Mail Code: 410.0
Phone: 301-286-7494
Fax: 301-286-1698

0 Revisions

Date	Description
4/24/98	Initial Submission
4/30/98	Included detail drawing of spacecraft to PAF interface requirement. Added two separation loopbacks (4 wires).
6/27/98	Added a third separation loopback signal on Watzin's recommendation. Added Spectrometer vacuum GSE attachment during daily battery top-off procedure. Added TMS and Gridlet equipment to space requirements. Defined the weak radioactive source to be used (Cd109, 100 uC)
8/6/98	Added radiator contamination shield requirement.
9/8/98	Added requirement to maintain cryocooler free piston horizontal in launch config. Changed cryo radiator and antenna locations from flush to 0.1" above sep. plane. Replaced figure showing detail of separation interface and cryocooler radiator. Changed S/C mass to 333kg, updated c.g. location, moments and products of inertia. Updated figure 1-2 showing spacecraft dimensions and envelope. Corrected coordinate axis origin definition to center of interface plane. Updated RF transmit and receive frequencies Added serial telemetry output for spacecraft monitoring via LV telemetry stream. Added S/C Power Rack to EGSE list
9/17/98 (rev A)	Submitted to document control. Assigned to sys_024.
9/23/98 (rev B)	Updated umbilical interface definition to remove signals used only for s/c testing. Added umbilical connector pin-outs, part number and location. Updated fairing access door size and location and added figure.
9/30/98 (rev C)	Changed from 4.0 to 0.4 BTU/ft2-sec in section 2.4.3 Change contamination shield to a desire in section 3.10.4.
10/8/98 (rev D)	Detailed the ACS system inhibits in section 1.5.2. Added a statement verifying a minimum 1 inch clearance to the fairing in 1.2.1 Added a drawing of the bottom of the S/C showing aft ring dimensions in 1.2. Added details on State of Health telemetry in section 3.2.3
10/14/98 (rev E)	Clarified S/C v. Launch Vehicle parts of figure in section 1.2 Clarified "Base Ring" in section 1.2 "HESSI View Looking Forward" Removed clearance between S/C and shroud in section 1.2.1. Added title Figure 1-1 "HESSI Spacecraft-to-LV Interface Side View" Added title Figure 1-2 " HESSI View Looking Forward" Updated figure 1-1 "HESSI Spacecraft Dimensions"-renamed figure 1.3 Added title Figure 1-4 "HESSI On-Orbit Configuration" Updated figure 1-2 "HESSI Coordinate Systems" - renamed figure 1.5 Updated cryocooler radiation contamination sensitivity in 1.8. Balancing S/C umbilical connector on +X in section 3.1.2 Orientation of the umbilical connectors is per ICD in section 3.1.3. Added figure 3.1 "Fairing Access Door Location" Fairing requirements = enough to fit HESSI in section 3.7. Helium sensitivity further explained in section 3.10.4. Explained contamination covers and Helium control plan in section 4.1.1 Added preferable temperature range for the battery in section 4.1.2. Defined LN2 as HESSI-provided in section 4.7.
11/10/98 (rev F)	Clarified that cryocooler orientation in launch and carry can be relative to local gravity. Opened requirement from 5 to 10 degrees in section 1.2. Changed impedance required from 4 to 5 Ohms in section 3.2.3. Changed tip off rate maximum from 3 to 4 degrees per second in section 2.3.4.

1 Spacecraft Characteristics

1.1 Mission Objectives

The primary scientific objective of the High Energy Solar Spectroscopic Imager (HESSI) is to understand particle acceleration and explosive energy release in the magnetized plasmas at the Sun, processes which also occur at many other sites in the universe. The Sun is the most powerful particle accelerator in the solar system, accelerating ions up to tens of GeV and electrons to hundreds of MeV in solar flares. The accelerated 10-100 keV electrons (and possibly >~1 MeV ions) appear to contain a significant fraction of the energy released in flares (up to 10^{32}-10^{33} ergs in 10^{2}-10^{3} s), indicating that the particle acceleration and energy release processes are intimately linked. How the Sun releases this energy, presumably stored in the magnetic fields of the corona, and how it rapidly accelerates electrons and ions with such high efficiency and to such high energies, is presently unknown.

The hard X-ray/γ-ray continuum and γ-ray lines are the most direct signatures of energetic electrons and ions, respectively, at the Sun. HESSI will provide the first hard X-ray imaging spectroscopy, the first high-resolution spectroscopy of solar γ-ray lines, the first imaging above 100 keV, and the first imaging of solar γ-ray lines.

HESSI will also obtain hard X-ray imaging of the Crab Nebula with ~2 arcsec resolution, and monitor a large fraction of the sky to provide, serendipitously, high spectral resolution observations of transient hard X-ray and γ-ray sources, including accreting black holes, cosmic γ-ray bursts, and terrestrial bursts from relativistic electron precipitation, aurora, and lightning.

1.2 Size and Space Envelope

The spacecraft mechanical interface to the launch vehicle is via a standard 0.98577 m [38.81”] diameter Marmon clampband adaptor ring. There is a thermal radiator for the cryocooler inside the adapter ring which is 2.54 mm [0.1”] above the separation plane. See the figure below for details of that interface (dimensions in inches).
The cryocooler pump free piston axis must be within 10° of local gravity in the launch configuration. The cryocooler free piston axis is parallel to the spacecraft Y-axis.

The spacecraft to launch vehicle interface area is detailed in the figure 1.1. The Base Ring is part of the spacecraft. The Payload Attach Fitting is part of the Launch Vehicle Separation System.

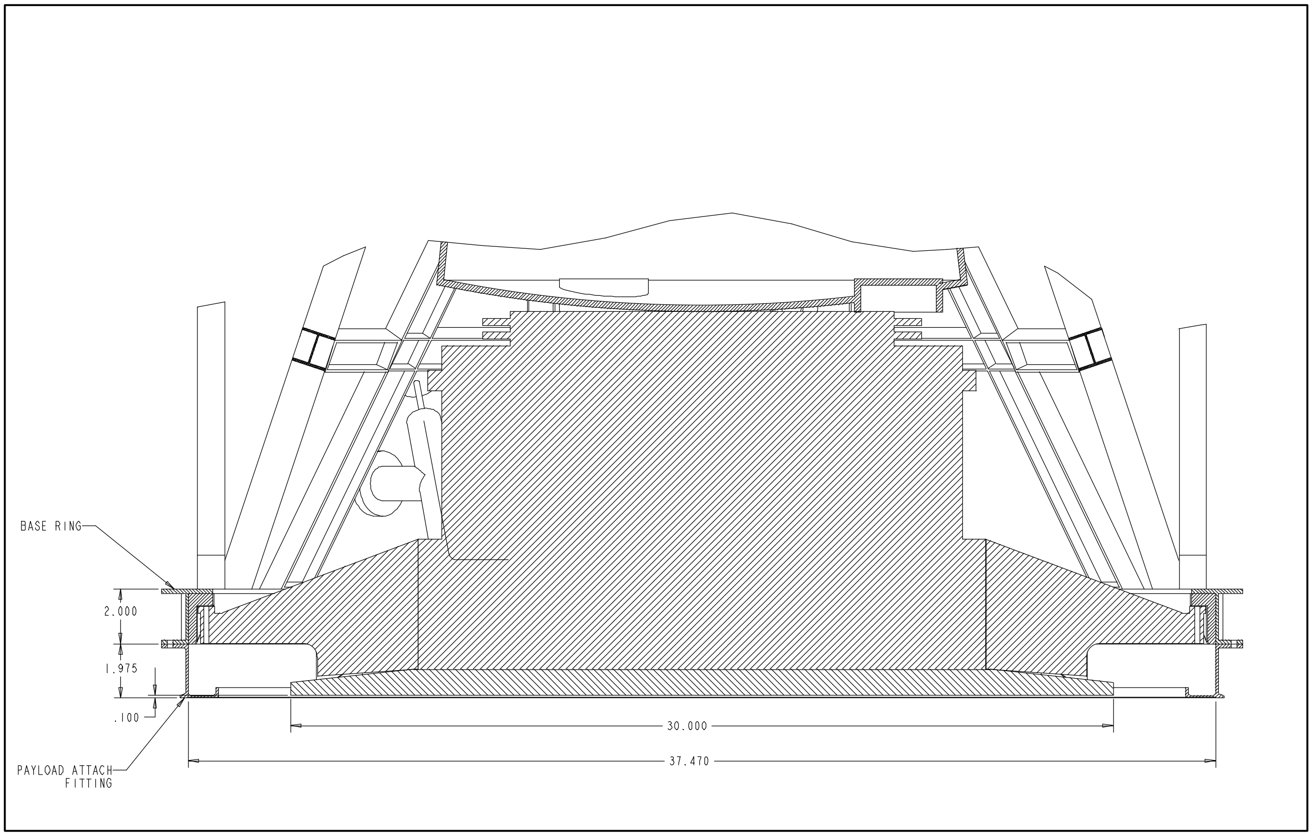

Figure 1-1 HESSI Spacecraft-to-LV Interface Side View

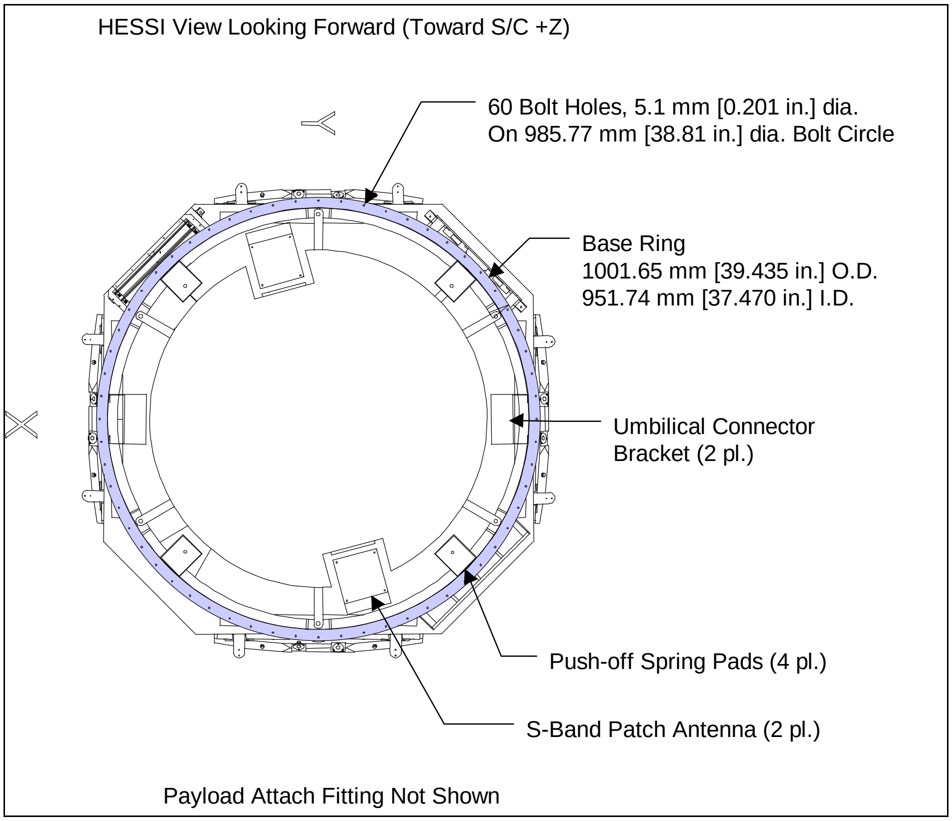

Figure 1-2 HESSI View Looking Forward (Toward S/C +Z)

1.2.1 Dimensioned Drawings/CAD Model (Launch Configuration)

The dimensions of the HESSI s/c in the launch configuration are shown in figure 1-3.

1.3 Orbit Configuration.

The on-orbit deployed configuration of the HESSI spacecraft is shown in figure 1-4.

1.4 Mass Properties and Dynamic Data (Launch Configuration/Separation Configuration Including Tolerances).

1.4.1 Weight (maximum or Nominal).

The HESSI spacecraft mass will not exceed 333 kg including the flyaway portion of the Marmon bandclamp separation system. The flyaway portion of the Marmon bandclamp separation system is estimated to not exceed 4.0 kg

1.4.2 Center of Mass Location.

The center of gravity of the spacecraft will be approximately 0.69 m above the separation plane along the spacecraft Z-axis.

1.4.3 Moments of Inertia About Spacecraft CG in Body Axes (I_{XX}, I_{YY}, I_{ZZ})

The moments of inertia about the spacecraft center of gravity in kg-m^2 are as follows:

I_{XX} = 82.6
I_{YY} = 82.4
I_{ZZ} = 29.2

1.4.4 Products of Inertia (I_{XY}, I_{XZ}, I_{YZ})

The moments of inertia about the spacecraft center of gravity in kg-m^2 are as follows:

I_{XY} = -1.0
I_{XZ} = 0.6
I_{YZ} = -0.9

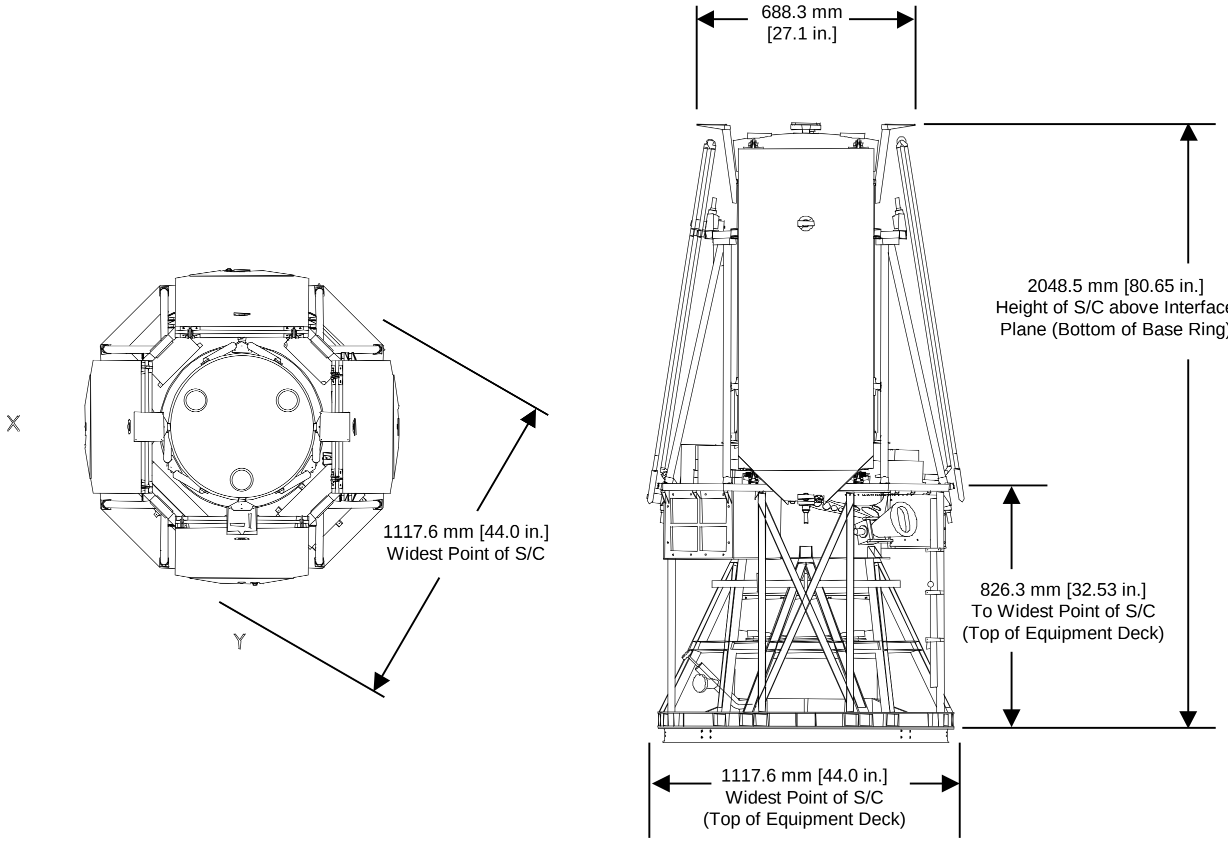

Figure 1-3 HESSI Spacecraft Dimensions. (dim in mm [in])

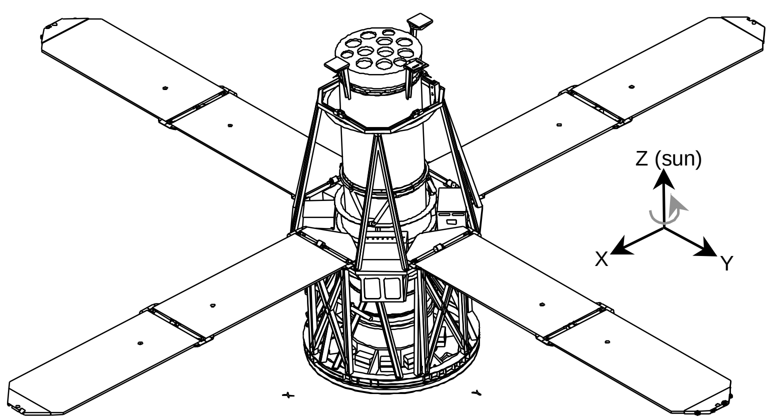

Figure 1-4 HESSI On-Orbit Configuration

1.4.5 Spacecraft Coordinate System.

The spacecraft coordinate axes are shown in figure 1-5. The origin of the coordinate system is in the Payload Interface Plane at the interface between the Marmon clampband separation system and the HESSI spacecraft.

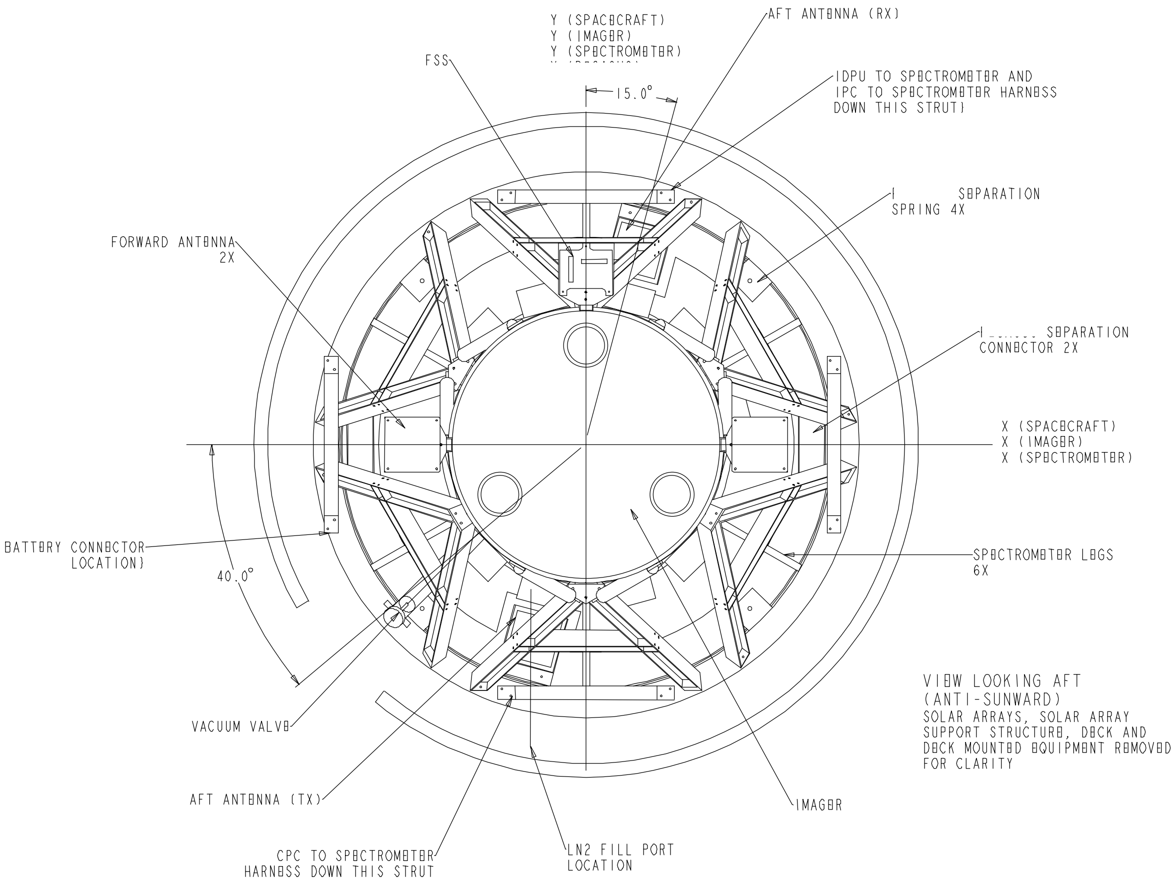

Figure 1-5 HESSI Coordinate Systems

1.4.6 Fundamental Frequencies (Thrust Axis/Lateral Axis).

The HESSI structure will be designed so that the fundamental frequencies will be greater than 30Hz in the thrust axis and greater than 20 Hz in the lateral directions.

1.4.7 Any Significant Vibration Modes.

A summary of the results of our finite element model will be provided when it is submitted for the preliminary coupled loads analysis. We expect to submit the model to NASA by November 1998.

Description of Spacecraft Dynamic Model

A description of the spacecraft dynamic model will be provided when it is submitted for the preliminary coupled loads analysis. We expect to submit the model to NASA by November 1998.

1.4.9 Time Constant and Description of Spacecraft Energy Dissipation Sources and Locations (i.e., hydrazine Fill Factor, Passive Nutation Dampers, Flexible Antennae, etc.)

There is not expected to be any component that has the capability to significantly dissipate energy on the spacecraft.

1.5 Spacecraft Hazardous Systems

1.5.1 Apogee Motor (Solid or Liquid).

There are no solid rocket motors or propulsion thrusters on the HESSI spacecraft.

1.5.2 Attitude Control System.

When the spacecraft is mated to the launch vehicle during launch operations and ascent, the only components powered are the essential bus components. These are the Communications Interface Board (CIB), the S-band transponder (receiver only) the Payload and Attitude Control Interfaces board (PACI), the Power Control Board (PCB) and the Charge Control Board (CCB). The other components, including the torque rods and processor, are commanded on following separation from the launch vehicle. Separation is detected using loop-back wires on the launch vehicle side of the umbilical connector interface. To provide single fault tolerance against premature activation of these components, there are three loop-backs, any two of which must indicate separation to begin the spacecraft initialization sequence.

The only spacecraft ACS actuators are three orthogonally mounted 60 A-m^2 magnetic torque rods. The torque rods have drivers in the power control board (PCB) which are controlled via the VME interface. Prior to separation from the launch vehicle, the spacecraft processor is unpowered and cannot provide any command input to the PCB to drive the torque rods. Additionally, the PCB has a solid state switch in series with the torque rod driver circuits which is open and provides an additional electrical inhibit to premature activation of the torque rods.

1.5.3 Hydrazine (Quantity, Spec, etc.).

The payload contains no hydrazine.

1.5.4 Other Hazardous Fluids (Quantity, Spec, etc.).

The only potentially hazardous fluid on the HESSI spacecraft bus is the electrolyte in the Nickel-Hydrogen battery cells. The battery cell electrolyte is a potassium hydroxide (KOH) solution.

1.5.5 High Pressure Gas (Quantity, Spec, etc.).

The Nickel-Hydrogen battery cell pressure vessels are pressurized with hydrogen gas with a maximum pressure less than 150KPa.

1.5.6 Radioactive Devices.

The payload contains no radioactive sources.

1.5.7 Can Spacecraft produce non-ionizing radiation at Hazardous Levels?

See RF section.

1.5.8 Do Pressure Vessels Conform to Safety Requirements of EWR 127-1?

The HESSI Spectrometer is a vacuum vessel which will conform to EWR 127-1.The HESSI NiH_2 battery contains 11 pressure vessels which will also conform.

1.5.9 Location Where Pressure Vessels Are Loaded and Pressurized.

The HESSI Spectrometer GSE includes a vacuum pump system which will be connected whenever convenient to verify and maintain the required vacuum in the device. The precise schedule will be worked out with the LV supplier.
The battery pressure vessels will pressurized before delivery to the launch site.

1.5.10 Other Hazardous Systems.

The payload instrumentation contains high voltage circuitry which will use a safing plug, and two-stage command interlocks.

1.6 Electro-Explosive Devices (EED)

1.6.1 Category A EEDs (Function, Type, Part Number, When Installed, When Connected).

The payload contains no EEDs. HESSI uses non-explosive Shaped Memory Alloy devices.

1.6.2 Are Electrostatic Sensitivity Data Available on Category A EEDs? List References.

Not applicable.

1.6.3 Category B EEDs (Function, Type, Part Number, When Installed, When connected).

Not applicable.

1.6.4 Are RF Susceptibility Data Available? List references.

Not applicable.

1.7 RF System

1.7.1 System.

The HESSI spacecraft has an S-Band RF system
(Cincinnati Electronics Corporation, TTC-306/701)

1.7.2 Frequency (MHz).

Transmit:	2215 MHz
Receive:	2039.645948 MHz

1.7.3 Maximum Power (EIRP) (dBm).

The maximum EIRP is 36 dBm, which occurs along spacecraft +z axis**.**

1.7.4 Average Power (W)

Transmitter output power is 5 Watts

1.7.5 Type of Transmitter

The transmitter is a solid state power amplifier using bi-phase modulation

1.7.6 Antenna Gain (dB)

The antenna gain is in the range between -5dB and +5dB

1.7.7 Antenna Location

There are two transmit antennas located at the forward and aft ends of the spacecraft. The forward antenna is mounted on a bracket at the forward end the imager telescope tube. The aft antenna is mounted just inside of the launch vehicle adapter ring 2.54 m [0.1"] above the separation plane.

1.7.8 Distance at Which RF Radiation Flux Density Equals 1 mW/cm^2.

20 cm.

1.7.9 When is RF Transmitter Operated?

The RF transmitter is operated during functional checkout of the spacecraft after shipment to the launch site in the payload processing facility, and in orbit after separation from the launch vehicle. The transmitter will only be turned on briefly for functional test after integration with launch vehicle. The transmitter will not be turned on from launch through separation.

1.7.10 RF Checkout Requirements (Location and Duration, to What Facility, Support Requirements, etc.)

The RF subsystem will be checked out at the payload processing facility..

1.8 Contamination-Sensitive Surfaces.

Both the Roll Angle System lens (located below the S/C deck looking outward) and Solar Aspect System lenses (located on the top of the S/C) are sensitive to dust particles.

Thermal radiator surfaces located on various components, as well as the Spectrometer radiator (located on the spacecraft aft end), are silver-coated teflon. All thermal surfaces will perform best on orbit if kept chemically clean (particulate contamination is not a primary concern).

See Section 4.1 for preferred processing requirements.

1.9 Spacecraft volume (Ventable and Non-Ventable).

The spacecraft structure is an open strut structure with no substantial enclosed volume except for the interior of the strut tubes and component boxes. All spacecraft components are being designed to be vented with vent area of 1 mm^2 per 2000 mm^3 of volume.

1.10 Spacecraft Systems Activated Prior to Separation from Launch Vehicle.

Only the minimal systems required to allow commanding the spacecraft are activated prior to separation with the launch vehicle. The specific components which are powered at launch include the Power Control Board (PCB), Charge Control Board (CCB), Communications Interface Board (CIB), the Payload and Attitude Control Interface Board (PACI), and the receiver portion of the S-band transponder. All other components including the RF transmitter and all instrument subsystems are powered off from launch through separation..

2 Mission Requirements and Restraints

2.1 Desired Transfer Orbit

2.1.1 Apogee (Integrated).

600 km altitude.

2.1.2 Perigee (Integrated).

600 km altitude.

2.1.3 Inclination.

38 degrees.

2.1.4 Argument of Perigee at Insertion.

N/A

2.1.5 Other

N/A

2.2 Launch Window Restraints and Duration

2.2.1 Sun Angle.

No constraint.

2.2.2 Eclipse.

The launch window shall allow the HESSI spacecraft to separate from the launch vehicle in sunlight at least 5 minutes prior to eclipse entry.

2.2.3 Ascending Node.

No constraint.

2.2.4 Inclination.

38 degrees.

2.2.5 Window Durations (Over a Year's Span).

The payload can be launched any time of the year.

2.2.6 Other.

The primary downlink station at Berkeley must be operational and should have predicted wind speed below 30 mph for the first five orbits (8 hours).

2.3 Separation Requirements (Including Tolerances)

2.3.1 Position

N/A

2.3.2 Attitude

Launch vehicle shall reorient the spacecraft to an orientation such that the nominal sun pointing spacecraft axis (+Z) points to the sun ± 5 degrees.

2.3.3 Sequence and Timing

The launch vehicle contractor shall ensure adequate separation between the launch vehicle and the spacecraft such that the spacecraft may safely deploy the arrays within 90 seconds after separation. This implies that the induced separation velocity and tip-off/coning (below) together will not allow the possibility of collision.

2.3.4 Tipoff and Coning

The transverse tip-off rate magnitude immediately after separation shall be < 4 deg/sec per axis as a requirement. The amount of coning is fixed by the specified transverse tip-off rates, the spin rate at separation (below), and the spacecraft inertia properties. As long as the tip-off and spin rates are satisfied, no-separate requirements will be imposed on coning.

2.3.5 Spin Rate at Separation

Nominal initial spin rate at separation shall be 15 ±2 deg/sec about the spacecraft +Z axis.

2.3.6 Other

N/A.

2.4 Special Trajectory Requirements

2.4.1 Thermal Maneuvers

None required

2.4.2 T/M Maneuvers

None required.

2.4.3 Free Molecular Heating Restraints

Free molecular heating rate shall not exceed 0.4 BTU/ft^2-sec

3 Spacecraft-to-Launch Vehicle Interface Requirements

3.1 Interface Connector and Umbilicals

3.1.1 Type and Part Number

The umbilical connector on the spacecraft side of the separation interface shall be a 42 pin receptacle with socket contacts, part number MS27474T-16F-42S, expected to be provided by the launch vehicle provider one year prior to launch. The mating connector on the launch vehicle side shall be a 42 pin plug with pin contacts, part number MS27484T-16F-42P.

3.1.2 Location

The umbilical connector is located inside the launch vehicle adaptor ring centered at the spacecraft –X axis. In order to improve the S/C roll rate due to LV separation, HESSI can provide a second connector located at +X in order to balance the separate force of the -X connector.

3.1.3 Orientation

The orientation of the umbilical connectors will be defined in the S/C-to-LV ICD.

3.2 Spacecraft-to Ground Support Equipment wiring Requirements

3.2.1 Number of Wires Required

A total of 14 umbilical pins are required by HESSI. 4 pins will be used as two pairs of power wires for battery charging while integrated with the launch vehicle. 6 pins will be used as 3 loopbacks on the launch vehicle side of the interface for sensing launch vehicle separation. 4 wires will be used as two pairs of wires for an asynchronous 9600 bit/sec serial telemetry interface.

3.2.2 Pin Assignments in the Spacecraft Umbilical Connector(s)

The table below lists the pin assignments for the umbilical connector. All pin numbers not included in the table are not required by the spacecraft and will not be wired to any spacecraft components. Pins 27 and 28 are wired together on the spacecraft side of the interface to provide a loopback to allow the launch vehicle to sense separation from the spacecraft.

Pin	Function
1	Battery Trickle Charge 1+
2	Battery Trickle Charge 1-
3	Battery Trickle Charge 2+
4	Battery Trickle Charge 2-
5	Separation Loopback 1+
6	Separation Loopback 1-
7	Separation Loopback 2+
8	Separation Loopback 2-
9	Separation Loopback 3+
10	Separation Loopback 3-
27	L/V Separation Sense +
28	L/V Separation Sense -
37	Serial Telemetry Poll+
38	Serial Telemetry Poll-
39	Serial Telemetry Data+
40	Serial Telemetry Data-

3.2.3 Purpose and Nomenclature of Each Wire Including Voltage, Current, Polarity Requirements, and Maximum Resistance.

The umbilical wiring definitions by signal type are listed in table 3-1. The maximum round trip resistance requirement between the umbilical connector and the ground support equipment for each twisted pair of S/C Power wires shall be less than 5 Ohms.

The spacecraft provides a serial telemetry output for state of health monitoring using the launch vehicle telemetry system. The launch vehicle can interrogate the spacecraft at a 1 Hz rate and receive 200 bytes of payload data to be interleaved into the launch vehicle telemetry stream.

Signal Description	**Wire Type**	**Qty.**	**Signal Type**	**Total Pins**
S/C Battery Charge Power & Return	TP	2	+34 Vdc max, power twisted with return	4
Launch Vehicle Serial Telemetry	TSP	2	RS-422 TX/RX	4
S/C Separation Sense Loopbacks	SC	3	+5Vdc max. Loopback on LV side	6
L/V Separation Sense Loopback	SC	1	Loopback on S/C side	2
Total Umbilical Pins:				14

Table 3-1. Umbilical Connector Signal Description

The wire type column abbreviations are defined in table 3-2:

	Definition	Pins Req'd
SC	Single Conductor	1
TP	Twisted Pair	2
TSP	Twisted Shielded Pair (Shields terminated to connector shell)	2

Table 3-2. Wire Type Definitions

3.2.4 Shielding Requirements.

Signals indicated in table 3-1 as requiring wire type "TSP" require twisted shielded pair wiring, with shields terminated to connector backshells (as opposed to being carried on umbilical pins). Other signals have no specific shielding requirements.

3.2.5 Voltage of the Spacecraft Battery and Polarity of the Battery Ground.

The battery voltage ranges from 24V to 34V. The negative terminal of the battery is electrically common with spacecraft structure.

3.3 Does Spacecraft Require Discrete Signals from Launch Vehicle? Describe.

No launch vehicle generated signals are required, however the spacecraft does required three loopbacks on the launch vehicle side of the umbilical connector interface to sense separation.

3.4 Separation Switch Pads.

None required.

3.5 Separation Switches.

No requirement for separation switches on the launch vehicle side of the interface.

3.6 Separation Springs.

Spacecraft can accommodate launch vehicle requirements.

3.7 Fairing Requirements – dimensions.

The HESSI spacecraft requires a fairing large enough to hold HESSI with at least 1 inch clearance. See Figure 1.3.

3.8 Access Doors in Fairing (Size, Location, Purpose).

One access door approximately 215mm x 330mm [approx. 8.5” x 13”] is required to install the battery enable flight plug and for access to the test access electrical connector. The bottom edge of the access door shall be 152mm [6.0”] above the interface plane, with the door centered 40° from the -X spacecraft axis looking down on the spacecraft (towards –Z). This location will also provide access to the instrument HV enable plug and the Spectrometer pump fitting.

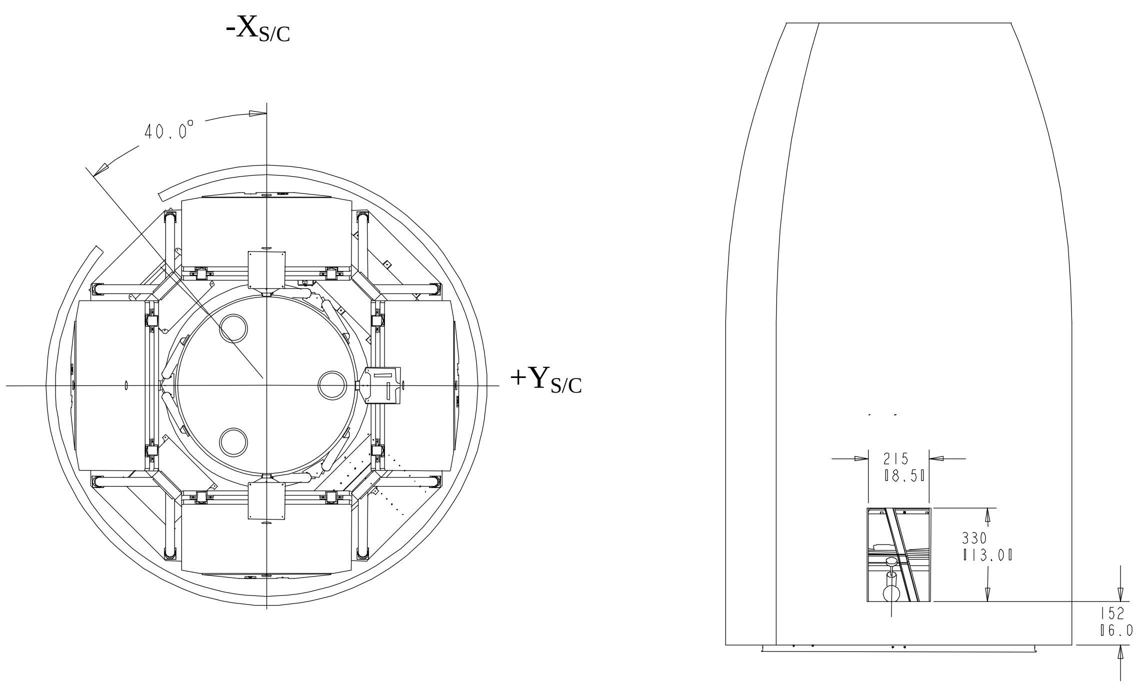

Figure 3-1. Fairing Access Door Location.

3.9 RF Window Requirements (Size, Location, purpose).

No RF window is required.

3.10 Fairing Environmental Requirements

The fairing temperature, humidity and cleanliness shall conform to the requirements listed in section 4.1.   Local supplemental cooling to reduce the battery assembly temperature is desirable.

3.10.1 Spacecraft In-Flight Requirements.

No special requirements

3.10.2 Spacecraft Ground Requirements (Fairing Installed).

The spacecraft battery will be “top off” charged once a day. This procedure will take approximately 2 to 3 hours. Concurrent with this activity, the instrument Spectrometer vacuum GSE may be attached to verify and/or maintain internal high vacuum conditions.

3.10.3 Critical Surfaces (i.e., Type, Size, Location).

None.

3.10.4 Surface Sensitivity (e.g., Susceptibility to Propellants, Gases and Exhaust Products, and Other Contaminants).

Both the Roll Angle System lens (located below the S/C deck looking outward) and Solar Aspect System lenses (located on the top of the S/C) are sensitive to dust particles.
The Spectrometer (located at the bottom of the S/C) is sensitive to Helium, so that the exposure to Helium should not exceed 5% by volume. The experimenter-supplied GSE vacuum pump will be able to remove Helium, so that Helium exposure during pre-launch processing is not as crucial as during the launch phase. The Radiator surface, at the very bottom of the spacecraft, must be kept clean (through the use of a contamination shield is desirable).

3.10.5 Purges Required.

HESSI does not require purge.

4 Spacecraft Processing Requirements

4.1 Spacecraft Environmental Requirements

4.1.1 Cleanliness Requirements.

The LV contractor should provide a standard Class 100,000 area. The experimenter will provide non-flight lens and radiator covers. If the LV provider plans to use Helium near the spacecraft, Spectrometer bagging and Nitrogen purge may be required.

4.1.2 Temperature Requirements.

Between 5°C and 30°C at all times. It is preferable to have the fairing air conditioning system providing maximum cooling to the battery, so that it would maintain a 10° to 20° C temperature range.

4.1.3 Humidity Requirements.

Between 30% and 70% relative humidity.

4.2 What Are the Spacecraft Ground Equipment Space Requirements?

The payload EGSE will consist of the following items :

1. SCAT (19” rack)
2. S/C Power Rack
3. Stimulus Rack
4. ITOS Workstation
5. S/C Bus Workstations (3)
6. Instrument Workstations (3)
7. Printers (2)
8. Diagnostic Equipment
9. Documentation cabinet.
10. Twist Monitoring System
11. Gridlet Test System

The payload MGSE will include the following items:

1. Payload dolly
2. S/C transport container
3. EGSE transport containers

4.3 What Are the Security Requirements of the Spacecraft when mated to the Launch Vehicle?

No special requirements placed upon the LV provider.

4.4 Is a Multishift Operation Planned once Spacecraft is mated to Launch Vehicle?

The HESSI team will support a 2-shift operation if needed to facilitate processing. HESSI is not requiring this of the LV supplier.

4.5 List the Support Items the Spacecraft Project Needs from NASA, USAF, or Commercial Providers to Support the processing of Spacecraft. Are There any Unique Support Items?

No special requirements.

4.6 Special Handling Requirements.

Avoid contact with the Imager tube, as strong side loads imposed may compromise its optical alignment. Whenever possible, HESSI should be stowed in a vertical orientation.

4.7 Special Ground Equipment or Facilities Required?

1. The HESSI final functional may involve the use of a weak radioactive source which will be provided and used by the HESSI team (Cadmium 109, 100 uC)..
2. The final functional will use HESSI-provided LN2 to cool the detectors.
3. The final alignment check, called the TMS test, will require a 14' ceiling height.

4.8 Spacecraft-To-GSE Signal Conditioning Requirements

No signal conditioning is needed for any spacecraft signals.

5 Spacecraft Development and Test Programs

5.1 Test Schedule at Launch site

5.1.1 Operations Flow Chart (Preliminary high level development/test timeline)

See figure 5-1 for a flow chart of launch site operations. The spacecraft requires approximately 5 days after arrival at the payload processing facility for checkout before beginning integrated operations with the launch vehicle. Once the spacecraft is mated to the launch vehicle the spacecraft requires approximately 2 to 3 hours each day until launch for battery charging.

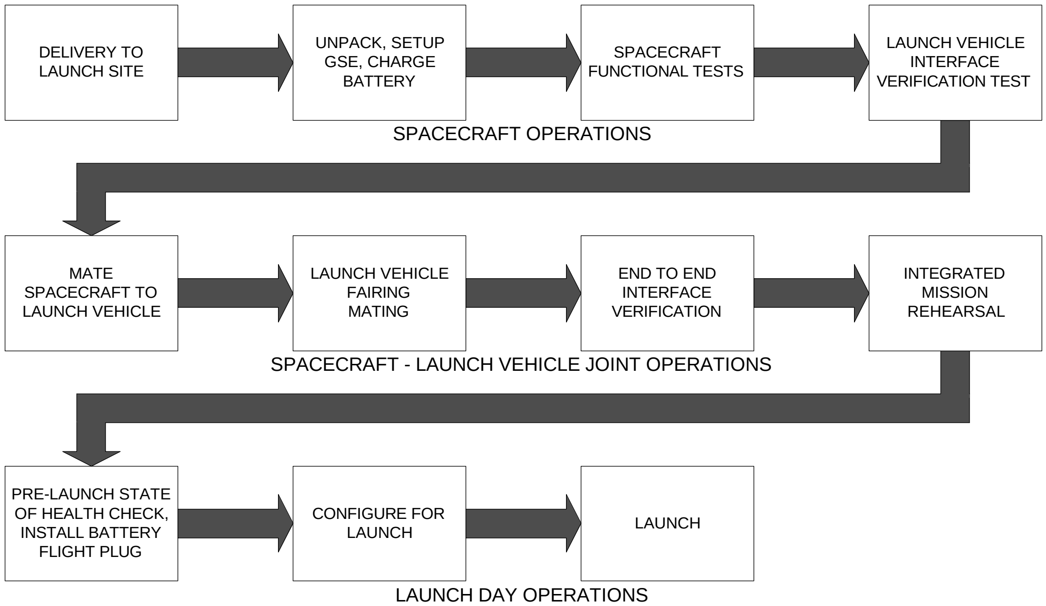

Figure 5-1. Launch Site Operations Flow Chart

5.2 Spacecraft Development and Test Schedules

5.2.1 When will a Test and/or flight PAF be required to support Spacecraft Test schedules?

Launch minus 7 months.

6 Identify Any Additional Spacecraft or Mission Requirements

Insertion vector should be given to the HESSI team no later than 45 minutes after launch to allow the flight operations team reasonable time to react to off-nominal profiles.