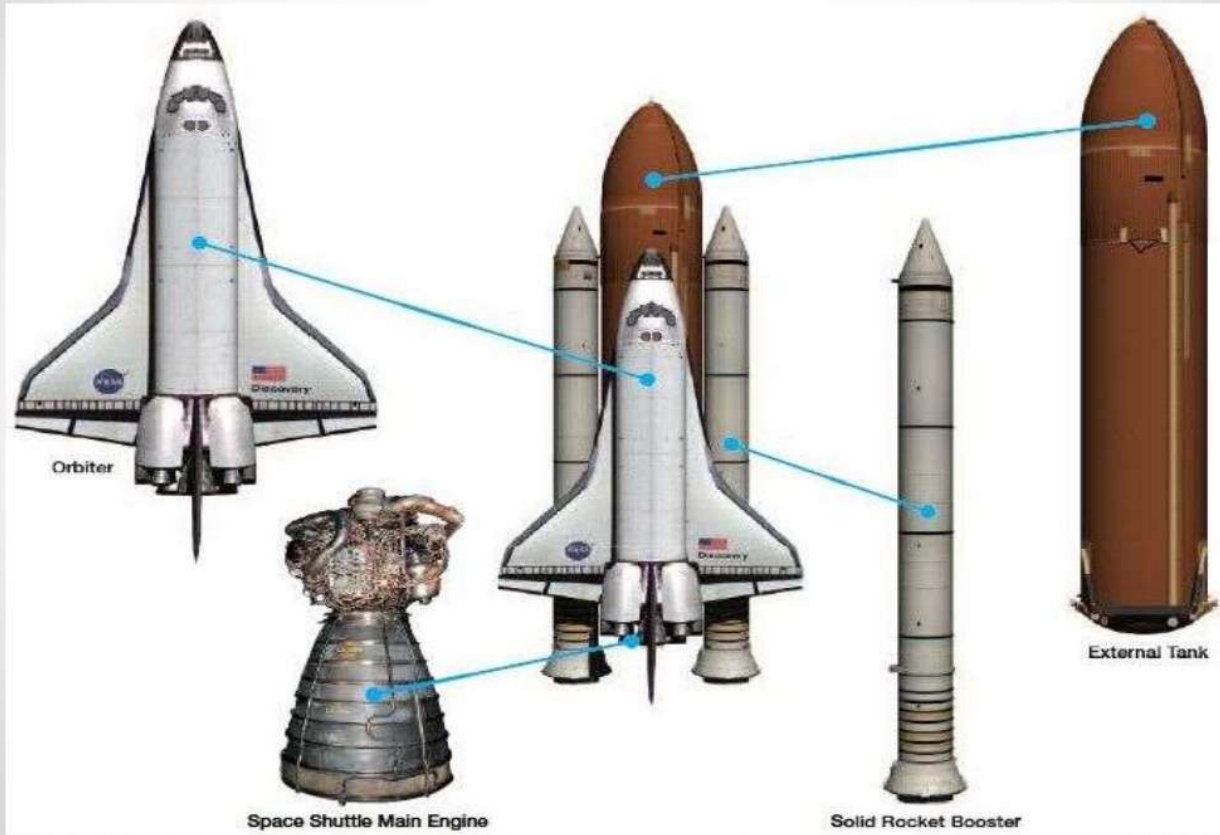
## Mission profile

- A typical shuttle mission lasts seven to eight days, but can extend to as much as 14 days depending upon the objectives of the mission.
- A typical shuttle mission is as follows:
  - 1. Getting into orbit
    - 1.1 Launch
    - 1.2 Ascent.
    - 1.3 Orbital maneuvering burn.
  - 2. Orbital life in space.
  - 3. Re-entry.
  - 4. Landing.

# The Launch

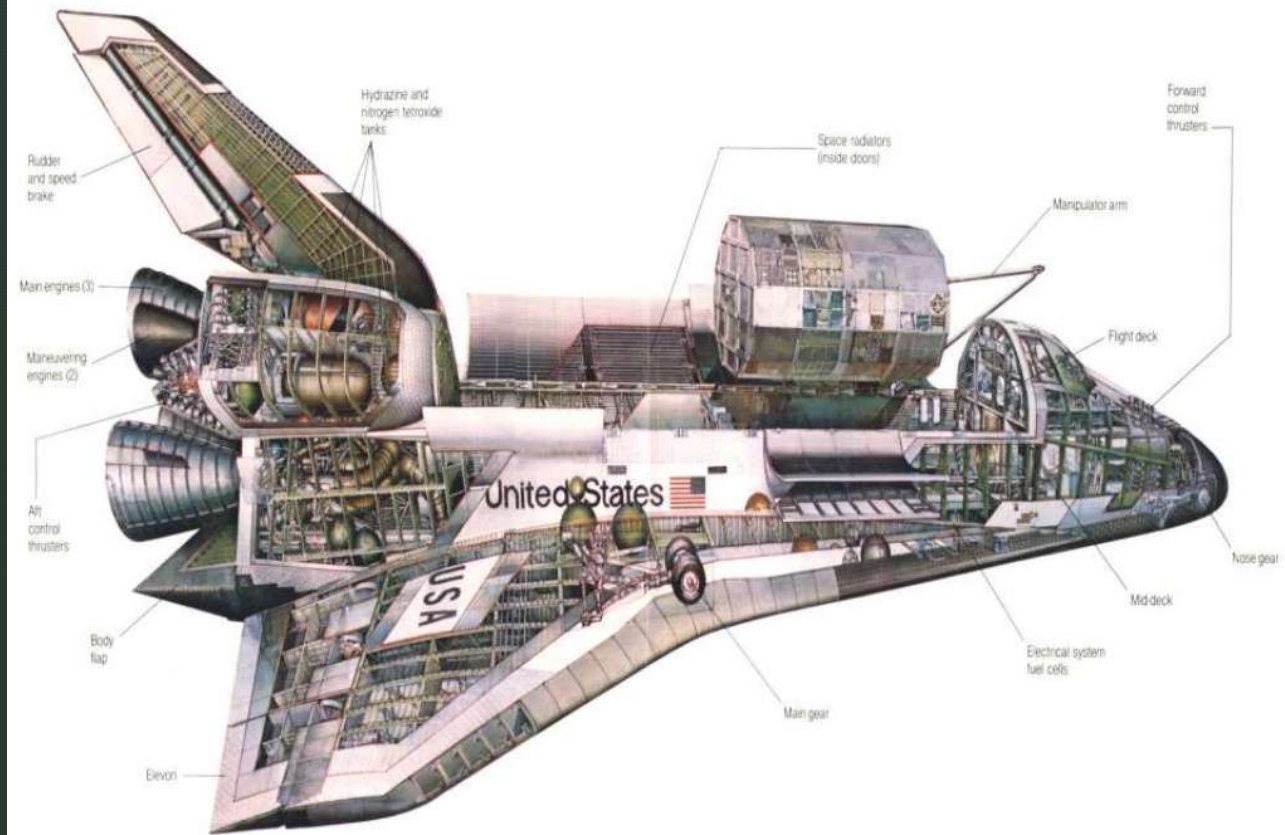


## Space Shuttle Launch Configuration

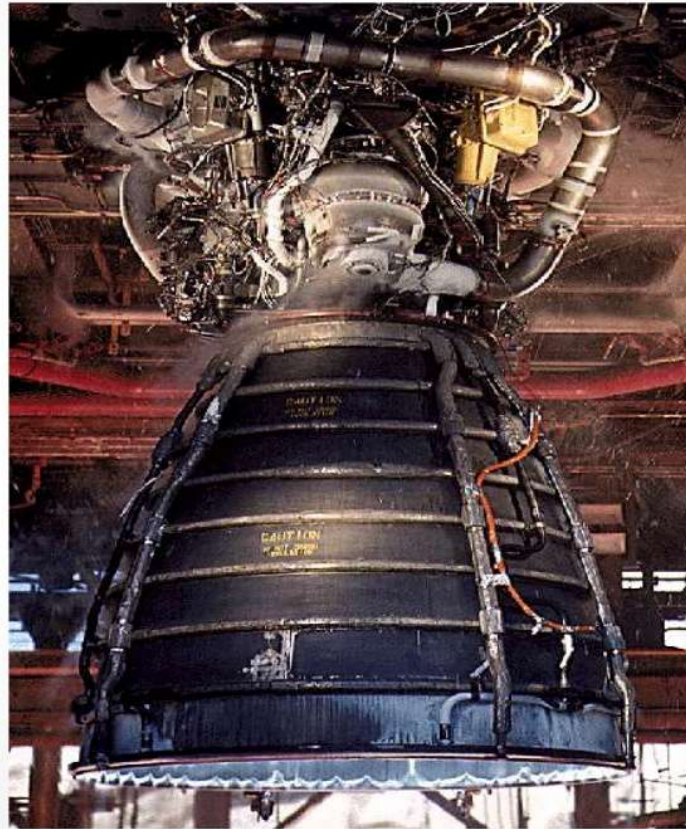




# Space shuttle orbiter



## Space Shuttle Main Engine

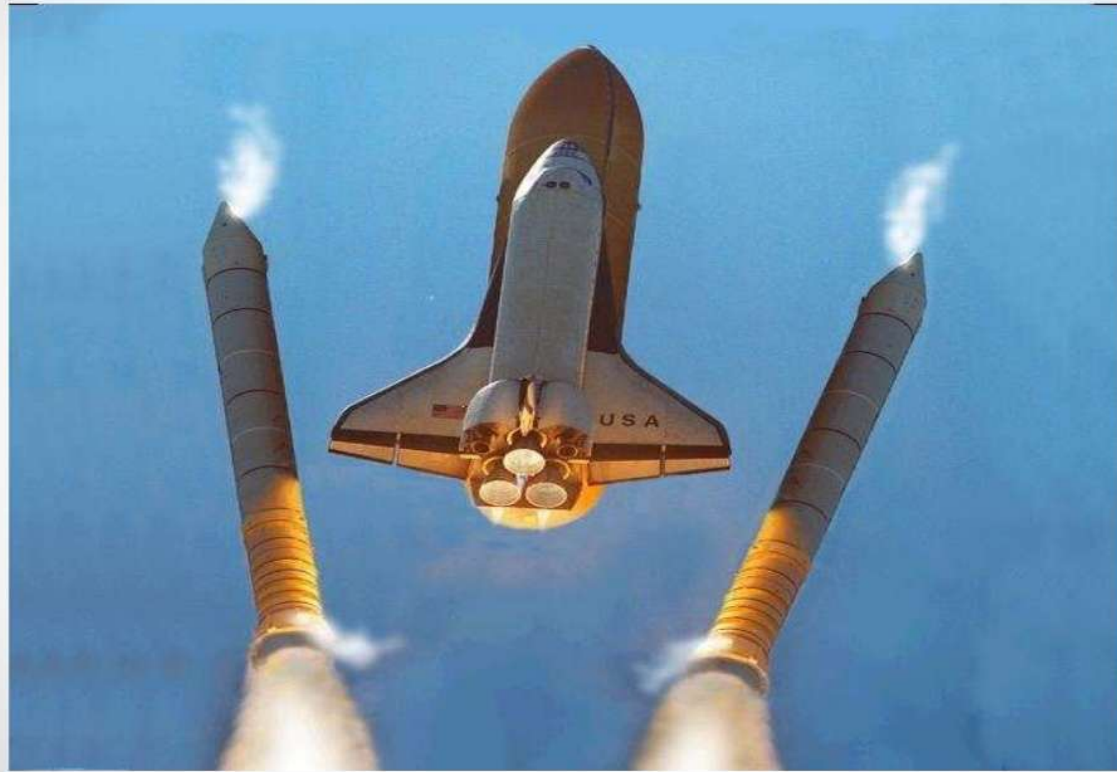


A Space Shuttle External Tank (ET) on its way to the Vehicle Assembly Building





## Solid Rocket Boosters



## • ORBITAL LIFE IN SPACE

- Shuttle usually flew at an altitude of 320 kilometers
- During 1980s and 1990s, many flights targeted on missions to the **NASA/ESA** Spacelab
- During 1990s and 2000s the focus shifted more in building the space station and satellite launches.
- From 2001 to 2011 missions were intended to launch astronaut to ISS and to service them.





# The Landing

- To assist the speed brake a 12 m drag chute is deployed.



- The chute was jettisoned once the orbiter slowed to 110 km/h
- Finally the orbiter comes to a Stop.

# Take off to Landing Diagram



## Conclusion

- Space Shuttle was a partially reusable low Earth orbital spacecraft
- Commissioned and operated by **NASA** from 1981 to 2011
- It was the most complex machine built at its time
- There were a total of 6 Orbital Vehicles build by NASA
- A total of 14 astronauts were lost in space due to space shuttle disaster including Indian astronaut Kalpana Chawla

## Reference

[1]Space Shuttle - A future Space Transportation System  
Robert.F.Thompson

[2] Kyle, Ed. "STS Data Sheet". spacelaunchreport.com.  
Retrieved July 2014.

[3] Space Shuttle Propulsion Systems, p. 153. NASA, June 26,  
1990.

[4] Jenkins, Dennis R. (2006). Space Shuttle: The History of the  
National Space Transportation System. Voyager Press. ISBN 0-  
9633974-5-1.

[5] "INTRODUCTION TO FUTURE LAUNCH VEHICLE  
PLANS [1963–2001] Updated 6/15/2001, by Marcus Lindroos".  
Pmview.com. June 15, 2001. Retrieved 2012-04-17.