

**WP-2 ATTACHED PAYLOAD ACCOMMODATIONS**

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**ABSTRACT**

The presentation provides an overview of the current SSFP attached payload accommodations on the U.S. truss. The overview includes discussions on the four attach sites, the power architecture, thermal control, DMS provisions and the mechanical attach mechanism. The presentation concludes with a description of a McDonnell Douglas concept for an attached payload pallet designed to take advantage of the four sites and existing SSF hardware. This presentation should provide the payload community with a basic understanding of the SSF attached payload utility ports and aid in attached payload concept development.



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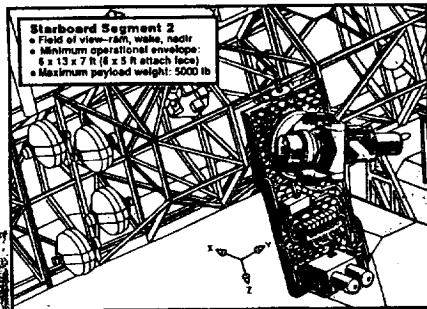
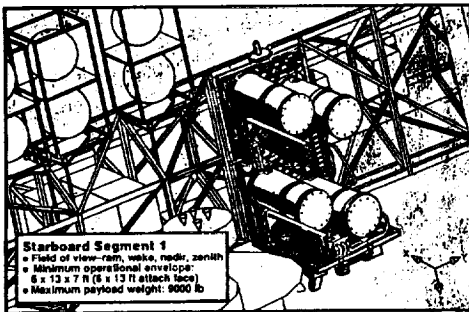
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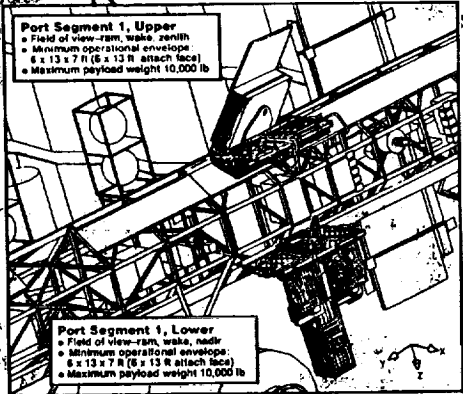
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**Accommodations\***

- Power: 3 kW each site, 6 kW aggregate
- Data: 1553 local bus—256 kbps down (FDDI scarring potential)
- Use of common station attachment mechanism (modified propulsion module assembly structure)

\*Pallets and payloads are representative only



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WP-2 Pre-Integrated Truss  
Attached Payload Accommodations**

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## NOVEMBER 12 SSCB AND ATTACHED PAYLOAD CR

- The November 12 SSCB and the parameters set forth in the Attached Payload CR #BB003113B require accommodations for attached payload as follows:
  - Number of sites: at least 4 separate sites for attached payloads
    - Viewing: view nadir, zenith, ram and wake direction without significant occultation by SSMB
    - Clearance Envelopes: attach faces of about 5x6 ft on S2 and 6x13 ft on the S1 and P1 sites, and 7 ft height at each site
  - Utility Ports: each site contains at least 1 port
    - Power: 3 kW peak per port (redundant power feed)  
6 kW total peak aggregate supplied to all ports
    - Thermal: payload provided
    - Data: 1553 Payload Local Bus with external FDDI network fibers and cables for later hook up
    - Mechanical Attachment: each attached payload site will contain 1 suitable mechanical attachment

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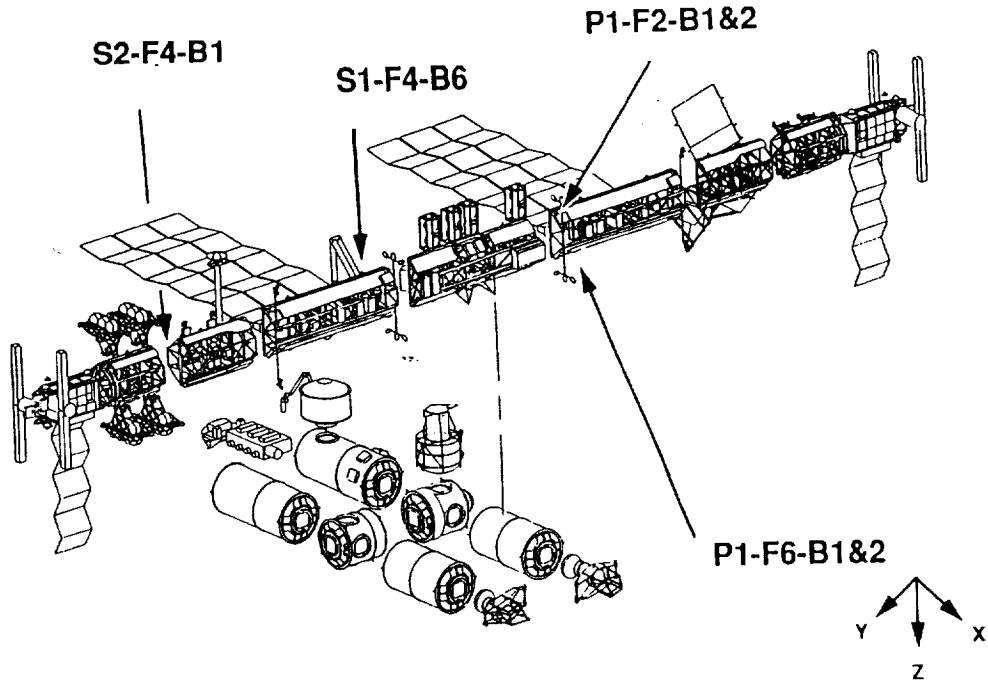
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## ATTACHED PAYLOAD UTILITY PORTS

- Starboard (MTC) Locations:
  - S2-F4-B1: pre-integrated attachment on Face 4 (5' x 6' attach face) with viewing in the Nadir and Wake directions (potential for Ram and Zenith viewing also)
  - S1-F4-B6: attachment over the grapple fixtures with no structural impact (6' x 13' attach face), viewing in Nadir, Zenith, Ram and Wake directions
- Port (post MTC) Locations:
  - P1-F2- B2: attachment over the utility trays (6' x 13' attach face), unobstructed view in Zenith, Ram and Wake directions
  - P1-F6- B2: attachment over the utility trays (6' x 13' attach face), unobstructed view in Nadir, Ram and Wake directions, common with P1-F2 location

Note: all sites provide a minimum height of 7 ft - see operational envelopes pages 10 through 12

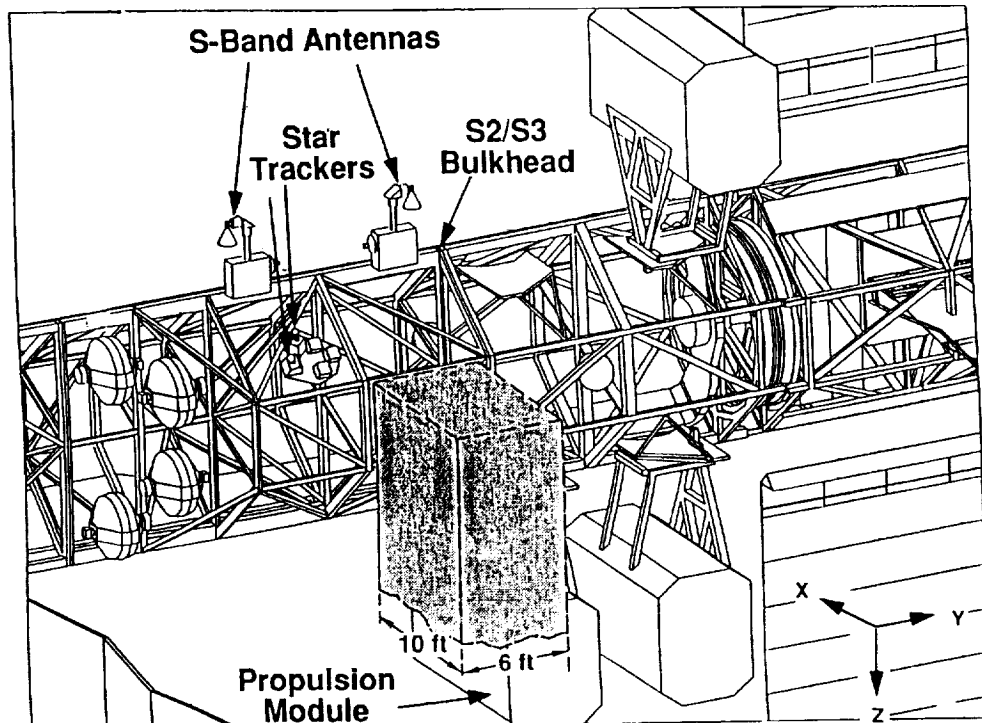
# ON-ORBIT CONFIGURATION SHOWING PRIME PAYLOAD ATTACHMENT SITES



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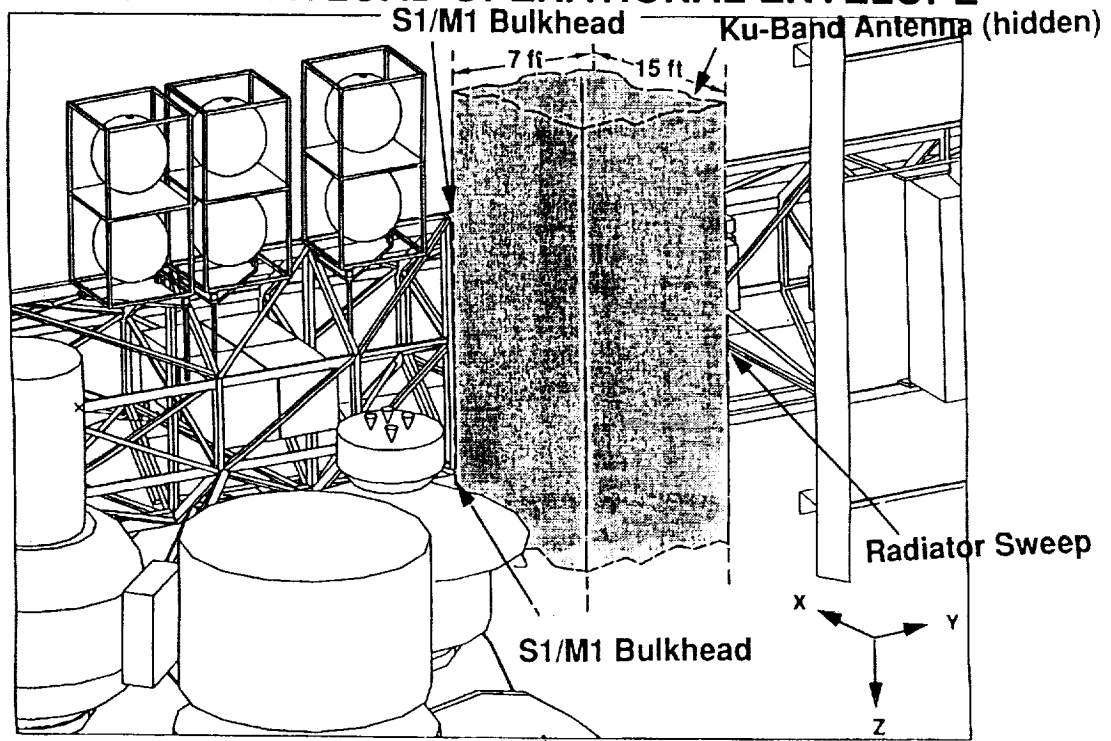
# S2 (MB-2) SEGMENT ATTACHED PAYLOAD OPERATIONAL ENVELOPE



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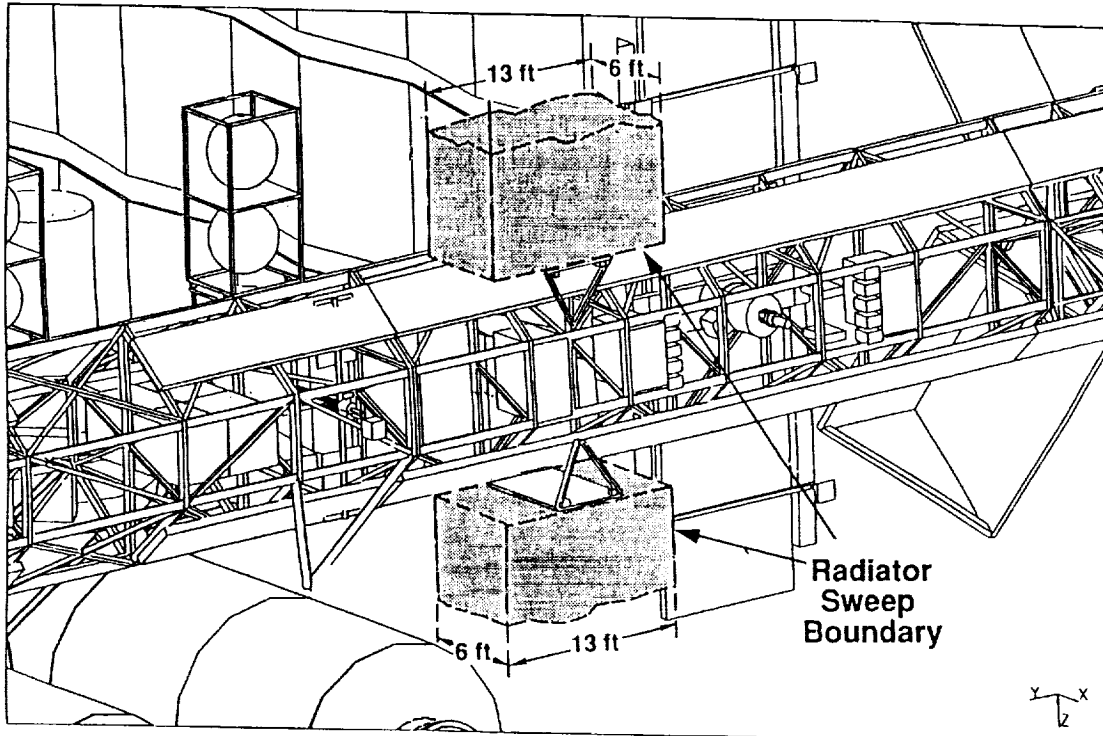
# S1 (MB-3) SEGMENT ATTACHED PAYLOAD OPERATIONAL ENVELOPE



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# P1 (MB-8) SEGMENT ATTACHED PAYLOAD OPERATIONAL ENVELOPE



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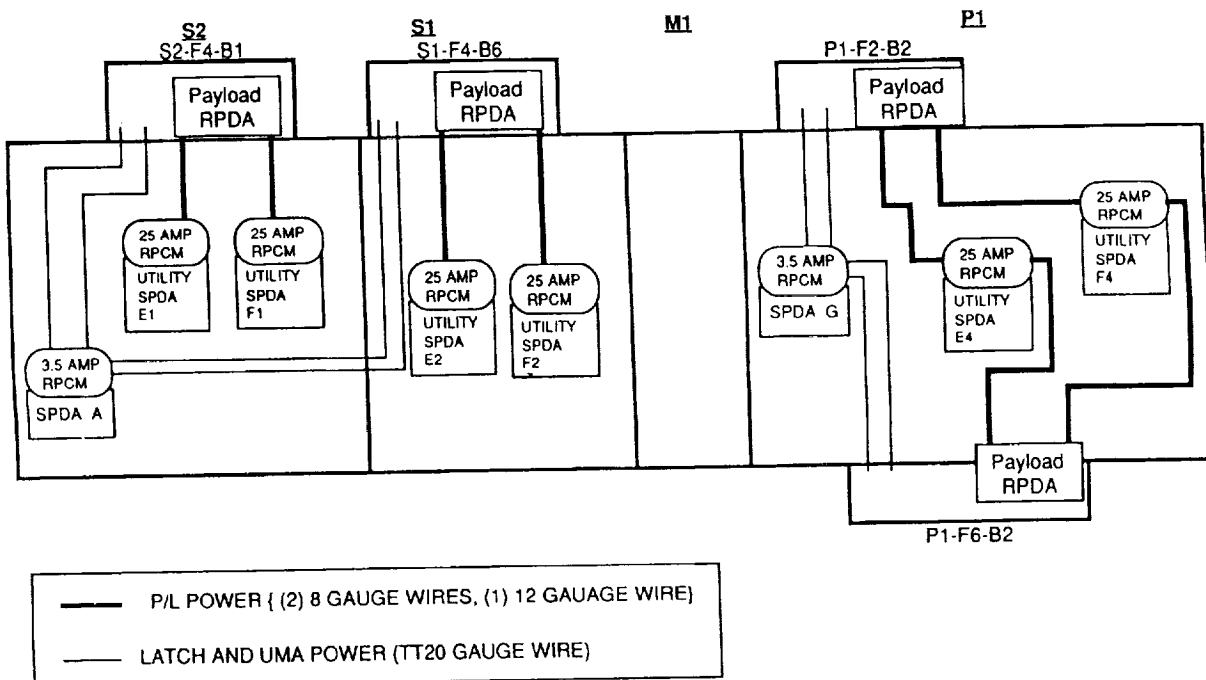
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# POWER ACCOMMODATIONS APPROACH

- The existing Electrical Power System (EPS) design was used
  - No new DC to DC Converter Units (DDCUs) are required, which would also require adding new Main Bus Switching Units (MBSUs)
  - Existing Secondary Power Distribution Assemblies (SPDAs) already in place along the truss are used
  - No impact on the growth of the overall EPS system to PMC
- Power accommodations provide payloads with continuous power (power levels depend on Station loads but do not exceed 6 kW total)
  - Each port is connected to a utility SPDA on each side of the truss making the ports single failure tolerant (in case of SPDA failure up to 500 Watts may be available)
  - If a utility SPDA fails on one side of the Station and the Mobile Transporter is using the utility SPDA on the other side, no keep-alive power to payloads can be guaranteed

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## PROPOSED ATTACHED PAYLOAD POWER ARCHITECTURE



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# ATTACHED PAYLOAD THERMAL CONTROL

- Payloads are required to provide their own thermal control
- Payloads must be assessed on an individual basis to determine thermal effects at the appropriate attached site and orientation. The following considerations must be addressed:
  - Operational/non-operational temperature ranges experienced by the payload components or its individual ORUs
  - What types of thermal coatings/insulation can be used to enhance the desired temperature range
  - What size radiators are needed to dissipate heat and what size heaters are needed to make-up heat
- Design-to thermal optical properties, radiator sizes, and insulation requirements at each payload site must be determined by integrating the payload model into a full Space Station model to properly size Passive Thermal Control Systems (PTCS) for each payload
- Preliminary thermal analyses for two example payloads: the Cosmic Dust Collection Facility and the Orbital Debris Collision Warning System were performed under this study

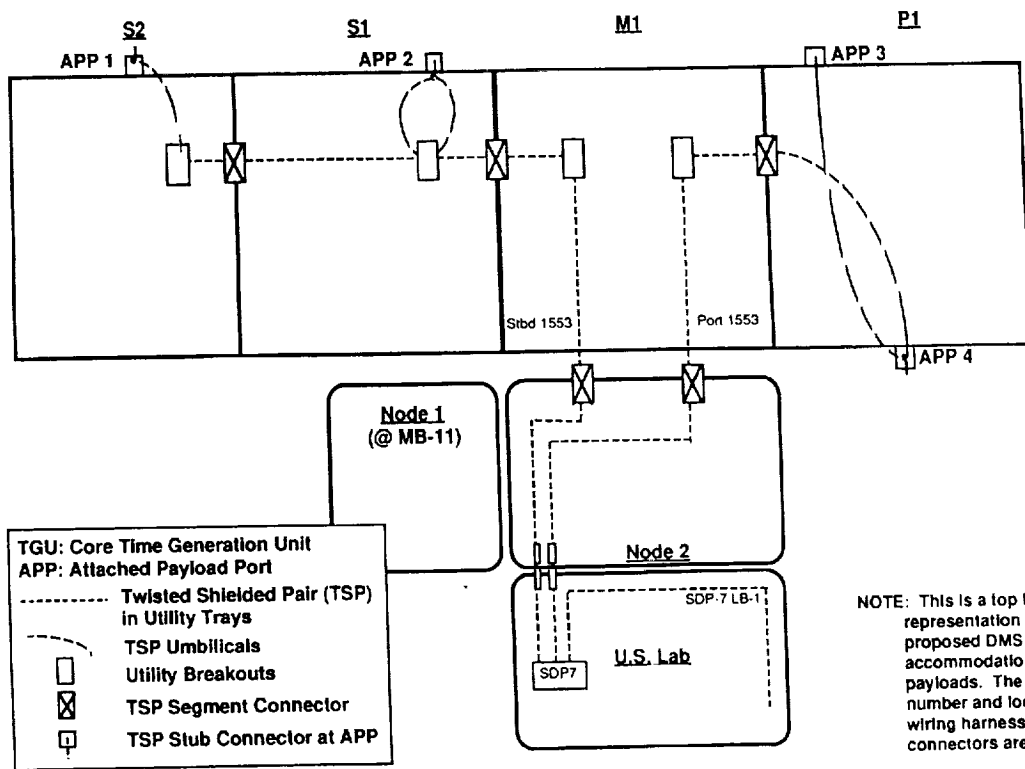
## DMS ACCOMMODATIONS

- SSCB has baselined 1553 local bus service
- FDDI scarring is possible but has not been finalized yet
- Interface Description:
  - DMS accommodations are provided by extending two 1553 local busses from SDP 7 in the Lab Element Control Workstation rack in the U.S. Lab
    - One 1553B bus to the port APP sites and a second separate 1553B bus to the starboard APP sites
  - The two Local Busses share the same Bus Interface Unit (BIU) with separate Bus Interface Adapters (BIA) to service each of the Payload Local Busses

Note: requires the addition of one BIU in SDP-7



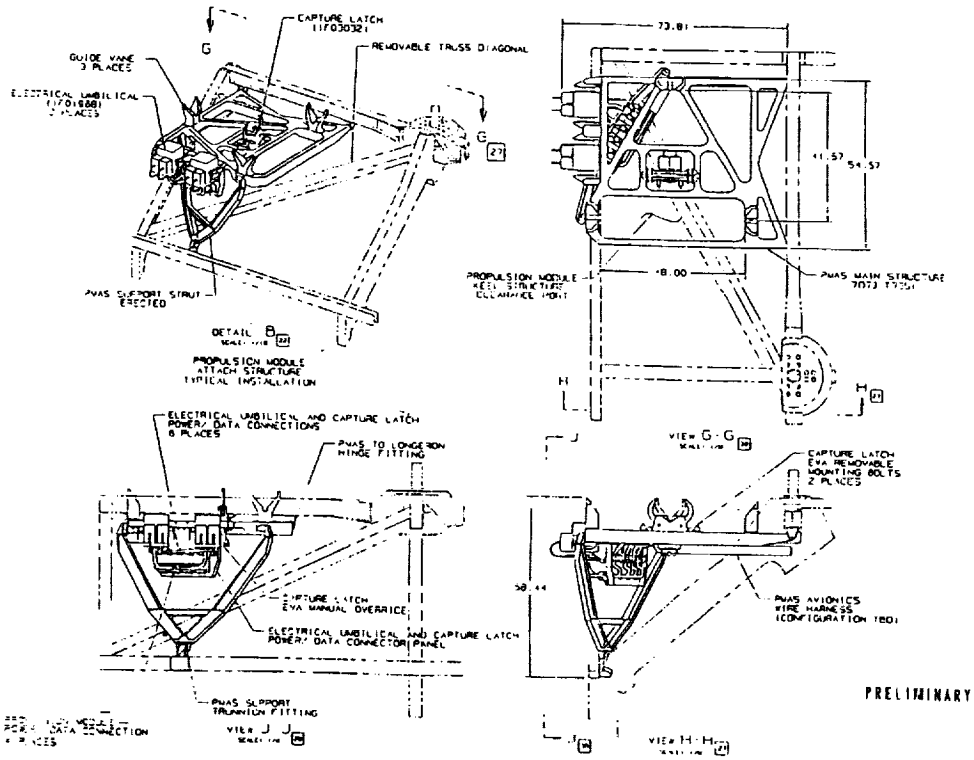
# 1553 ATTACHED PAYLOAD LOCAL BUS ARCHITECTURE



## ATTACHMENT ACCOMMODATIONS SUMMARY

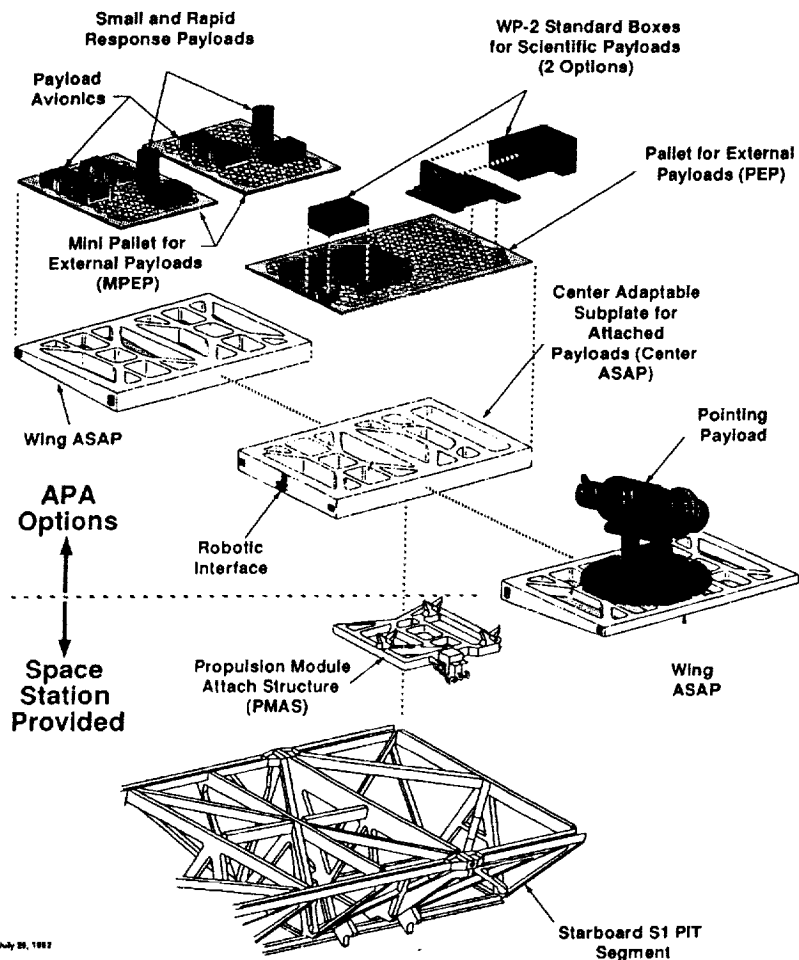
- Accommodations include provisions for Propulsion Module Attach Structure (PMAS) at each payload port
  - PMAS is composed of mechanical latch, umbilical mechanism, guide vanes, wire harness and support structure
  - PMAS and support structure are not pre-integrated and are installed with EVA at the time of payload first use
  - Installation of attached payload pallet to PMAS will utilize the RMS for positioning and EVA for final alignment
  - PMAS standard attachment interface provides payload community with the flexibility to connect single or multiple payloads at each location (e.g. large payloads, gas cans or SARR pallet)
  - On segment P1 faces 2 and 6 the PMAS and the payload(s)/payload pallet will swing away from the utility trays if on-orbit utility tray servicing is ever necessary

# PROPULSION MODULE ATTACH STRUCTURE (PMAS)



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*SESSION 3:  
MICROGRAVITY RESEARCH AND  
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*AUGUST 5, 1992*

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