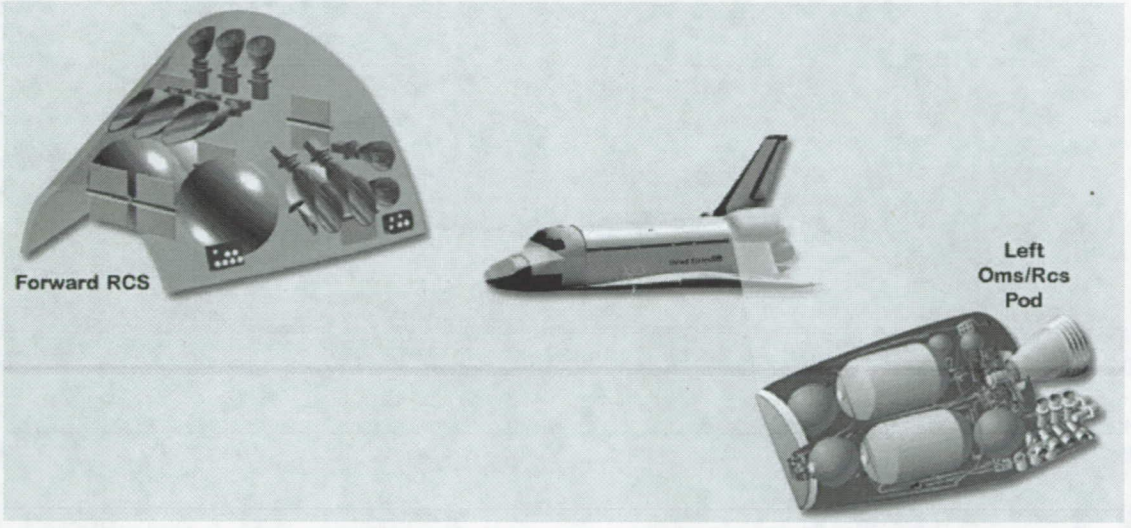
Reaction Control Systems (RCS)

What is RCS?

- Provides the thrust on the space shuttle for:
  - Attitude maneuvers - pitch, yaw, and roll
  - Small velocity changes along the orbiter axis
- Comprised of three systems:
  - Forward RCS
  - Aft RCS (right and left)

Locations of RCS

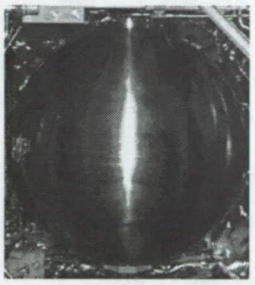


Reaction control systems are used for:

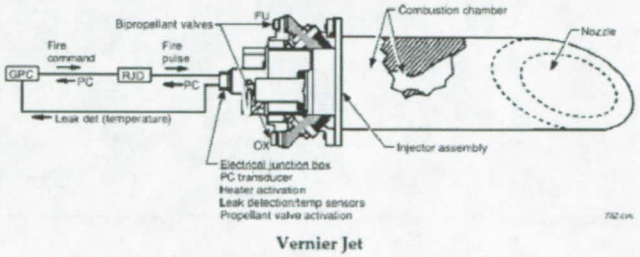
- ❖ **Attitude control during re-entry**
- ❖ **Station keeping in orbit**
- ❖ **Close maneuvering during docking procedures**
- ❖ **Control of orientation**
- ❖ **As a backup means of de-orbiting**

Each RCS System Consists of:

- High-pressure gaseous helium storage tanks
- Pressure regulation and relief systems
- A fuel tank (MMH)
- An oxidizer tank (N_2O_4)
- A distribution system
- Electrical heaters
- Thrusters

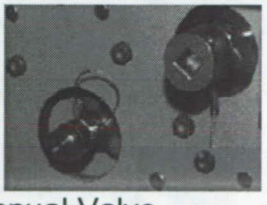


Oxidizer / Fuel Tank

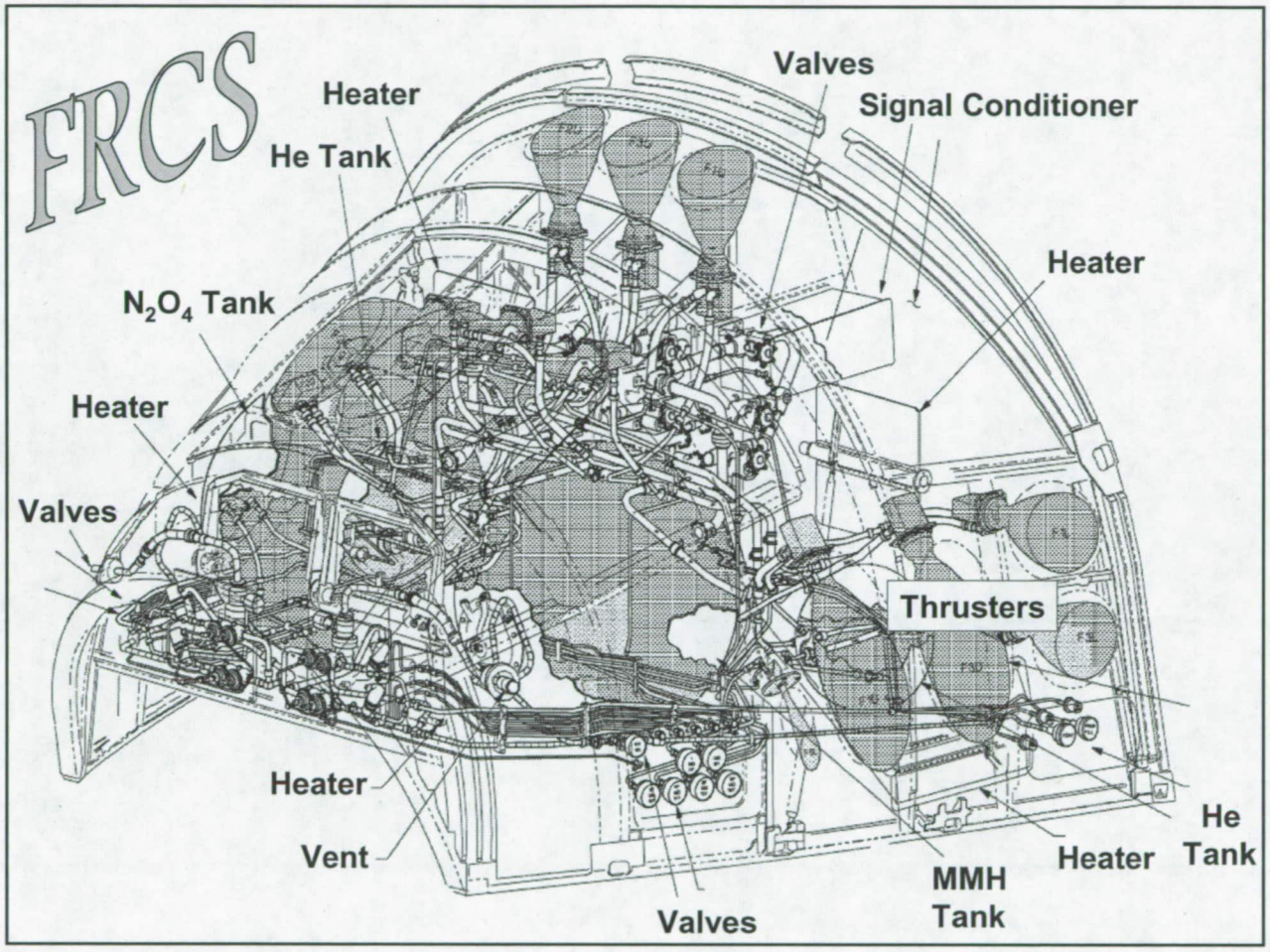


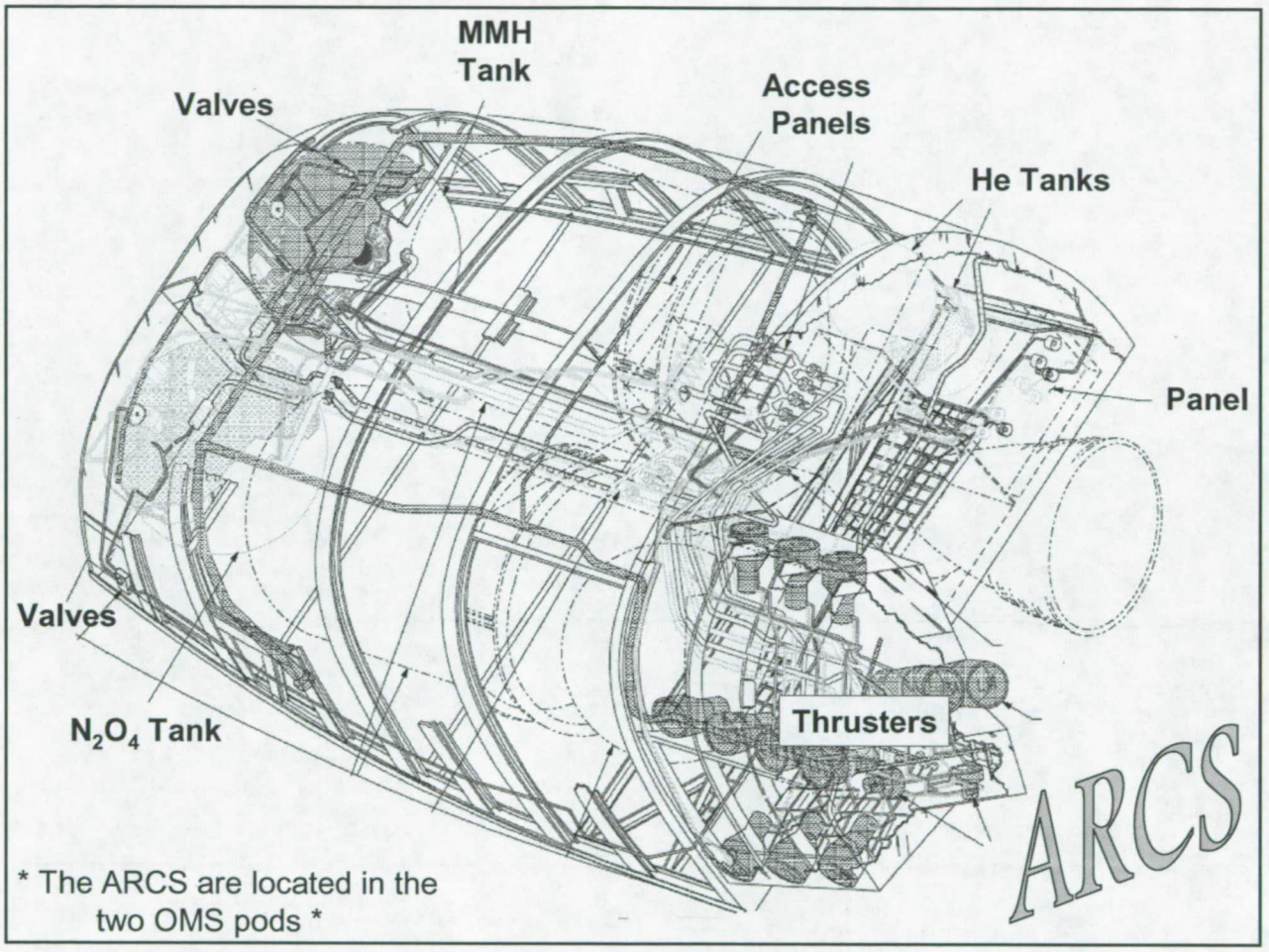
Vernier Jet

Iso Valve



Manual Valve


FRCS
Heater
He Tank
Valves
Signal Conditioner
Heater
N_2O_4 Tank
Heater
Valves
Thrusters
Heater
Vent
Valves
MMH
Tank
Heater
He
Tank

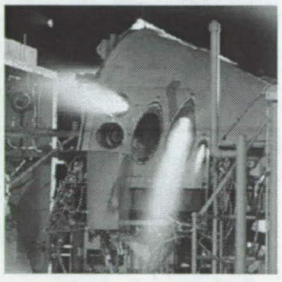

MMH
Tank
Valves
Access
Panels
He Tanks
Panel
Valves
N_2O_4 Tank
Thrusters
ARCS
* The ARCS are located in the
two OMS pods *

Distribution System

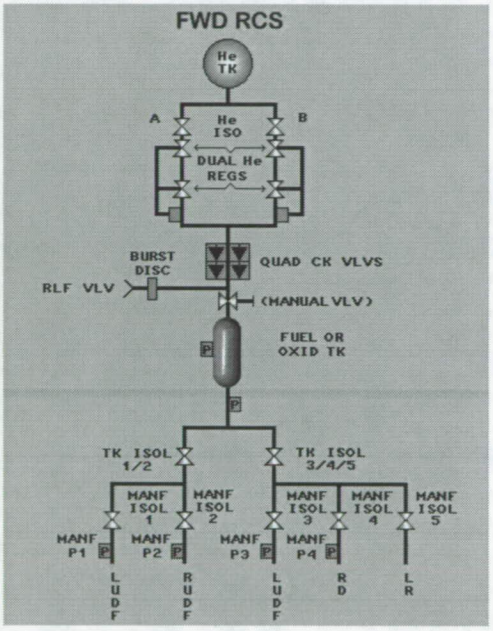
- Tank and manifold isolation valves, crossfeed valves, regulators, and distribution lines
- Valves open / close through pressure gradients
- Oxidizer and fuel are supplied under pressure to the RCS jet thrusters where they atomize, ignite, and produce a hot gas and thrust

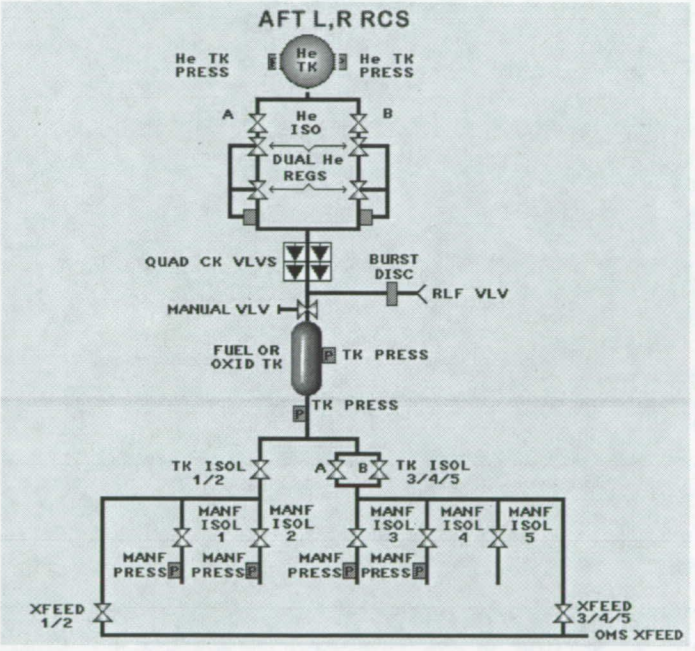
Engine Specs

- **Primary ~ 14 in FRCS and 12 in each ARCS pod**
  - **870 lbs thrust each**
- **Vernier ~ 2 in FRCS and 2 in each ARCS pod**
  - **24 lbs thrust each**
- **N_2O_4 to MMH ratio for each engine is 1.6 to 1**

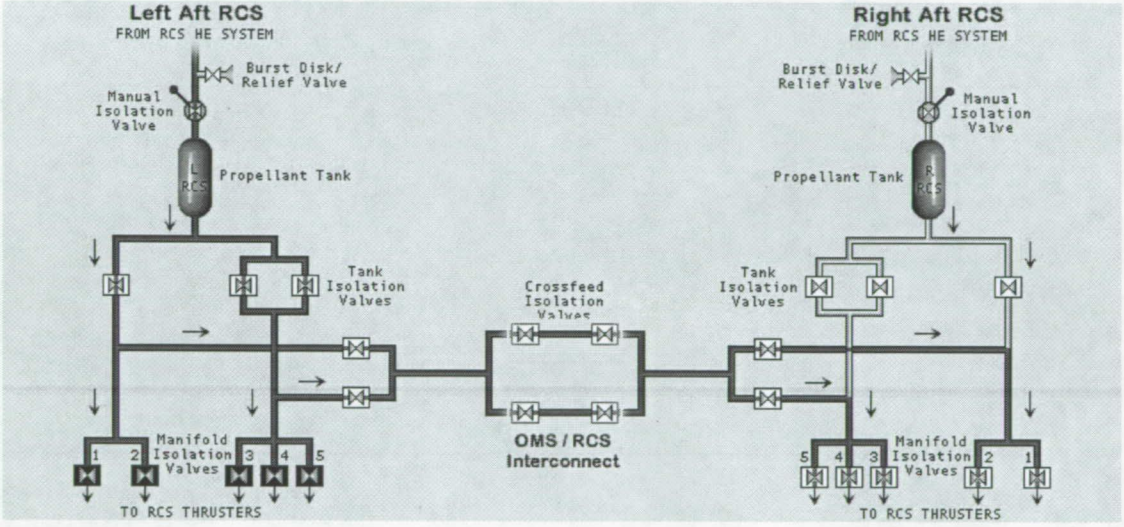


RCS Block Diagrams





RCS Block Diagrams cont.



References

- www.nasa.gov
- http://science.ksc.nasa.gov
- United Space Alliance

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14. ABSTRACT

This presentation explains how the reaction control system is incorporated into the shuttle and how it functions.

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