

Section 17

ISS Microgravity Requirements

**Microgravity Environment Interpretation Tutorial
NASA Glenn Research Center
March 5-7, 2002**

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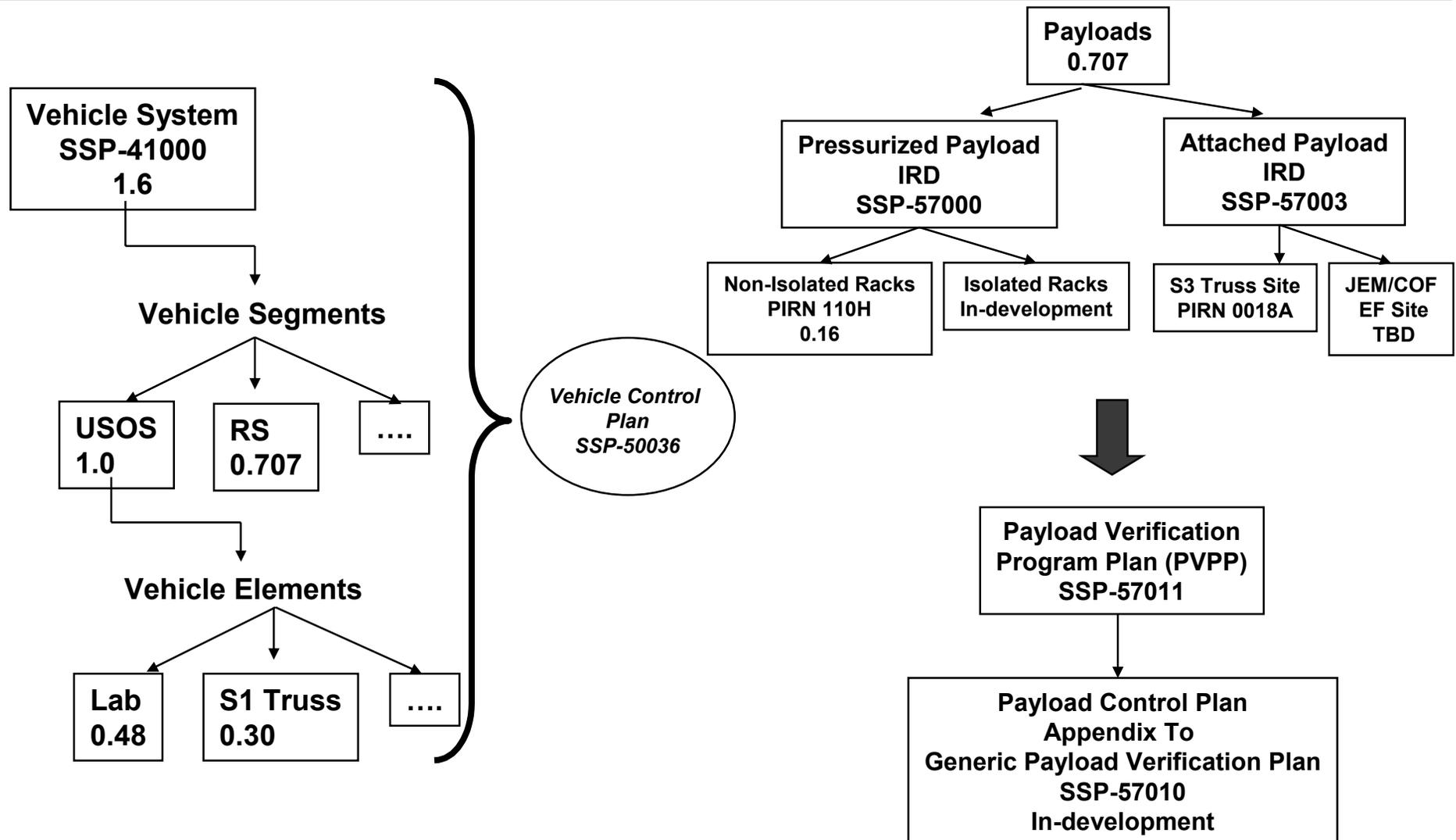
Presentation Overview

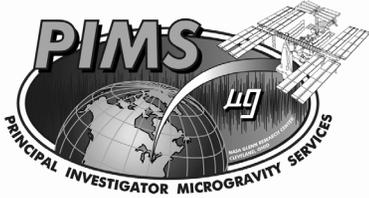


REQUIREMENTS

- **Flow-down**
- **Vehicle**
- **Payloads**

Microgravity Requirement Architecture



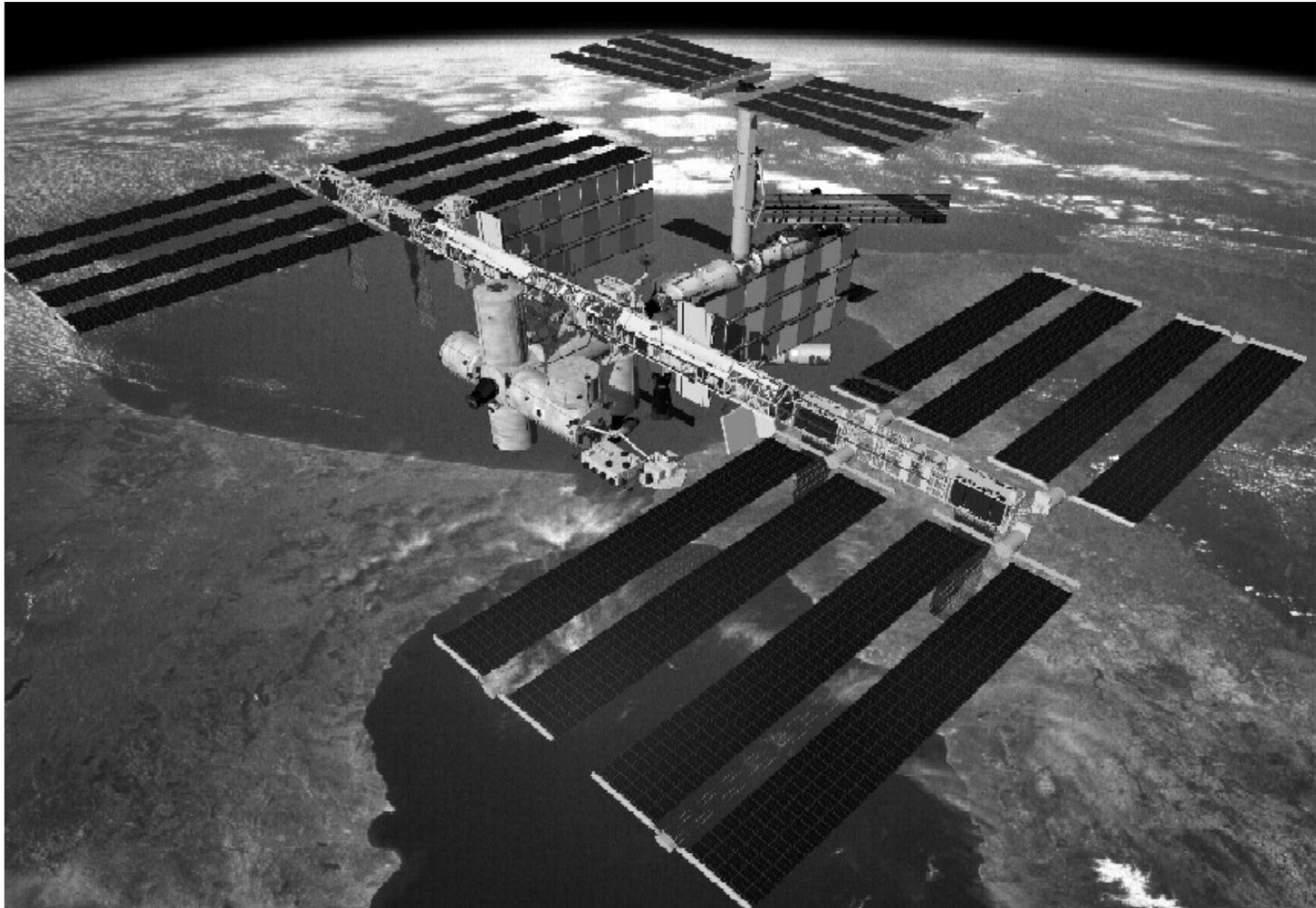


VEHICLE MICROGRAVITY REQUIREMENT



At Assembly Complete the Space Station shall provide the following microgravity acceleration performance for at least 50 percent of the internal payload locations (excluding nadir window payload location) for 180 days per year in continuous time intervals of at least 30 days:

Assembly Complete Configuration



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Vehicle Quasi-Steady Microgravity Requirements

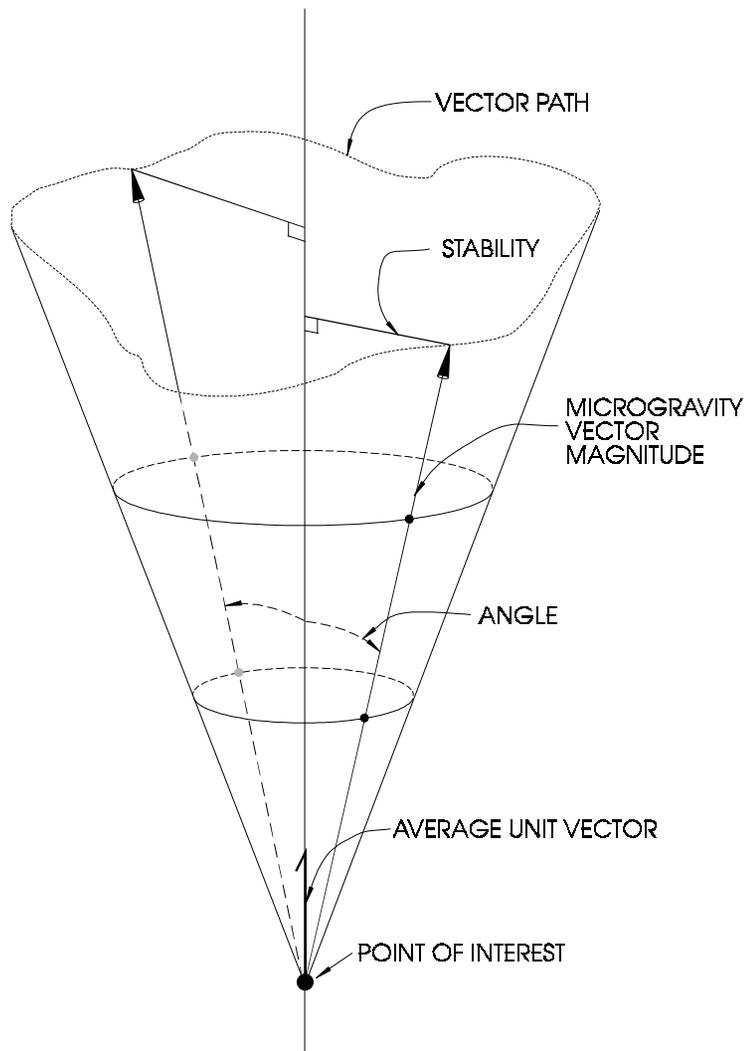
Duration

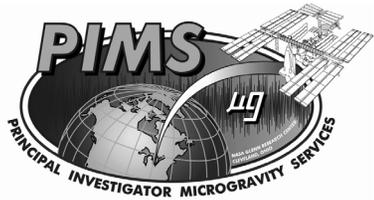
- **Periods:** ≥ 30 days
- **Yearly Total:** ≥ 180 days / year

Location - at ISPR center

Magnitude - $1.0 \mu\text{g}$ ($0 \leq f \leq 0.01$ Hz.)

Stability - $0.2 \mu\text{g}$ perpendicular component to orbital average QS acceleration vector





Vehicle Vibratory Microgravity Requirements



Duration - same as quasi-steady

Location - at module/ISPR interface

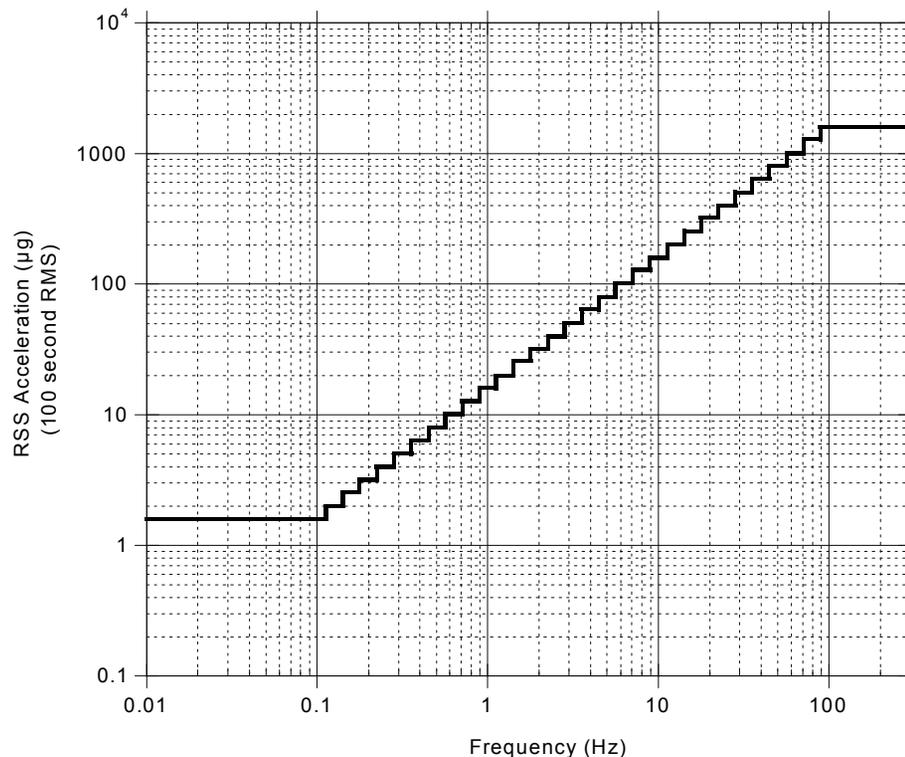
Does not include effects of crew activity. Requirements on design not crew members.

Combined Vibratory - per figure (0.01 $\leq f \leq 300.0$ Hz.)

- 100 second root mean square average
- Per one-third octave band

Individual Transient

- 1000 μg peak per axis
- 10 $\mu\text{g}^*\text{s}$ integrated over any 10 s interval per axis





PRESSURIZED PAYLOAD REQUIREMENTS



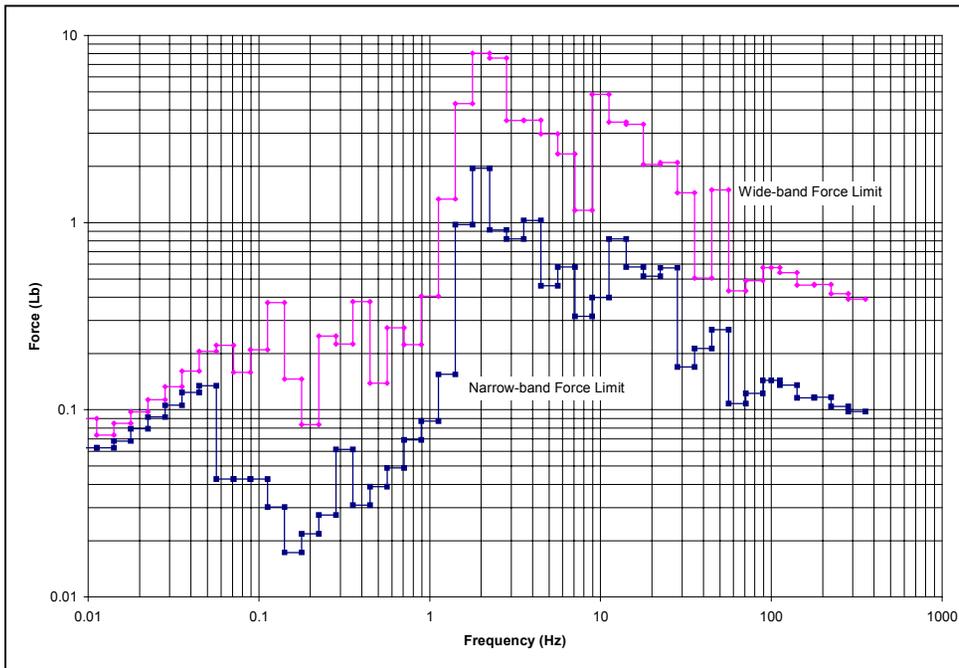
3.1.2.1 Quasi-Steady Requirements: For frequencies below 0.01 Hz, Integrated racks and non-rack payloads shall limit unbalanced translational average impulse to generate less than 10 lb-s (44.8 N-s) within any 10 to 500 second period, along any ISS coordinate system vector.

3.1.2.2 Vibratory Requirements: Between 0.01 and 300 Hz, Integrated Rack payloads without ARIS, inactive ARIS payloads and Non-Rack payloads shall limit vibration so that the force limits are not exceeded using the force method, or the acceleration limits are not exceeded using the acceleration method.

3.1.2.3 Transient Requirements:

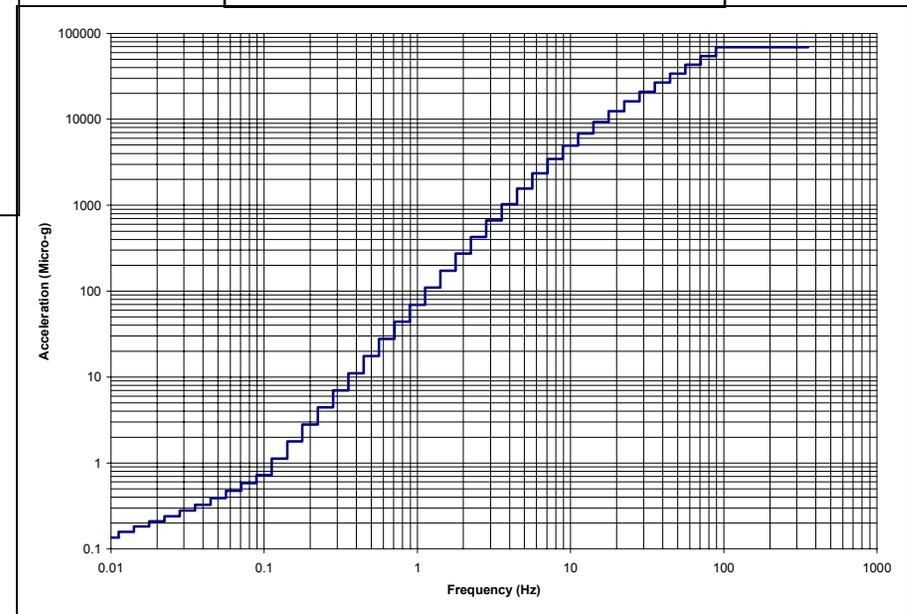
- Integrated racks and non-rack payloads shall limit force applied to the ISS over any ten second period to an impulse of no greater than 10 lb-s (44.5 N-s).
- Integrated racks and non-rack payloads shall limit their peak force applied to the ISS to less than 1000 lb (4448 N) for any duration.

PRESSURIZED PAYLOAD REQUIREMENTS



Rack Interface Force Requirement

Adjacent Rack Interface Acceleration Requirement





ATTACHED PAYLOAD REQUIREMENTS

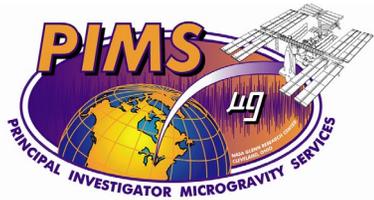


3.1.5.1 Quasi-Steady Requirements: For frequencies below 0.01 Hz, Attached Payloads shall limit unbalanced translational average impulse to generate less than 10 lb-s (44.8 N-s) within any 10 to 500 second period, along any ISS coordinate system vector.

3.1.5.2 Vibratory Requirements: Between 0.01 and 300 Hz, payloads shall limit vibration so that the acceleration limits are not exceeded using the force and moment transfer functions.

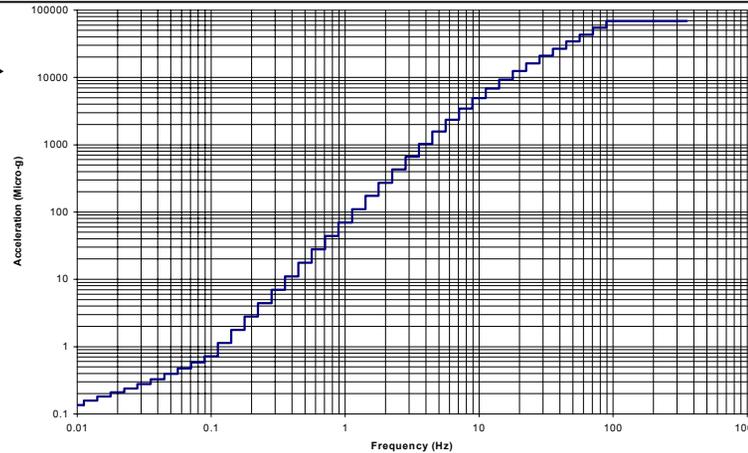
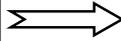
3.1.5.3 Transient Requirements:

- Attached Payloads shall limit force applied to the ISS over any ten second period to an impulse of no greater than 10 lb-s (44.5 N-s).
- Attached Payloads shall limit their peak force applied to the ISS to less than 1000 lb (4448 N) for any duration.

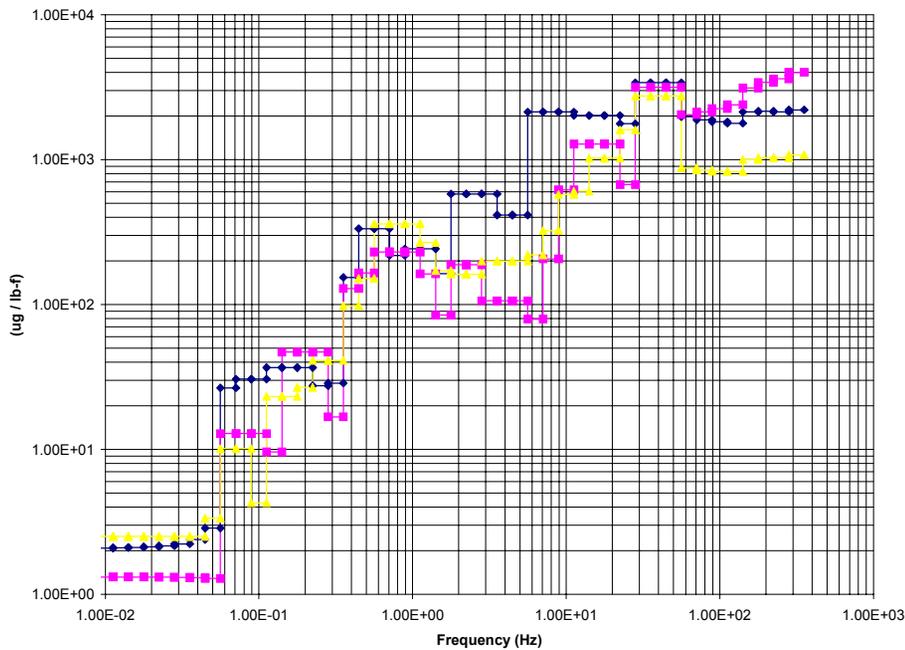


ATTACHED PAYLOAD REQUIREMENTS

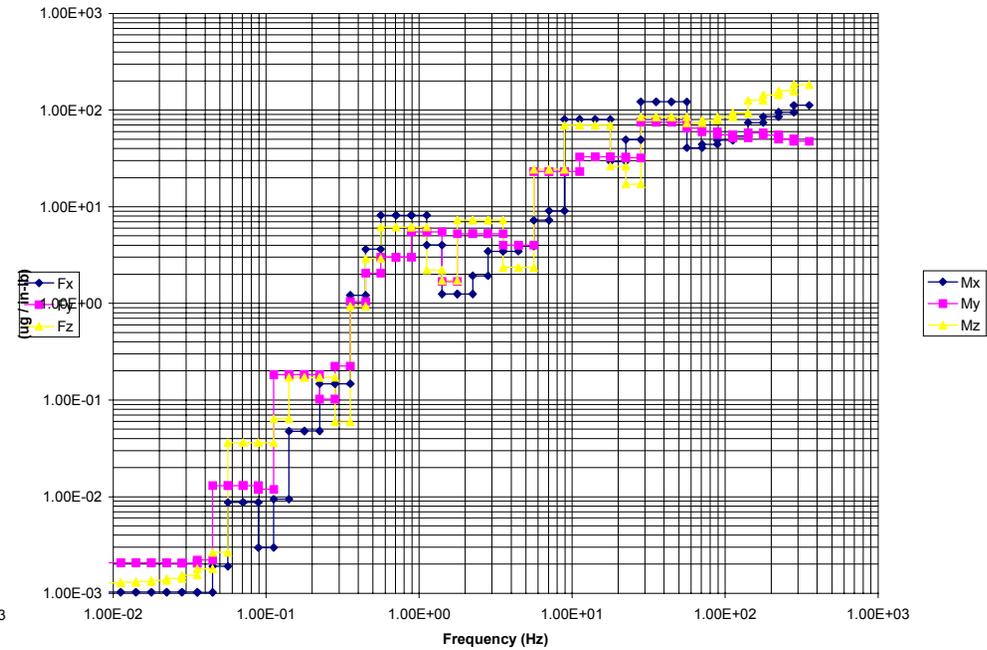
Acceleration Limit



Force Transfer Functions



Moment Transfer Functions



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