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Abbreviations and Acronyms

ICA	Interface Control Agreement
IDD	Interface Definition Document
QUEST	Quick External Science Tray
Q9	Quest panel equipped with 9 cell payloads
Q1	Quest SHI module rooftop adapter plate equipped with one cell payload

1. INTRODUCTION

1.1 PURPOSE

This Interface Definition Document (IDD) defines and controls the design of the following interfaces:

- The Quick External Science Tray (QUEST) System to the payload.

The data about the Shuttle cargo bay and related environment is included for information only these data are controlled by the Shuttle Orbiter / Cargo Standard Interface document ICD-2-19001

1.2 SCOPE

This document consists of the following elements:

- Main part covers all standard interfaces of the QUEST system and payload
- Appendices are containing carrier specific interfaces

Based on this IDD mission specific payload interface agreements will be defined in Interface Control Agreements (ICA) to cover resource requirements (power, data, volume, mass etc.)

1.3 SYSTEM OVERVIEW

The QUEST system consists of the following elements as defined in Figure 1.3-1: QUEST System Elements:

- Standard Quest Panel
  provides the carrying capability in a standard format panel, able to be accommodated on different carriers (provided by DASA/SHI)
- Carrier dependent I/F Structure
  establishes the necessary interface to the different carriers (provided by DASA/SHI)
- Connector Bracket
  defined according to mission specific needs (provided by the Payload Integrator)
- Power, Data Management
  covers Power-/Data distribution system, appropriate harness and connectors on a mission specific basis (provided by the Payload Integrator)
- Mission specific Equipment
  covers all kind of EVA H/W such as handrails, tethers etc
  on a mission specific basis (provided by the Payload Integrator)
- Payload
  designed to meet the payload cell requirements (provided by the Payload Developer)

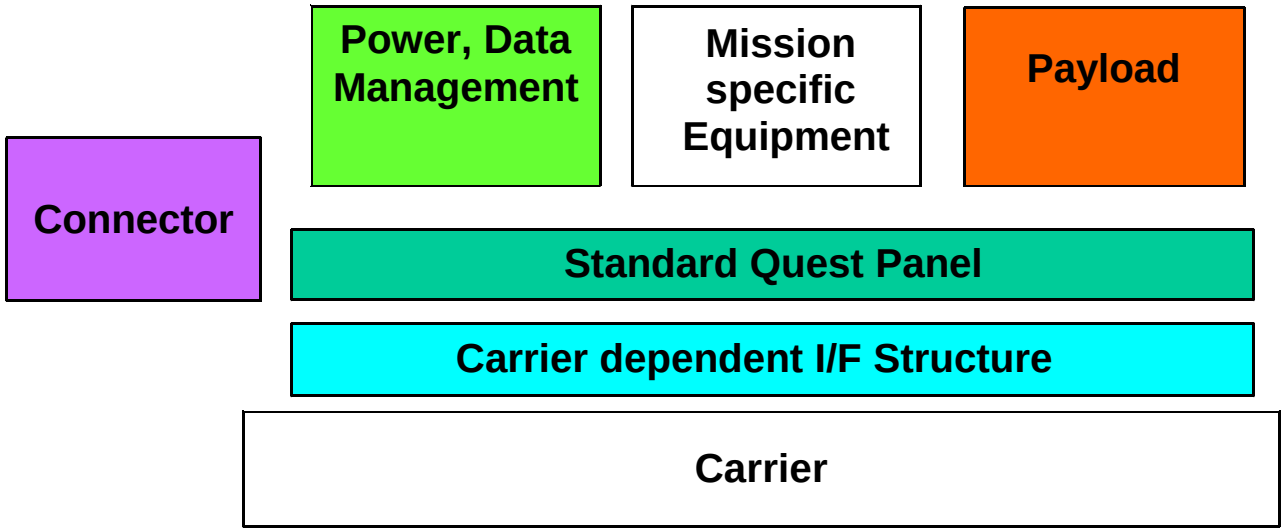


Figure 1.3-1: QUEST System Elements

1.4 DOCUMENT CHANGE CONTROL

DASA-RI will maintain configuration control of this document in accordance with the ICC Configuration Management Plan [11]

2. DOCUMENTS

2.1 APPLICABLE DOCUMENTS

The following documents form part of this IDD to the extent explicitly specified here-in.

[1] Payload Flight Equipment Requirements and Guidelines for Safety-Critical Structures
SSP 52005 (B); Dec. '98

[2] Shuttle Orbiter / Cargo Standard Interfaces
ICD-2-19001, Rev. K. 20.08.97

[3] Spacehab Experimental Interface Definition Document
MDC 91W5023G, January 99

[4] Shuttle Payload Verification Requirements
NSTS 14046 (D); 02.07.97

[5] Structural Design and Test Factors of Safety for Spaceflight Hardware
NASA-STD-5001, 21.06.1996

[6] MIL-STD- 461

[7] Measurement of EMI Characteristic
MIL-STD- 462

[8] Chemical Conversion Coating of Aluminum Alloys Class C
MIL-C-5541

[9] Bonding, Electrical Lightning Protection for Aerospace Systems
MIL-C-5087

[10] Fracture Control Requirements for Payloads using the Space Shuttle
NASA-STD-5003

[11] ICC Configuration Management Plan
ICC-RIHOU-PL-0001

[12] General Tolerances for Linear and Angeluar Dimensions without Induvidual Tolerance Indication
ISO 2768-M

2.2 REFERENCE DOCUMENTS

The following documents contain supplemental information to guide the Payload Representative in the application of this document. These reference documents may or may not be specifically cited within the text of this document.

TBD

3. STANDARD INTERFACES

3.1 GENERAL

3.1.1 Dimension and Tolerances

Unless otherwise noted herein all dimensions are in metric units according to the International System of Units (SI) the Modernized Metric System. Not defined tolerances are in accordance to ISO 2768-M.

3.1.2 Definition of the Coordinate Systems

3.1.2.1 Shuttle / Orbiter Coordinate System

The Shuttle / Orbiter Coordinate System coordinate system is shown in Figure 3.1-1: Shuttle / Orbiter Coordinate System.

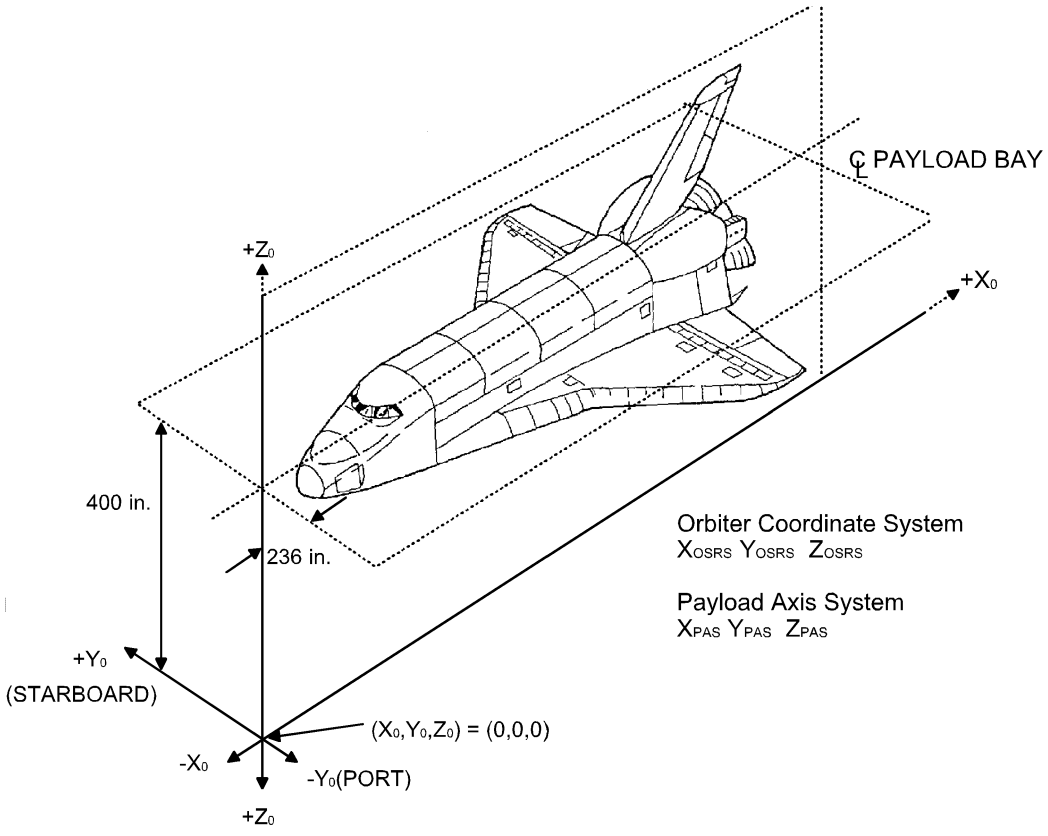


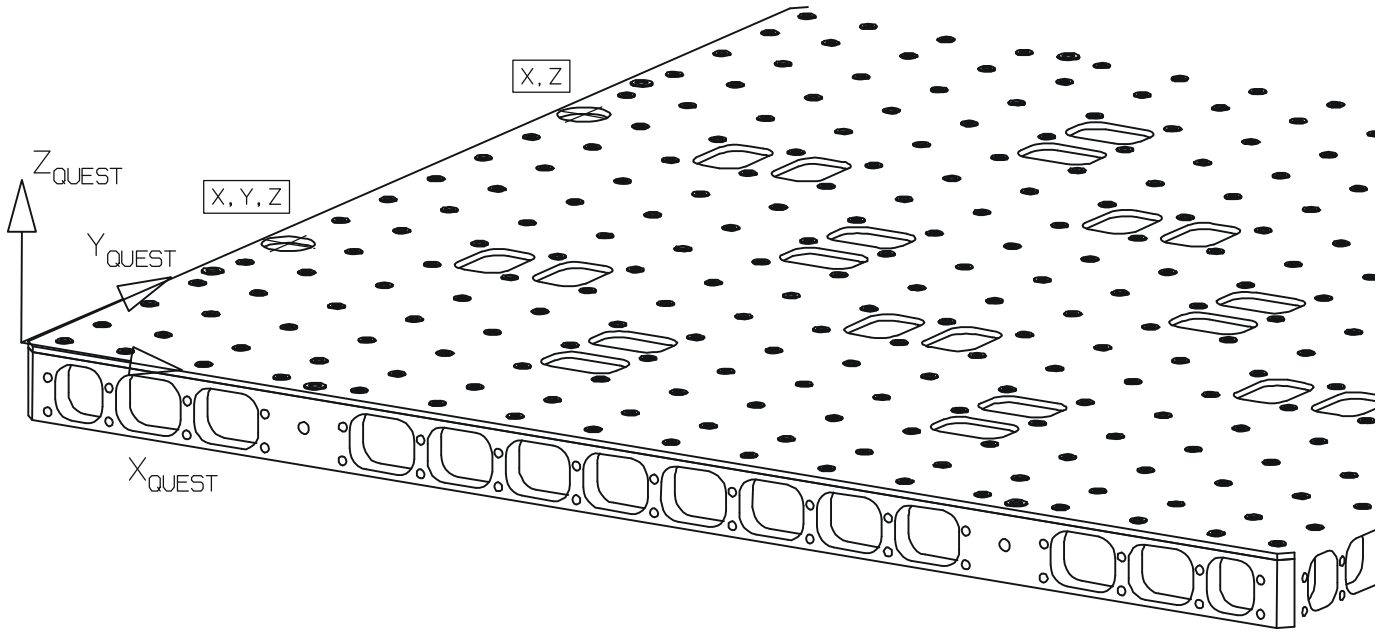
Figure 3.1-1: Shuttle / Orbiter Coordinate System

3.1.2.2 Quest Carrier Coordinate System

The Quest Carrier Coordinate System is defined in the appropriate Appendices

3.1.2.3 Quest Coordinate System

The Quest Coordinate System is defined in Figure 3.1-2: QUEST Coordinate System.



Note: Origin of the coordinate system is in the area of the fixed bearing.

Figure 3.1-2: QUEST Coordinate System

3.2 PHYSICAL INTERFACES

3.2.1 Carrier to QUEST Interface

The Carrier to OUEST Interfaces are defined in the Appendices

3.2.2 Quest to Payload

The following paragraphs define the Quest to Payload interfaces, exceptions/deviations are mission dependent and will be documented in the ICAs.

3.2.2.1 Single cell payload

3.2.2.1.1 Single cell payload mounting plane

The footprint for a single cell is defined in Figure 3.2-1: Single Cell Footprint.
One Quest panel can accommodate 9 single payload cells as defined in Figure 3.2-2: 9 Cell Quest Configuration.

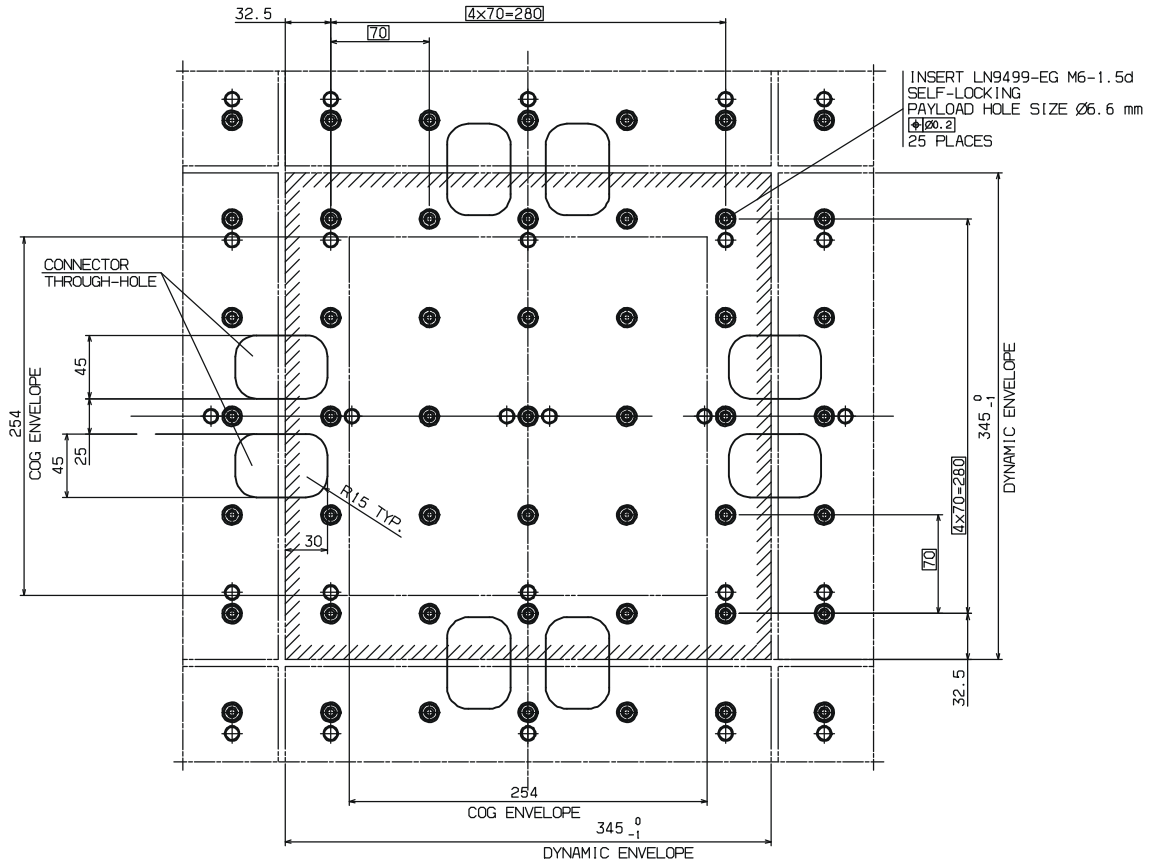


Figure 3.2-1: Single Cell Footprint

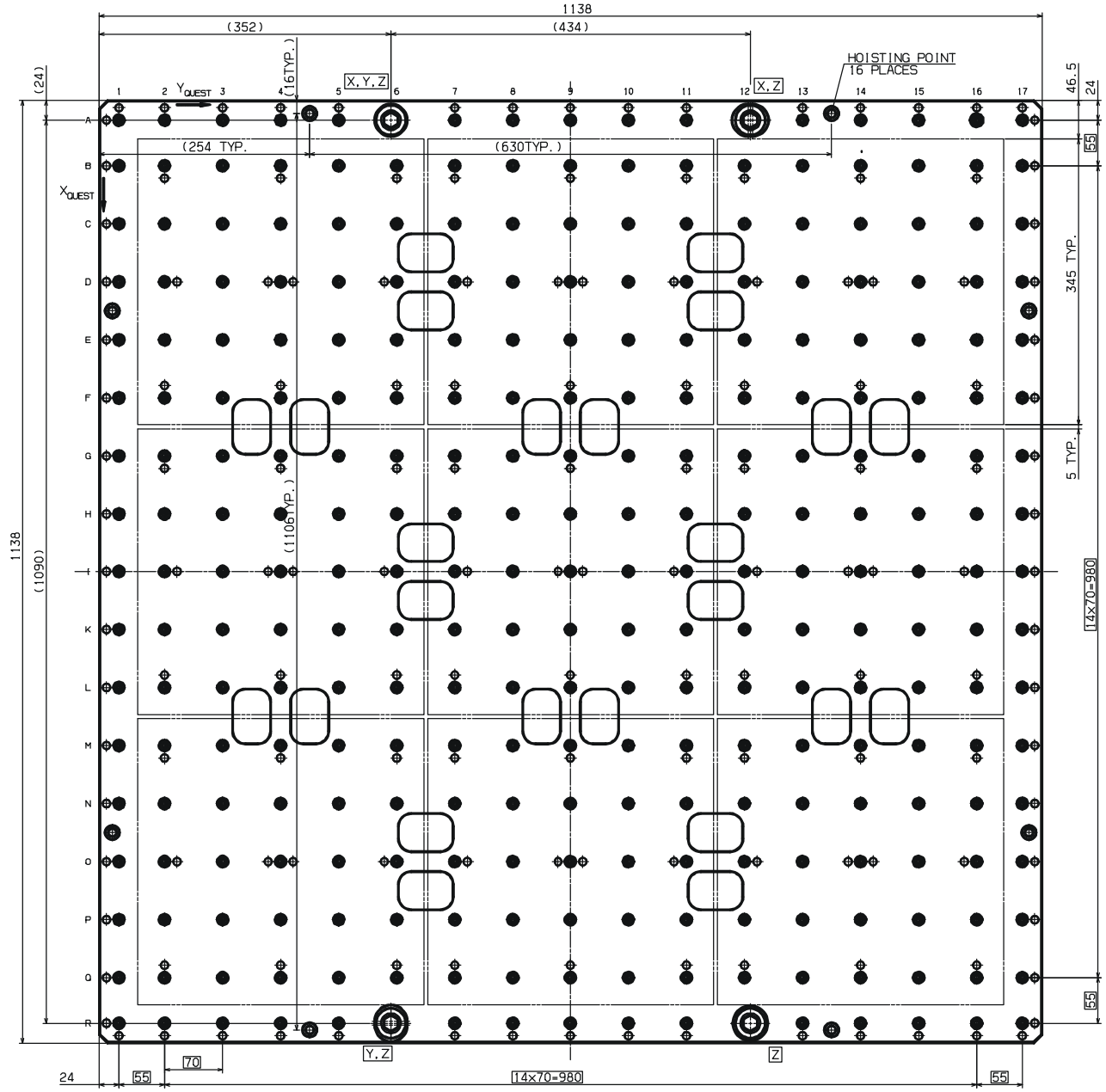


Figure 3.2-2: 9 Cell Quest Configuration

3.2.2.1.2 Single Cell Payload Mass and Center of Gravity Envelope

The Single Cell Payload max load carrying capability is m= 13,62 Kg (30 lbs).
The dynamic and center of gravity envelope is defined in Figure 3.2-3: Single Cell Payload Mass and Center of Gravity Envelope.

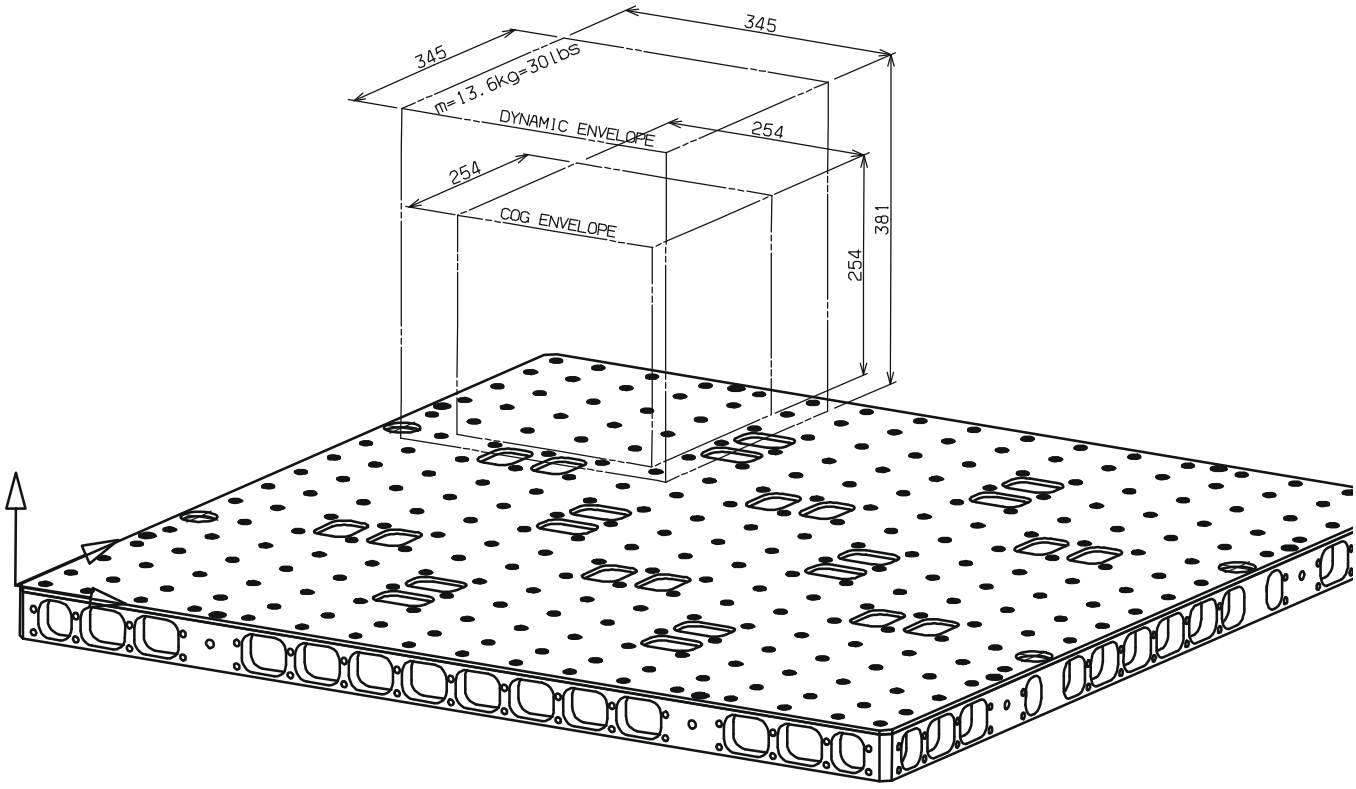


Figure 3.2-3: Single Cell Payload Mass and Center of Gravity Envelope

3.2.2.1.3 9 Cell Payload Mass and Center of Gravity Envelope

For a 9 cell Quest configuration the Payload max load carrying capability is m= 122.58 Kg (270 lbs.).
The dynamic and center of gravity envelope is defined in Figure 3.2-4: 9 Cell Payload Mass and Center of Gravity Envelope.

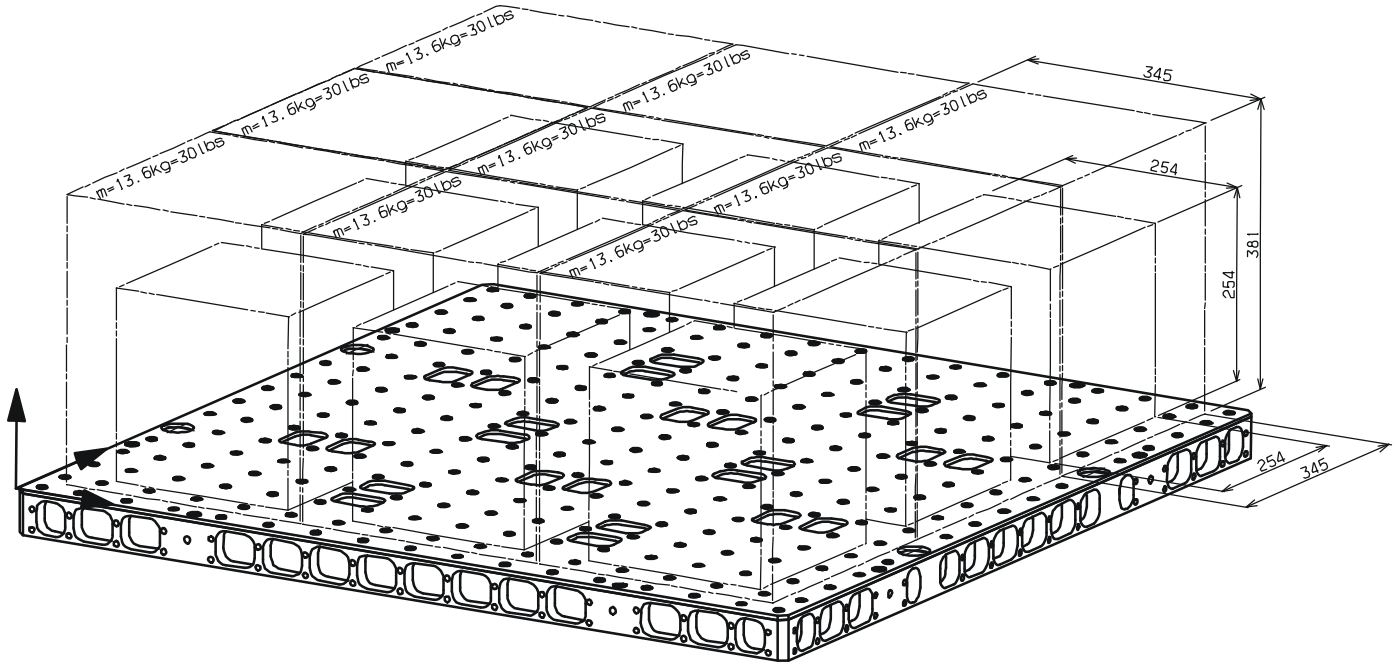


Figure 3.2-4: 9 Cell Payload Mass and Center of Gravity Envelope

3.2.2.2 Payload Mounting Interface

The Quest to Payload I/F for a single cell is defined as a planar mounting surface with a grid pattern of 70 x 70mm with M6 inserts. Figure 3.2-5: Payload to Quest Interface defines the Payload to Quest Interface. The insert pull-out capability supports M6 bolts up to an ultimate strength of 1400 N/mm² with an engaged thread length of 9mm (1,5 x d).

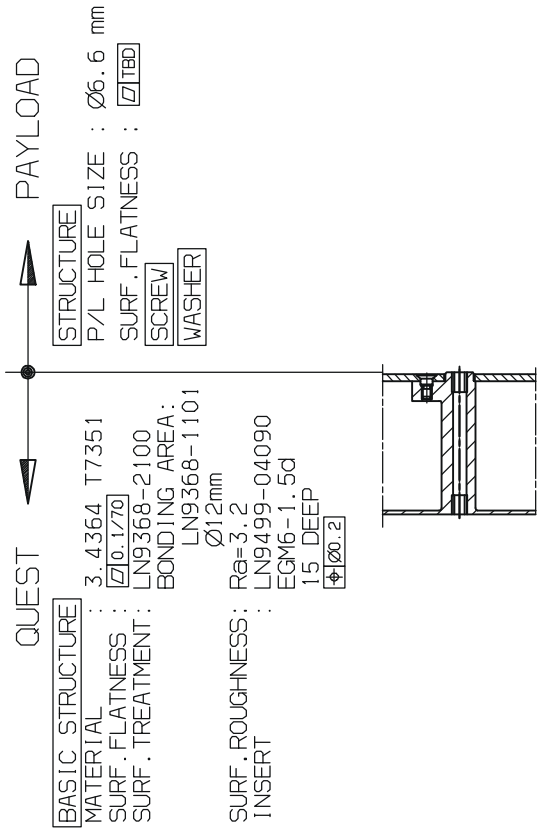


Figure 3.2-5: Payload to Quest Interface

3.2.2.3 Payload Bonding Interface

All Quest Payload hardware shall be electrically bonded to the Quest structure to provide homogeneous electrical characteristics. All electrical and mechanical elements shall be securely bonded to the Quest structure in compliance with MIL-B-5087.
The surface of the Quest mounting hole pattern at the inserts is treated with alodine to provide a structural bonding path.
All payload surfaces used for bonding shall be cleaned to bare metal and chemical filmed per MIL-C-5541, Class 3 (gold alodine 1200LN9368, or equivalent).The bonding class per MIL-C-5087 shall be applicable Ref ICD 19001 Para. 10.7.4.2

3.3 STRUCTURAL INTERFACES

The structural interfaces are carrier dependent and defined in the respective Appendices

3.4 THERMAL INTERFACES

3.4.1 Payload Thermal Control

The QUEST System is not providing any active or passive thermal control. Each Payload is responsible for its own thermal control.
The payloads shall be thermal isolated from each other, they shall not radiate heat to neighboring payloads. Heat radiation from Payload top surface is allowable.
Specific thermal requirements are carrier dependent and are defined in the respective Appendices.
Exceptions / deviations are mission dependent and will be documented in the ICAs.

3.4.2 General Requirements

3.4.2.1 Orbiter Environmental Condition

Externally mounted payloads shall be compatible with the worst case thermal environment of the payload bay as defined in ICD-2-19001, Paragraph 6.1

3.4.2.2 Thermal Environment on Ground

During ground handling the Payload Element is imposed to the thermal environment as defined in ICD-2-19001, Paragraph 6.1

3.4.2.3 Pre-launch and Post Landing Thermal Environment

During Pre-launch and Post Landing activities the Payload Element is imposed to the thermal environment as specified in ICD-2-19001, Paragraph 6.1

3.5 ELECTRICAL POWER INTERFACES

3.5.1 Electrical Power Distribution System

The Electrical Power Distribution System is carrier dependent and defined in the respective Appendices.

3.5.2 Electrical Wiring Interface

The specific details of the electrical wiring interface (connector type, location, provision etc.) are mission dependent and will be documented in the ICAs.

3.6 COMMAND DATA INTERFACE

The Command Data Interface is carrier dependent and defined in the respective appendices.

3.7 SOFTWARE INTERFACES

The Software Interfaces are carrier dependent and defined in the respective appendices.

3.8 INDUCED ENVIRONMENTS

3.8.1 Vibration

See section 3.3

3.8.2 Acoustics

See section 3.3

3.8.3 Shock

See section 3.3

3.8.4 Temperature

See section 3.4

3.8.5 Orbiter Payload Particulates and Gases Environment

Refer to Shuttle Orbiter / Cargo standard interfaces (ICD-2-19001) section 10.6.

3.8.6 Electromagnetic Compatibility

Generally the EMC chapter 10.7 Electromagnetic Compatibility of the Shuttle Orbiter / Cargo standard interfaces (ICD-2-19001) shall be applicable to the QUEST payload. Furthermore the Chapter 7 Electrical Power Interfaces defines the power quality of the supply buses. Both chapters together define the electromagnetic environment within the orbiter.

To ensure the compatibility between the different payload equipment on Quest conducted and radiated susceptibility requirements shall be applicable as defined below:

- **Wire EMC Classes**
  is covered by Para. 10.7.1 of ICD 19001

- **Conducted Current Emission NB**
  is covered by Para. 10.7.3.1.1 of ICD 19001 DC Power (CE, transient, no inrush current)
  Para. 10.7.3.1.2 of ICD 19001 AC Power

- **Radiated Emission**
  is covered by Para. 10.7.3.2.1 of ICD 19001 Magnetic Field
  Para. 10.7.3.2.2 of ICD 19001 E-Field (NB, BB)

- **ESD**
  is covered by Para. 10.7.3.2.2.3 of ICD 19001

- **Isolation / Grounding**
  is covered by Para. 10.7.4.1 of ICD 19001 Avionics Electrical Compatibility

- **Electrical Bonding**
  is covered by Para. 10.7.4.2 of ICD 19001 Bonding

- **Lightning**
  is covered by Para. 10.7.2.2.1.2 of ICD 19001

- **Conducted Susceptibility**
  There is not an adequate requirement in the ICD 19001, therefore following requirement shall be applicable.

  - sine wave injection
  CS01, CS02 of MIL-STD- 461

  - transient injection
  cargo allowed transient emission plus 6 dB shall be taken as EMI level for susceptibility test.

- **Radiated Susceptibility**
  There is not an adequate requirement in the ICD 19001, therefore following requirement shall be applicable.

  - E-Field
    In the frequency range 14 kHz to 200 MHz the EUT shall be subjected with 4 V/m. Above this frequency range the level defined in Figure 10.7.3.2.2.2.1.1-1 shall be taken for the susceptibility tests.

  - H-Field
    The EUT shall be subjected with a magnetic field according MIL-STD- 462 RS01. The level shall be 140 dBpT in the frequency range 30 Hz to 50 kHz.

    All EMC test shall be performed according MIL-STD-462.

3.8.7 Nuclear Radiation

N/A

3.9 EVA / EVR Interfaces

The EVA / EVR Interfaces are carrier/mission dependent and defined in the appropriate Appendices/ICAs.

3.10 OTHER INTERFACES AND CONSTRAINTS

TBD