

# **GUVI**

## **Structural Analysis**

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# **GUVI Mechanical Design Requirements**

**Reference: SEM-2-1450 Rev B, 7/19/96, 'TIMED Structural Design and Test Requirements'.**

**Quasi-Static Limit Loads (G):**

**All Assemblies:  $\pm 30$  G's** [Loads applied separately at assy c.g. in 3 orthogonal axes]

**Design Loads:**

**Mat'L Yield =  $1.4 \times$  Max Expected Load**

**Mat'L Ultimate =  $1.875 \times$  Max Expected Load**

**Stiffness:  $> 50$  Hz Lateral;  $> 80$  Hz Thrust (for a Taurus launch)**

**Operational Temperatures:  $+50$  C to  $-40$  C**

**Pressure Change:  $< 0.5$  psi/sec.**

**Mass:  $< 19.3$  Kg.**

**Redundant Load Paths, Non-Critical Fasteners.**

**Low Outgassing, Low SCC Materials.**

**Alignment:**

**Boresight alignment accuracy:  $1.0$  deg.**

**Boresight alignment knowledge:  $0.05$  deg.**

**2 year lifetime.**

# GUVI

## Structural Analysis Issues

### Mounting Foot: (SSG)

- Revised foot geometry must have stress check for positive MS.
- GUVI Fn > 50 Hz lateral, 80 Hz in thrust if Taurus LV.

### Scan Mirror Assembly: (SSG)

- Time to complete single scan reduced from 22 sec to 15 sec.
- Increased gear tooth contact stresses vs reduced number of scan cycles.  
SSUSI lifetime: 7.17E6 cycles; GUVI lifetime: 4.2E6 cycles.
- Possible increase in settling time per step.

### Cover Deployment: (SSG)

- Increase sunshade-to-cover clearances.
- Possible revision of pinpuller design to eliminate performance deterioration seen during NEAR NIS testing.

### Detector Tube Assembly: (APL)

- Removal of HV Bias boards from potted assembly and revision of tube lead routing and attachment.

# **GUVI**

## **Mechanical Test Plan**

### **Final SSUSI Unit:**

- **Run scan mirror at higher GUVI rate to evaluate settling time per step.**

### **Spare GUVI Detector Tube:**

- **Thermal cycle testing of new lead routing and stress relief.**
- **3 axis sine and random vibration attached to SIS mass model to evaluate HV Bias board changes and new lead attachments.**

### **GUVI Flight Unit:**

- **100 hr. minimum run-in test of scan assembly to smooth out gearbox and journal bearing torques.**
- **Baseline cover door deployment test.**
- **Sine and random vibration.**
- **Powered thermal vacuum test.**
- **Cover door TV deployment test (performed during cold cycle).**

# GUVI vs SSUSI Component Vibration Tests

## Protoflight Sine Tests

### TIMED/GUVI

### SSUSI

#### Sine Sweep:

#### Sine Burst:

##### *Thrust Axis*

<i>Frequency (Hz)</i>	<i>Acceleration (G's)</i>
5 - 24	0.5 in. (DA)
24 - 80	15.5 G (0 to pk)
80 - 100	2.0 G (0 to pk)

<i>Frequency (Hz)</i>	<i>Acceleration (G's)</i>
25	25.0 G's Pk
Duration: 10 cycles/axis	
3 Axes	

Rate = 4 octaves/min

##### *Lateral Axes*

<i>Frequency (Hz)</i>	<i>Acceleration (G's)</i>
5 - 18	0.5 in. (DA)
18 - 30	8.5 G (0 to pk)
30 - 100	1.4 G (0 to pk)

Rate = 4 octaves/min

# GUVI vs SSUSI Component Vibration Tests

## Protoflight Random Test

### TIMED/GUVI

<i>Freq (Hz)</i>	<i>PSD (G<sup>2</sup>/Hz)</i>
20	0.026
50-800	0.16
2000	0.026

Overall: 14.1 Grms  
1 min/axis  
3 Axes

### SSUSI

<i>Freq (Hz)</i>	<i>PSD (G<sup>2</sup>/Hz)</i>
10 - 50	0.06
250 - 1000	0.20
2000	0.06

Overall: 17.0 Grms  
3 min/axis  
3 Axes