

**ACIS Verification Summary Report**

|                       |                                      |
|-----------------------|--------------------------------------|
| <b>Specification:</b> | ACIS Contract End Item Specification |
|-----------------------|--------------------------------------|

|                                  |                               |
|----------------------------------|-------------------------------|
| <b>Requirement Number/Title:</b> | 3.2.2.1 Weight (VRSD 3.2.2.1) |
|----------------------------------|-------------------------------|

**Requirement Statement:** The ACIS weight, excluding GFE components, shall not exceed the Control Weight specified in Table 3.2-3 of the Observatory to Science Instrument ICD.

|                             |             |
|-----------------------------|-------------|
| <b>Verification Method:</b> | Measurement |
|-----------------------------|-------------|

**Procedure Number:** N/A

**Configuration:** Individual pieces, sub assemblies, and assemblies weighed as available.

**Cycle Time:** N/A

**Verification Discussion/Results:**

Table 3.2-3 (attached) allows a control weight of 252.20 pounds. Basic weight which is essentially 100% measured is 239.2 pounds. See the attached spread sheet for percent measured, contingency, and reserve.

Weight is well within the requirement.

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ACIS Cognizant Engineer

4-29-97  
Date

TABLE 3.2-3: ACIS EQUIPMENT CONTROL WEIGHTS AND MOMENTS

| Component Name                     | Maximum Control<br>Wt. (1,2)<br>(lbs) | Center of Mass<br>(in.) (3) |       |        | Moments of Inertia<br>(lb·sec <sup>2</sup> ·in) (3) |       |       |
|------------------------------------|---------------------------------------|-----------------------------|-------|--------|---|-------|-------|
|                                    |                                       | Xcg                         | Ycg   | Zcg    | Ixx   | Iyy   | Izz   |
| Detector Assembly ACIS Total       | 37.7                                  | 3.84                        | 0.57  | 0.21   |   |       |       |
| CFE Fiducial Light System          | 1.00                                  |                             |       |        |   |       |       |
| CFE Trim & Survival Heater<br>Sys. | 0.90                                  |                             |       |        |   |       |       |
| CFE Mounting Hardware              | 0.50                                  |                             |       |        |   |       |       |
| Detector Assembly Total            | 40.10                                 |                             |       |        |   |       |       |
| Vent Valve less Vent Tube          | 5.10                                  | 12.73                       | 13.64 | -0.07  |   |       |       |
| CFE Mounting Hardware              | 0.30                                  |                             |       |        |   |       |       |
| Vent Valve less Vent Tube Total    | 5.40                                  |                             |       |        |   |       |       |
| Vent Mechanical Interface          | 2.20                                  | 12.73                       | 19.98 | 3.50   |   |       |       |
| CFE Mounting Hardware              | 0.10                                  |                             |       |        |   |       |       |
| Vent Mechanical Interface Total    | 2.30                                  |                             |       |        |   |       |       |
| Vent Electrical I/F                | 0.50                                  | 12.85                       | 20.18 | -3.94  |   |       |       |
| CFE Mounting Hardware              | 0.10                                  |                             |       |        |   |       |       |
| Vent Electrical I/F Total          | 0.60                                  |                             |       |        |   |       |       |
| Support Assy ACIS Total            | 133.80                                | 3.32                        | 1.13  | 0.23   | 64.80   | 15.90 | 68.90 |
| CFE Trim & Survival Heater Sys     | 4.20                                  |                             |       |        |   |       |       |
| CFE Mounting Hardware              | 1.00                                  |                             |       |        |   |       |       |
| Support Assy Total                 | 139.00                                |                             |       |        |   |       |       |
| Radiators (5)                      | 13.50                                 | 3.23                        | -0.02 | 8.83   | 2.49  | 0.74  | 3.20  |
| CFE Mounting Hardware              | 0.12                                  |                             |       |        |   |       |       |
| Radiators Total                    | 13.62                                 |                             |       |        |   |       |       |
| Sun Shade                          | 8.50                                  | -5.34                       | -0.52 | 19.64  |   |       |       |
| CFE Mounting Hardware              | 0.10                                  |                             |       |        |   |       |       |
| Sun Shade Total                    | 8.60                                  |                             |       |        |   |       |       |
| Telescope Shade & Posts            | 7.60                                  | 13.67                       | -0.63 | 20.39  |   |       |       |
| CFE Mounting Hardware              | 0.50                                  |                             |       |        |   |       |       |
| Telescope Shade & Posts Total      | 8.10                                  |                             |       |        |   |       |       |
| PSMC                               | 32.90                                 | 6.00                        | 12.00 | -32.50 |   |       |       |
| CFE Mounting Hardware              | 1.10                                  |                             |       |        |   |       |       |
| CFE Trim & Survival Heater Sys     | 1.00                                  |                             |       |        |   |       |       |
| PSMC Total                         | 35.00                                 |                             |       |        |   |       |       |
| PSMC Cable Less Ends               | 6.10                                  | —                           | —     | —      |   |       |       |
| CFE Cable Clamps & Hardware        | 1.00                                  |                             |       |        |   |       |       |
| PSMC Cable Total                   | 7.10                                  |                             |       |        |   |       |       |
| SIM Mounted Calibration Source     | 4.20                                  | 20.75                       | 0.00  | 16.88  |   |       |       |
| CFE O-Ring and Hardware            | 0.20                                  |                             |       |        |   |       |       |
| SIM Mounted Cal. Source Total      | 4.40                                  |                             |       |        |   |       |       |

|                             |        |
|-----------------------------|--------|
| ACIS Control Weight (1)     | 252.20 |
| CFE Subtotal                | 12.12  |
| Total Control Weight<br>(2) | 264.32 |

See next page for Table Notes

**NOTES FOR TABLE 3.2-1:**

1. Maximum Control Weights include contingency and are specified by component for SIM interface design purposes. Actual weights of the components may be less. The maximum control weight of the ACIS instrument assembly is **253 lbs** even though the individual control weights shown in this table exceed that number.
2. Weights do not include RCTU Cables and cable clamps, Fiducial Light Controller Assembly, cables and connectors, or Light Seal..
3. Coordinate system for the Center of Mass is the ISIM system with ACIS in the launch locked position. Moments of Inertia are with respect to the unit Center of Mass.
4. Tolerance for CM is  $\pm 1$  inch along the X axis and  $\pm 0.5$  inch along the Y and Z axes.
5. Includes ~ 0.9 lbs distributed weight for +Z Panel MLI blanket.

| ACIS MASS PROPERTIES                     |                |                  |             | 30-Apr-97   | P. C. Tappan                       |                             |                             |                             |                             |                             |  |
|--|----------------|------------------|-------------|---|------------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|--|
| /am:/snebulos/h2/pct/acis/mass_prop3.xs3 |                |                  |             | Coordinate system is the ISIM system with ACIS in the launch lock position. |                                    |                             |                             |                             |                             |                             |  |
|  |                |                  |             | RCTU Cables, Fudical Lights, Light Seal, Mounting Hardware,                 |                                    |                             |                             |                             |                             |                             |  |
|  |                |                  |             | Survival and Trim Heater System weights are not included.                   |                                    |                             |                             |                             |                             |                             |  |
| Description                              | Basic Weight   | Percent Measured | Contingency |   | Reserve                            | Current Weight              | Prior Basic Weight          | Basic Weight Change         | Prior Current Weight        | Current Weight Change       |  |
|  | (Lbs)          |                  | %           | (Lbs)   | (Lbs)                              | (Lbs)                       | (Lbs)                       | (Lbs)                       | (Lbs)                       | (Lbs)                       |  |
| Detector Assembly                        | 27.5           | 99%              | 0%          | 0.0   | 0.0                                | 27.5                        | 28.4                        | -0.9                        | 29.1                        | -1.6                        |  |
| Proton Shield                            | 3.8            | 100%             | 0%          | 0.0   | 0.0                                | 3.8                         | 3.8                         | -0.0                        | 3.8                         | -0.0                        |  |
| MLI, Thermal Straps (.33)                | 2.3            | 100%             | 0%          | 0.0   | 0.0                                | 2.3                         | 2.3                         | -0.0                        | 2.3                         | -0.0                        |  |
| DA to DEA Cabling (.3)                   | 0.7            | 100%             | 0%          | 0.0   | 0.0                                | 0.7                         | 0.7                         | -0.0                        | 0.7                         | -0.0                        |  |
| PSMC Cabling (.091)                      | 0.8            | 100%             | 0%          | 0.0   | 0.0                                | 0.8                         | 0.8                         | 0.0                         | 0.8                         | 0.0                         |  |
| Vent Tube                                | 1.0            | 100%             | 0%          | 0.0   | 0.0                                | 1.0                         | 1.0                         | 0.0                         | 1.0                         | 0.0                         |  |
| DETECTOR ASSEMBLY TOTAL                  | 36.1           | 99%              | 0%          | 0.0   | 0.0                                | 36.1                        | 37.0                        | -0.9                        | 37.7                        | -1.6                        |  |
| VENT VALVE less Vent Tube                | 5.1            | 100%             | 0%          | 0.0   | 0.0                                | 5.1                         | 5.0                         | 0.1                         | 5.1                         | 0.0                         |  |
| VENT MECH. INTERFACE                     | 2.2            | 100%             | 0%          | 0.0   | 0.0                                | 2.2                         | 2.2                         | 0.0                         | 2.2                         | 0.0                         |  |
| VENT ELECT. INTERFACE                    | 0.5            | 100%             | 0%          | 0.0   | 0.0                                | 0.5                         | 0.5                         | 0.0                         | 0.5                         | 0.0                         |  |
| Support Structure                        | 25.5           | 100%             | 0%          | 0.0   | 0.0                                | 25.5                        | 25.5                        | 0.0                         | 29.9                        | -4.4                        |  |
| DEA                                      | 47.1           | 100%             | 0%          | 0.0   | 0.0                                | 47.1                        | 47.1                        | 0.0                         | 52.5                        | -5.4                        |  |
| DPA                                      | 43.1           | 100%             | 0%          | 0.0   | 0.0                                | 43.1                        | 43.1                        | 0.0                         | 48.5                        | -5.4                        |  |
| DA to DEA Cabling (.7)                   | 1.6            | 100%             | 0%          | 0.0   | 0.0                                | 1.6                         | 1.6                         | 0.0                         | 1.6                         | 0.0                         |  |
| DEA to DPA Cabling                       | 3.1            | 100%             | 0%          | 0.0   | 0.0                                | 3.1                         | 3.1                         | 0.0                         | 3.1                         | 0.0                         |  |
| PSMC Cabling (.127)                      | 1.2            | 100%             | 0%          | 0.0   | 0.0                                | 1.2                         | 1.2                         | -0.0                        | 1.2                         | -0.0                        |  |
| SUPPORT ASSEMBLY                         | 121.6          | 100%             | 0%          | 0.0   | 0.0                                | 121.6                       | 121.6                       | -0.0                        | 133.8                       | -12.2                       |  |
| Radiators                                | 10.2           | 100%             | 0%          | 0.0   | 0.0                                | 10.2                        | 10.2                        | 0.0                         | 10.3                        | -0.1                        |  |
| MLI, Thermal Straps (.67)                | 3.2            | 100%             | 0%          | 0.0   | 0.0                                | 3.2                         | 3.2                         | 0.0                         | 3.2                         | 0.0                         |  |
| RADIATORS                                | 13.4           | 100%             | 0%          | 0.0   | 0.0                                | 13.4                        | 13.4                        | 0.0                         | 13.5                        | -0.1                        |  |
| SUN SHADE                                | 8.5            | 100%             | 0%          | 0.0   | 0.0                                | 8.5                         | 8.4                         | 0.1                         | 8.5                         | 0.0                         |  |
| TELESCOPE SHADE & POSTS                  | 7.6            | 100%             | 0%          | 0.0   | 0.0                                | 7.6                         | 7.6                         | 0.0                         | 7.6                         | 0.0                         |  |
| PSMC                                     | 32.9           | 100%             | 0%          | 0.0   | 0.0                                | 32.9                        | 31.7                        | 1.2                         | 31.9                        | 1.0                         |  |
| PSMC Cabling (.109)                      | 1.0            | 100%             | 0%          | 0.0   | 0.0                                | 1.0                         | 1.0                         | 0.0                         | 1.0                         | 0.0                         |  |
| PSMC TOTAL                               | 33.9           | 100%             | 0%          | 0.0   | 0.0                                | 33.9                        | 32.7                        | 1.2                         | 32.9                        | 1.0                         |  |
| PSMC CABLES Less Ends                    | 6.2            | 100%             | 0%          | 0.0   | 0.0                                | 6.2                         | 6.1                         | 0.1                         | 6.1                         | 0.1                         |  |
| SIM MOUNTED CALIBRATION SOURCE           | 4.1            | 98%              | 2%          | 0.1   | 0.0                                | 4.2                         | 4.1                         | 0.0                         | 4.2                         | 0.0                         |  |
|  | ---            | ---              | ---         | ---   | ---                                | ---                         | ---                         | ---                         | ---                         | ---                         |  |
| TOTAL                                    | 239.2          | 100%             | 0%          | 0.1   | 0.0                                | 239.3                       | 238.6                       | 0.6                         | 252.1                       | -12.8                       |  |
|  |                |                  |             |   |                                    |                             |                             |                             |                             |                             |  |
| Description                              | Current Weight | Center of Mass   |             |   | Moment of Inertia about Unit C. M. |                             |                             | Products of Inertia         |                             |                             |  |
|  | (Lbs)          | Xcg (in.)        | Ycg (in.)   | Zcg (in.)   | Ixx (in-lb-s <sup>2</sup> )        | Iyy (in-lb-s <sup>2</sup> ) | Izz (in-lb-s <sup>2</sup> ) | Pxy (in-lb-s <sup>2</sup> ) | Pxz (in-lb-s <sup>2</sup> ) | Pyz (in-lb-s <sup>2</sup> ) |  |
| DETECTOR ASSEMBLY TOTAL                  | 36.1           | 3.84             | 0.57        | 0.21  | 1.75                               | 3.93                        | 4.21                        | -0.14                       | -0.20                       | 0.04                        |  |
| VENT VALVE less Vent Tube                | 5.1            | 12.73            | 13.64       | -0.07   | 0.17                               | 0.13                        | 0.06                        | 0.00                        | 0.00                        | 0.00                        |  |
| VENT MECH. INTERFACE                     | 2.2            | 12.73            | 19.98       | 3.50  | 0.03                               | 0.01                        | 0.02                        | 0.00                        | 0.00                        | 0.00                        |  |
| VENT ELECT. INTERFACE                    | 0.5            | 12.85            | 20.18       | -3.94   | 0.00                               | 0.00                        | 0.00                        | 0.00                        | 0.00                        | 0.00                        |  |
| SUPPORT ASSEMBLY                         | 121.6          | 3.44             | 0.55        | 0.26  | 50.5                               | 12.5                        | 54.0                        |                             |                             |                             |  |
| RADIATORS                                | 13.4           | 3.70             | -0.16       | 9.00  | 2.49                               | 0.74                        | 3.20                        | 0.00                        | 0.00                        | -0.02                       |  |
| SUN SHADE                                | 8.5            | -5.34            | -0.52       | 19.64   | 4.92                               | 1.36                        | 3.57                        | 0.00                        | 0.00                        | 0.25                        |  |
| TELESCOPE SHADE & POSTS                  | 7.6            | 13.67            | -0.63       | 20.39   | 3.89                               | 1.14                        | 3.04                        | -0.01                       | 0.07                        | -0.26                       |  |
| PSMC                                     | 33.9           | 6.00             | 12.00       | -32.50  | 1.21                               | 0.97                        | 1.27                        | -0.11                       | -0.01                       | 0.00                        |  |
| PSMC CABLES Less Ends                    | 6.2            |                  |             |   |                                    |                             |                             |                             |                             |                             |  |
| SIM MOUNTED CALIBRATION SOURCE           | 4.2            | 20.75            | 0.00        | 16.88   |                                    |                             |                             |                             |                             |                             |  |
|  | ---            | ---              | ---         | ---   | ---                                | ---                         | ---                         |                             |                             |                             |  |
| TOTAL                                    | 239.3          |                  |             |   |                                    |                             |                             |                             |                             |                             |  |