CRITICAL VISCOSITY OF XENON 2 (CVX-2) EXPERIMENT TO HITCHHIKER (HH) INTERFACE CONTROL DOCUMENT (ICD)

870-ICD-299

Rev A

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SWALES & ASSOCIATES, INC.

5050 Powder Mill Road
Beltsville, Maryland 20705

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LIST OF ACRONYMS

ACCESS	Advanced Carrier Customer Equipment Support System
AP	Avionics Package
CARS	Customer Accommodations and Requirements Specifications
CGSE	Customer Ground Support Equipment
CM	Configuration Management
CVX-2	Critical Viscosity of Xenon 2
EMC	Electromagnetic Compatibility
EP	Experiment Package
FREESTAR	Fast Reaction Experiment Enabling Science Technology Applications and Research
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
HH	Hitchhiker
ICD	Interface Control Document
IVT	Interface Verification Test
KSC	Kennedy Space Center
LEP	Lower End Plate
LSSP	Launch Site Support Plan
LT	Lower Truss
MLI	Multi-Layer Insulation
MPE	Mission Peculiar Equipment
MPESS	Multi-Purpose Equipment Support Structure
NDE	Nondestructive Evaluation
OPF	Orbiter Processing Facility
OSR	Orbiter Simulation Rack

LIST OF ACRONYMS (CONT.)

PCR	Payload Changeout Room
PGHM	Payload Ground Handling Mechanism
POCC	Payload Operations and Control Center
PPF	Payload Processing Facility
TBD	To Be Determined
UEP	Upper End Plate
UT	Upper Truss

1.0 SCOPE

This document defines and controls the design of mechanical, electrical, and thermal interfaces between the Critical Viscosity of Xenon 2 (CVX-2) experiment and the Hitchhiker (HH) carrier system. It also serves to document agreed upon services between the HH project and CVX-2. In the event of any discrepancies, CM controlled drawings shall take precedence over this ICD.

2.0 APPLICABLE DOCUMENTS

740-SPEC-008	Hitchhiker, Shuttle Payload of Opportunity Carrier; Customer Accommodations and Requirements Specifications (HH CARS)
GSFC S-313-100	Fastener Integrity Requirements
ICD-2-19001	Shuttle Orbiter/Cargo Standard Interfaces
N/A	CVX-2 Customer Payload Requirements (CPR) Document, dated 5/21/99
KHB 1700.7	STS Payload Ground Safety Handbook
NASA-STD-5003	Fracture Control Requirements For Payloads Using The Space Shuttle
TA-92-038	Protection of Payload Electrical Power Circuits

3.0 MECHANICAL

3.1 Interface Definition

3.1.1 Hitchhiker

Reference the following GSFC drawing numbers for the CVX-2 mechanical interface definition:

GE2046340	FREESTAR Bridge Launch Assembly, STS-107
GE2046346	CVX-2 Canister #1 AP Assembly
GD2046347	CVX-2 Canister #2 EP Assembly

3.1.2 CVX-2

Reference the following NASA GRC drawing numbers for the CVX-2 mechanical interface definition:

60009MA41001	EP Assembly
60009MA47001	AP Assembly
60009MD41050	EP UEP
60009MD47050	AP UEP

3.2 Physical Interfaces

The payload consists of two assemblies: the Experiment Package (EP) and Avionics Package (AP). The EP includes the viscometer and precision temperature control elements and the AP includes the data acquisition/control electronics and the power conditioning systems. The EP and AP are carried in two separate HH canisters with an electrical interconnect cable between the two UEP's. The two CVX-2 canisters

will be installed on the forward face of the HH Multi-Purpose Equipment Support Structure (MPESS) as part of the Fast Reaction Experiment Enabling Science Technology Applications and Research (FREESTAR) payload as illustrated in Figure 1. The CVX-2 EP and AP must be mounted in adjacent positions in any location on the HH MPESS. The canisters must also be oriented such that the upper end plates (UEPs) are indexed at 0° toward the MPESS (Ref. drawing numbers 60009MD41050 and 60009MD47050 above). Additionally, the EP canister must be mounted to the left of the AP canister, when viewed from the side opposite the canister brackets.

The composite center of gravity of each the EP and the AP must be constrained within the envelope defined in the HH CARS Table 3.2.

The weight each canister can support is limited to a total of 400 lbs. including the carrier weight and payload weight. The bottom 3" of each container is reserved for HH interface equipment. CVX-2 is required to fit within the envelope defined in Figure 2.7 of the HH CARS.

The CVX-2 equipment shall be subjected to structural testing at 1.25 times the limits loads and show positive margins of safety by analysis at 1.4 times the limit loads for all ultimate failure modes. Alternatively, CVX-2 may qualify the equipment by analysis alone by showing positive margins of safety at 2.0 times the limit loads for material yield and 2.6 times the limit loads for ultimate failure modes. GSE must be designed using a factor of safety of 5.0 for ultimate failure.

All CVX-2 supplied equipment shall have a lowest natural frequency of 35 Hz or greater. It is desirable to have the lowest natural frequency above 50 Hz.

Mechanical interface control drawings are required to contain the information called out in Table 3.2 of the HH CARS. See drawings GF2046346, CVX-2 Canister #1 AP Assembly and GF2046347, CVX-2 Canister #2 EP Assembly.

All CVX-2 fasteners shall be in compliance with GSFC S-313-100.

Ground Support Equipment (GSE) must be designed using a factor of safety of 5.0 for ultimate failure and proof tested to a factor of 2.0. Specific GSE requirements can be found in KHB 1700.7.

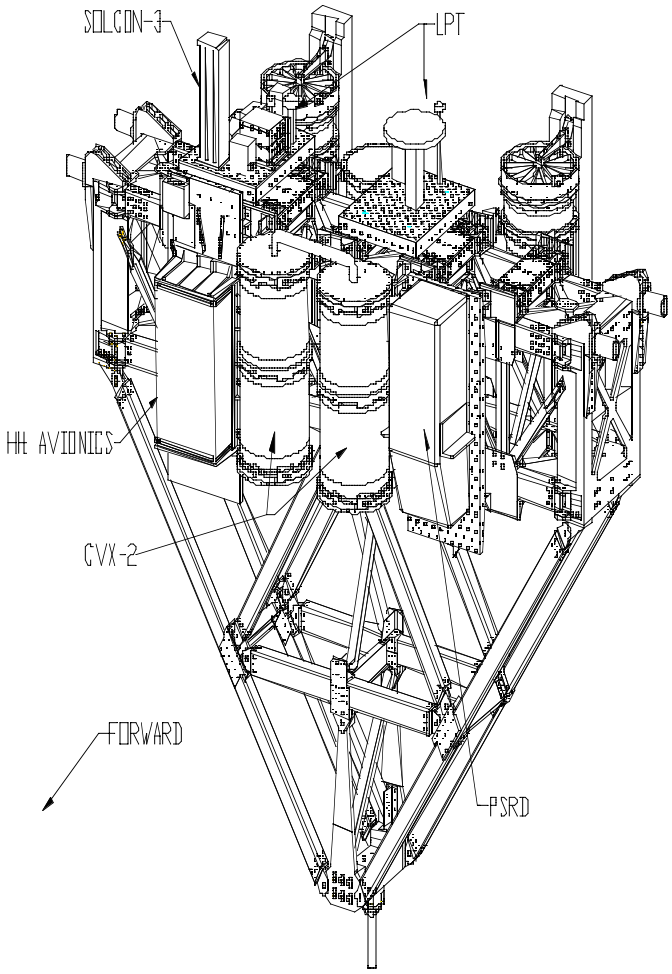

Figure 1 FREESTAR Payload Configuration (Forward View)

3.3 Mechanical Integration

3.3.1 GSFC Operations

Refurbishment of the two canisters will be performed by GSFC prior to CVX-2 integration. Two lower end plates (LEPs) will also be prepared for integration. The two unique UEP's will be supplied by CVX-2. These and the CVX EP and AP shall be delivered to GSFC ready for integration with the flight canister.

The CVX-2 EP and AP shall arrive at GSFC in two standard shipping crates, each approximately 27 x 27 x 44 in., 357 lbs. (gross) that will be mounted on a skid (830 lb. Total). The other CVX-2 hardware shall be shipped in the following: one crate, 27 x 27 x 21 in., 125 lbs. and miscellaneous CVX-2 hardware including a GSE rack cabinet, GSE monitor, tool box and 2 lifting carts will be shipped uncrated.

The initial phase of CVX-2 integration will be performed in the Building 5 cleanroom facility, which is rated at class 100,000. Following CVX-2 offline functional checkout, the EP and AP will be installed into the canisters using lifting hardware provided by GSFC. Following LEP electrical connections to the AP, the LEP will be integrated onto the cans and leak checks will be performed. The cans will then be pressurized with dry nitrogen to 15 psia and installed onto the bridge.

Upon completion of payload integration and functional testing, the FREESTAR upper truss (UT) will be double-wrapped and transferred to Building 7 for Electromagnetic Compatibility (EMC) testing.

Following completion of the EMC test, the FREESTAR UT will be transferred back to Building 5 for pre-ship operations, if necessary. Upon completion, the hardware will be re-wrapped and shipped with GSE to Kennedy Space Center (KSC) via an environmentally controlled moving van.

CVX-2 requires that EP temperature remains between 17°C and 35°C at all times during ground processing. If the EP is outside of the required temperature range, then CVX-2 personnel will be consulted prior to any move.

3.3.2 KSC Operations

During all KSC operations, GSFC shall represent the FREESTAR payload and experiments, and interface directly with KSC personnel. Besides the aforementioned temperature constraints, CVX-2 has no additional unique requirements at KSC.

Upon arrival at KSC, the flight and ground hardware will be configured at the Payload Processing Facility (PPF), where the payload will be prepared for orbiter integration. The PPF will be preassigned and identified in the Launch Site Support Plan (LSSP).

A post-ship functional test will be performed at the PPF, after which the UT and LT will be mated. Pre-transfer photography and sharp-edge inspections will also be completed at the PPF. Weight and CG measurements will be taken in conjunction with the lift of the payload into the transport canister.
The FREESTAR payload will then be transferred to the pad via the transport canister, where it will be installed into the Payload Ground Handling

Mechanism (PGHM) in the Payload Changeout Room (PCR). After the shuttle rolls out to the pad, the payload will be installed into the orbiter. GSFC shall require KSC to install a temporary debris shield in the PCR whenever operations are being performed above FREESTAR. Following the orbiter Interface Verification Test (IVT), final pre-launch inspection and close-out photography are performed.

The FREESTAR mission is scheduled to land at KSC. Orbiter deintegration at the Orbiter Processing Facility (OPF) will be followed by transfer via the transport canister to the PPF, where the UT and LT will be demated. No CVX-2 post-flight operations are planned at KSC.

A temperature profile of the shipping vehicle will be provided to CVX-2.

CVX-2 requires that EP temperature remains between 17°C and 35°C at all times during ground processing. If the EP is outside of the required temperature range, then CVX-2 personnel will be consulted prior to any move.

3.3.3 GSFC Deintegration

The FREESTAR payload will then be shipped back to GSFC via an environmentally controlled moving van for final deintegration in Building 5. After the canisters are removed from the bridge, CVX-2 will be deintegrated and returned to the customer.

CVX-2 requires that EP temperature remains between 17°C and 35°C at all times during ground processing. If the EP is outside of the required temperature range, then CVX-2 personnel will be consulted prior to any move.

3.4 Responsibilities and Deliverables

3.4.1 Hitchhiker

3.4.1.1 Flight

A. Provide two (2) adjacent mounting locations for the CVX-2 canisters on the HH MPESS.

B. Provide one (1) HH MPESS.

C. Provide two (2) 5 ft^3 HH insulated canisters to house EP and AP, consisting of:

- Two (2) canister LEPs and fasteners
- Two (2) canister Lower Insulating End Caps and fasteners
- O-ring seals, as required
- Two (2) sets of HH brackets to hold the payload to the Mission Peculiar Equipment (MPE)
- Two (2) sets of flight fasteners to mount the HH brackets to the canisters
- Two (2) sets of flight fasteners to mount the CVX-2 integrated payload canisters to the HH MPE
- Two (2) flight grounding straps and fasteners to ground the payload canisters to the MPE
- Provide fasteners to mount the UEPs to each canister.

D. Provide cable support brackets and fasteners to secure the UEP interconnect cable.

E. Provide a 15 psia GN_2 blanket pressure in each canister after performing a leak test and purge.

F. Provide two (2) 18 psi pressure relief valves to be installed on the EP LEP.

G. Provide two (2) 18 psi pressure relief valves to be installed on the AP LEP.

H. Provide two (2) assembly drawings that show the CVX-2 EP and AP assemblies integrated into their respective HH canisters.

I. Provide one (1) mission assembly drawing showing the CVX-2 EP and AP assemblies integrated onto the bridge.

J. Provide resultant limit loads from the FREESTAR STS flight coupled loads analysis, no earlier than completion of the STS-107 VAR.

K. Perform mechanical integration of CVX-2 to the HH carrier.

3.4.1.2 Non-Flight

A. Provide Ground Support Equipment (GSE) lifting hardware to install the CVX-2 EP and AP into the HH canisters and to install the HH canisters onto the MPESS.

B. Provide dollies for canister handling prior to installation onto bridge and following deintegration.

C. Provide two (2) shipping containers (already at GRC).

D. Provide CVX-2 a temperature profile of the shipping vehicle during operation.

3.4.2 CVX-2

A. Provide two (2) heavy upper end plates (100 lbs. each).

B. Manufacture, test and deliver the CVX-2 EP and AP to the HH Project ready for integration into the HH canisters.

C. Provide the HH Project office with measured weight, measured or calculated center of gravity (c.g.), and measured or calculated moments of inertia, for math model.

D. Provide a Structural Integrity Verification Plan at L-13 months which includes the following:

- Complete payload assembly and interface control drawings
- Detailed stress analysis including a finite element model, if required

- Fracture control analysis including certification of Nondestructive Evaluation (NDE) inspections.
- Thermal analysis
- Structural/Strength qualification test report
- Modal test report
- Thermal test report

E. Submit a list of all materials used in the payload design to confirm the absence of hazardous agents or materials with poor structure, outgassing, and contamination characteristics

F. Submit a structural integrity verification report at L-12, including the following:

- Detailed stress analysis including a finite element model and natural frequency analysis, if required
- Fracture control analysis including certification of Nondestructive Evaluation (NDE) inspections in accordance with NASA-STD-5003.
- Thermal analysis report.
- Structural/Strength qualification test report as required depending on the analysis method selected.

G. Assembly certification logs detailing assembly processes, fastener toques, quality inspections and tests performed.

H. Provide a fastener quality certification log to show that the payload fasteners conform to GSFC Fastener Integrity Requirements S-313-100.

4.0 ELECTRICAL

4.1 Interface Definition

4.1.1 Hitchhiker

Reference the following GSFC drawing numbers for the CVX-2 electrical interface definition:

2046364	Cable Interconnect Diagram, FREESTAR
1556010	Cable Assembly, HH-W102, FREESTAR
1556016	Cable Assembly, HH-~~W202~~W206, FREESTAR

4.1.2 CVX-2

Reference the following NASA GRC drawing numbers for the CVX-2 electrical interface definition:

60009ES54166	System Power Diagram
60009ES56167	Flight System Wire Diagram
60009EA56178	Cable Assembly, CVX-W1
60009EA56140	Canister Interconnect Cable Assembly

4.2 Physical Interface

The carrier-to-experiment cable harnesses to be used for FREESTAR will be a combination of those flown on previous missions and new harnesses. Physical description and pin assignments for the HH-to-CVX-2 cables shall be defined on the individual cable assembly drawings.

The CVX-2 payload shall conform to the HH canister interfaces defined in the HH CARS unless otherwise specified in this ICD. Payload circuit wiring and fusing shall be designed to JSC reference letter TA-92-038, "Protection of Payload Electrical Power Circuits".

For all flight harnesses provided by GSFC, a flight cable end connector will be provided to CVX-2. GSFC will also provide a flight mating wall mount for each flight cable end connector for testing purposes. CVX-2 will be required to meet the pin-outs listed in section 2.3.1 of the HH CARS for the standard power and signal interfaces. For any non-standard power or signal interface, CVX-2 will be required to meet the pin-outs listed on signed CM controlled drawings supplied by GSFC.

Grounding and shielding shall also conform to that called out in the HH CARS. Payload power will be isolated from chassis by 1M Ohm. CVX-2 GSE shall tie their grounds and returns together to simulate the HH Avionics and Orbiter.

CVX-2 shall ensure that the payload meets the EMC specifications stated in ICD-2-19001 of JSC 07700, Volume 14. It is highly recommended that the payload be tested at the developer’s facility for conducted and radiated emissions in all operational modes. Conducted and radiated emissions tests and susceptibility shall be performed by GSFC at the integrated payload level. The purpose of the EMC test is to qualify the integrated payload for flight by fulfilling the requirements of ICD-2-19001.

4.2.1 Power

The CVX-2 payload will require one (1) HH Avionics power port through the CVX-2 AP LEP.

The HH Avionics shall provide the CVX-2 payload with unprocessed +28V ± 4V Orbiter power through customer port 2. The power characteristics are defined in ICD-2-19001 (note: Power line transients generated by the HCP on the aft bus (Sec 7.3.7.2.1) are not applicable for the FREESTAR payload). CVX-2 must provide power line filtering to meet Orbiter conducted emissions specifications. CVX-2 will not require the customer heater power line. The maximum current is as follows:

Port #	Circuit A	Circuit B
2	10 amps	10 amps

The total power required for CVX-2 shall be 66.8 Watts, with peak of 282 Watts. The estimated total energy used is 65.54 kWh for the entire mission.

4.2.2 Signal

The HH Avionics shall provide CVX-2 with one asynchronous low rate command interface, RS-422, at 1200 bps on signal port ~~2~~6. Four (4) 28 V bi-level commands to be sent via the HH Advanced Carrier Customer Equipment Support Structure (ACCESS) shall also be provided. Experiment commands shall be generated by CVX-2 Customer Ground Support Equipment (CGSE) located at the GSFC Payload Operations Control Center (POCC). The CGSE

shall interface with the HH ACCESS; command interface and format is defined in the CARS.

The HH Avionics shall provide CVX-2 with one asynchronous low rate telemetry interface, RS-422, at 1200 bps on signal port ~~2~~6. The telemetry electrical interface and the data format are described in the HH CARS document. The CVX-2 CGSE shall receive (unformatted or formatted) low rate telemetry data from the HH ACCESS.

Three thermistors shall be provided for the CVX-2 canisters. Two inputs will be used to monitor temperature, and one for EP canister pressure. The HH Avionics shall provide CVX-2 with thermistor data through the HH ancillary data. Thermistor data shall be available to the customer's CGSE during flight.

The HH ancillary data shall be available on a 9600 baud RS-232 serial data interface to the CGSE during mission operations. Pins 4 and 7, signal ground, are not used. Use pin 1, frame ground.

A second set of the ACCESS equipment will be used to playback CVX-2 data during periods where there is a loss of signal (LOS). This playback will occur within 3 hours during periods of CVX-2 critical operations.

Each data interface (command/telemetry, HH ancillary and playback (LOS)) shall be distributed to all four CVX-2 CGSE machines.

4.3 Electrical Integration and Test

4.3.1 GSFC Operations

The HH Avionics will be refurbished and retested prior to payload integration. This will include replacement of the fuses and modification of the mission-unique jumpers. Also before integration, the canister LEPs will be functionally tested, and the pressure transducer will be calibrated.

CVX EGSE to be used for I&T consists of two payload package swivel stands and a test rack containing one PC, one 17" monitor, one printer, a 28V power supply, an Uninterruptible Power Supply, and a power switching panel.. This equipment shall require two 15 A, 115 V, 60 Hz AC outlets to be provided by GSFC.

Upon delivery, a post-ship stand-alone functional test will be performed by the experiment developers in the Bldg. 5 cleanroom. After integration of the LEPs with the canisters, continuity and isolation resistance will be measured at the HH-to-experiment interface connectors. Following installation onto the bridge, the flight cable harness will be connected to CVX-2. With the CVX-2 CGSE connected to ACCESS outside the cleanroom, a CVX-2 functional test will be conducted.

Upon completion of Building 5 I&T operations, the payload-level EMC test shall commence. The EMC test will be performed by GSFC in Building 7, with the payload in the screen room and the CVX-2 CGSE configured outside the screen room, approximately ten meters from the payload. The EMC test will include activation of the CVX-2 experiment for indefinite periods of time;

however, CVX-2 activation can be limited to accommodate experiment-unique constraints , if necessary.

In parallel with the EMC test, a POCC test will be conducted and telemetry recorded for use in mission simulations. A second set of CGSE is required to support mission simulations in parallel with I&T.

From the start of I&T at Goddard, any modifications to the CVX-2 flight hardware or CGSE shall require the customer to submit an SSPP Customer Configuration Change Request (CCCR) form for approval by the I&T Manager.

4.3.2 KSC Operations

The ACCESS/Orbiter Simulation Rack (OSR) and CGSE will be configured inside the PPF cleanroom. A post-ship short functional test for CVX-2 will then be performed. Following all payload functional tests, an IVT simulation will be performed at the PPF.

The FREESTAR-to-orbiter IVT will be performed at the pad, with HH personnel supporting from the PPF. The CVX-2 experiment will not require activation for the IVT.

After the mission, the FREESTAR payload will be electrically disconnected from the orbiter at the OPF. There is no post-flight testing of CVX-2 planned for KSC operations.

4.3.3 GSFC Deintegration

Following return of the payload to Goddard, post-flight testing in Building 5 may be required if there are any in-flight anomalies. If an in-flight anomaly occurs, post-mission test requirements will be reassessed.

4.4 Responsibilities and Deliverables

4.4.1 Hitchhiker

A. Provide flight electrical connectors to interface the CVX-2 experiment to the LEP. This shall include mating connectors for power, and signal safe-arm interface plus test harnesses.

B. Provide flight electrical connectors to interface the AP canister LEP to the HH Avionics

C. Provide a total of three (3) thermistor inputs to the avionics to monitor the two (2) LEP thermistors and the canister pressure.

D. Provide one wiring modification on the AP canister LEP which will allow an additional thermistor monitoring point in place of the LEP pressure transducer.

E. Provide signal interfaces for asynchronous telemetry and commanding.

F. Provide the flight cable harnesses between HH to AP LEP power and HH to AP LEP signal.

G. Provide a payload cable interconnect diagram showing CVX-2 electrically integrated with the carrier.

H. Provide electrical drawings for all GSFC supplied cables.

I. Perform electrical Integration and Test (I&T) to verify the correct CVX-2/HH/Orbiter electrical interfaces.

J. Provide ACCESS and OSR for testing with the integrated payload.

K. Provide temperature profile of the shipping vehicle.

4.4.2 CVX-2

A. Functionally test (including EMC) the CVX-2 experiment prior to integration at GSFC.

B. Provide the flight cable harnesses between the AP and EP, for power and signal.

C. Provide feed-through connectors for each UEP/cable interface.

D. Provide electrical drawings for all CVX-2 supplied cables and interfaces.

E. Provide all customer GSE required to perform standalone functional testing of CVX-2 and to support mission simulations and flight operations at the POCC. Two sets of GSE shall be available.

F. Provide procedures for testing CVX-2 at GSFC and KSC, including functional and contingency procedures.

5.0 THERMAL

5.1 Interface Definition

5.1.1 Hitchhiker

Reference the following GSFC drawing numbers for the CVX-2 thermal interface definition:

GE 1507027	Canister Thermal Blanket, Outer
GE 1507028	Canister Thermal Blanket, Inner
GE1534820	Lower Insulating End Cap
GE2046346	CVX-2 Canister #1 Assembly
GE2046347	CVX-2 Canister #2 Assembly

Thermal interface definitions for the HH canisters are the responsibility of HH, and are defined in the HH CARS.

5.2 Physical Interfaces

The CVX-2 experiment is contained within two adjacent HH canisters. Each canister will be insulated with Multi-Layer Insulation (MLI) blankets and will have a modified UEP, weighing 100 lbs each, coated with Silver Teflon Tape.

The ascent and descent thermal characteristics, wall and air temperature, are presented in Shuttle Orbiter/Cargo Standard Interface, ICD-2-19001 of JSC 07700, Vol. XIV.

Temperature limits for all payload provided hardware shall include operating, non-operating, and survival temperatures which are defined below.

Operating Temperature: the temperature at which a unit will successfully function and meet all specifications.

Non-Operating Temperature: the temperature to which a unit may be exposed in a power OFF condition and if turned ON, will not be damaged. The unit does not does not have to meet its specification until it is within the operational temperature range.

Survival Temperature: the temperature, if exceeded, at which the unit will suffer permanent damage.

CVX-2 shall also define any special temperature requirements, such as levels, gradients, etc. CVX-2 requires that EP temperature remains between 17°C and 35°C at all times during ground processing. If the EP is ever out of the required temperature range, then CVX-2 personnel will be consulted prior to any move.

Ground temperatures and humidity provided by the orbiter and other ground processing locations at KSC are defined in ICD-2-19001.

5.3 Thermal Integration

5.3.1 GSFC Operations

The CVX-2 canister blankets will be removed from storage, refurbished, and installed on the canisters. A blanket bonding check will be performed to verify proper continuity. The lower insulating end caps will undergo refurbishment prior to being installed on the CVX-2 canisters.

5.3.2 KSC Operations

The CVX-2 payload will undergo a final thermal checkout at the PPF. All protective coatings will be removed and the external payload surfaces will be cleaned with alcohol.

5.4 Responsibilities and Deliverables

5.4.1 HH

A. Provide the on-orbit environmental fluxes on all external surfaces.

B. Provide two (2) lower insulating end caps to insulate each LEP.

C. Provide two (2) 5 ft^3 HH insulated canisters to house the EP and AP.

5.4.2 CVX-2

A. Determine all internal conduction, convection, and radiation within the EP and AP canisters.

B. Design and couple high power components and design the electrical interconnect thermal control elements.

C. The CVX-2 experiment shall be responsible for their own thermal design, analysis and documentation.

D. Supply reduced thermal models of the experiment and associated electronics to HH. Temperature limits as defined in section 5.2 above, shall also be provided for each node in the reduced thermal math model.

E. Generate thermal interface control drawings that define the interfaces with the HH canisters or other HH supplied equipment. The drawings shall include, but not be limited to:

- The instrument size and shape
- The mounting interfaces with the upper lids and canisters
- Detailed definition of thermal control devices, such as heaters, circulation fans, etc.
- Thermal control coatings for each external surface
- Definition of average power dissipation of each module

F. Provide heaters on the experiment provided hardware. The heater specification along with the predicted dissipation, duty cycle and HH bus usage shall be supplied to HH.

G. Establish the temperature limits for all provided hardware.

H. Determine the adequacy of the ground cooling provided by the Orbiter and by other ground processing locations at KSC. Any unique requirements shall be negotiated by HH through the LSSP.

I. Provide attitude duration limits and recovery times for bay-to-sun and other attitudes if reduced thermal model is not capable of predicting loss of temperature control of the CVX-2 sample.

J. Strip and then apply silver Teflon tape to each UEP.