Structural Design Practices

• Payload interfaces to launch vehicles
• Examples of structural design approaches from past space vehicle structural designs
Shuttle Payload Restraint Configurations

3-POINT ATTACH

PRIMARY FITTINGS;
REACT LONGITUDINAL AND
VERTICAL LOADS ($F_x$ & $F_z$)

KEEL FITTING;
REACTS SIDE AND LONGITUDINAL
LOADS ($F_y$ & $F_x$)

5-POINT ATTACH

PRIMARY FITTINGS;
REACT LONGITUDINAL AND
VERTICAL LOADS ($F_x$ & $F_z$)

KEEL FITTING;
REACTS SIDE LOAD ($F_y$)

STABILIZING FITTINGS;
REACT VERTICAL LOAD ($F_z$)
Orbiter Active Latches
Orbiter Passive Latches

LONGERON
BRIDGES
PASSIVE FITTINGS

LONGERON BRIDGE FITTING
(RIGHT SIDE SHOWN)
PAYLOAD LATCH FITTING
PAYLOAD TRUNNION
SILL LONGERON
FUSELAGE FRAME
PAYLOAD SEGMENT
SLOT FOR LOCKING PINS
Atlas V Payload Fairing Configuration

Structural Practices
Principles of Space Systems Design
Delta IV Bolted Payload Attach Fitting
Delta IV Pyro Payload Attach Fitting
Saturn V First Stage (S-IC) Cutaway
Saturn V S-IC Intertank Fairing
Saturn V S-II LOX Tank Cutaway
Saturn V S-II Thrust Structure Detail
Saturn V S-IVB/J-2 Thrust Structure
Lunar Module Overall Configuration
Lunar Module Ascent Stage Structure
Lunar Module Ascent Stage Structure

- Antenna Supports
- Midsection
- Aft Equipment Bay
- Equipment Rack
- Thermal and Micrometeoroid Shield
- Crew Compartment
- TCA Cluster Supports
Lunar Module Descent Stage Structure
Lunar Module Descent Stage Structures
Gemini Spacecraft Equipment Arrangement

GEMINI EQUIPMENT ARRANGEMENT

- Propellant Tanks
- Communications Equipment
- Coolant Radiators
- Orbit Attitude Control Thrusters (Typical)
- Coolant Pumps
- Cryogenic Oxygen Tank
- Electrical Power System
- Instrumentation Equipment
- Drinking Water

- Retrograde Rockets
- Entrance Seats
- Entry Attitude Control System
- Parachute Landing System
- Horizon Sensors
- Electrical Equipment
- Inertial Guidance System
- Maneuver Thrusters (Typical)
- Rendezvous Radar

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