

SOLICITATION, OFFER AND AWARD		1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 350)		RATING	PAGE OF 1 25 PAGES	
2. CONTRACT NO.	3. SOLICITATION NO. N00173-01-R-CB06	4. TYPE OF SOLICITATION <input type="checkbox"/> SEALED BID (IFB) <input checked="" type="checkbox"/> NEGOTIATED (RFP)		5. DATE ISSUED 22 Jun 2001	6. REQUISITION/PURCHASE NO.	
7. ISSUED BY CONTRACTING OFFICER NAVAL RESEARCH LABORATORY ATTN: CODE 3230.CB WASHINGTON DC 20375-5326			8. ADDRESS OFFER TO (If other than Item 7)			

NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".

SOLICITATION

9. Sealed offers in original and _____ copies for furnishing the supplies or services in the Schedule will be received at the place specified in Item 8, or if handcarried, in the depository located in Bldg. 222, Room 115 until 4:00 local time 23 July 2001
(Hour) (Date)

CAUTION - LATE Submissions, Modifications, and Withdrawals: See Section L, Provision No. 52.214-7 or 52.215-10. All offers are subject to all terms and conditions contained in this solicitation.

10. FOR INFORMATION CALL:	A. NAME CHERI R. BURKHARDT	B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS) (202)767-6542
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OFFER (Must be fully completed by offeror)

NOTE: Item 12 does not apply if the solicitation includes the provisions at 52.214-16, Minimum Bid Acceptance Period.

12. In compliance with the above, the undersigned agrees, if this offer is accepted within _____ calendar days (60 calendar days unless a different period is inserted by the offeror) from the date of receipt of offers specified above, to furnish any or all items upon which prices are offered at the price set opposite each item, delivered at the designated point(s), within the time specified in the schedule.

13. DISCOUNT FOR PROMPT PAYMENT (See Section I, Clause No. 52-232-8)	10 CALENDAR DAYS	20 CALENDAR DAYS	30 CALENDAR DAYS	CALENDAR DAYS
	%	%	%	%

14. ACKNOWLEDGMENT OF AMENDMENTS (The offeror acknowledges receipt of amendments to the SOLICITATION for offerors and related documents numbered and dated:	AMENDMENT NO.	DATE	AMENDMENT NO.	DATE

15A. NAME AND ADDRESS OF OFFEROR	CODE	FACILITY	16. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or print)	
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15B. TELEPHONE NO. (Include area code)	15C. CHECK IF REMITTANCE ADDRESS IS DIFFERENT FROM ABOVE - ENTER SUCH ADDRESS IN SCHEDULE.	17. SIGNATURE	18. OFFER DATE
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AWARD (To be completed by Government)

19. ACCEPTED AS TO ITEMS NUMBERED	20. AMOUNT	21. ACCOUNTING AND APPROPRIATION	
22. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION: <input type="checkbox"/> 10 U.S.C. 2304(c) () <input type="checkbox"/> 41 U.S.C. 253(c) ()		23. SUBMIT INVOICES TO ADDRESS SHOWN IN (4 copies unless otherwise specified)	
		25. PAYMENT WILL BE MADE BY	
24. ADMINISTERED BY (If other than Item 7)		28. AWARD DATE	

26. NAME OF CONTRACTING OFFICER (Type or print)	27. UNITED STATES OF AMERICA (Signature of Contracting Officer)	28. AWARD DATE
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IMPORTANT - Award will be made on this Form, or on Standard Form 26, or by other authorized official written notice.

**PART I - THE SCHEDULE
SECTION B
SUPPLIES OR SERVICES AND PRICES/COSTS**

B-1 SUPPLIES OR SERVICES AND PRICES/COSTS

ITEM NUMBER	SUPPLIES OR SERVICES	QTY	UNIT	UNIT PRICE	AMOUNT
0001	The Contractor shall design and manufacture two star trackers and testing, deliver all hardware, software, equipment in accordance with Section C and Attachment No. 1, Specification.	2	LO	\$	\$
0002	The Contractor shall provide reports and data in accordance with the DD Form 1423, Contract Data Requirements List.	1	LO	**NSP	**NSP
OPTION 1					
0003	The Contractor shall provide a an Engineering Development Unit (EDU) in accordance with Section C and Attachment No. 1, Specification.	1	LO	\$	\$
OPTION 2					
0004	The Contractor shall provide a Multiple Start Simulator unit In accordance with Section C and Attachment No. 1, Specification.	1	LO	\$	\$
TOTAL DOLLAR AMOUNT FOR ALL CLINs, IF EXERCISED* :					\$

*CONTRACT LINE ITEM NUMBER

** NOT SEPARATELY PRICED

NOTE: See Payment Schedule G-7 Milestone Payment Schedule

SECTION C
DESCRIPTION/SPECIFICATIONS/STATEMENT OF WORK

C-1 The work under this contract shall be performed in accordance with Attachment (1), Specification, with Exhibit A, DD Form 1423, Contracts Data Requirements List, and all other Attachments cited in Section J, which are incorporated by reference into Section C.

SECTION D
PACKAGING AND MARKING

D-1 Preservation, packaging, packing and marking of all deliverable contract line items must conform to normal commercial packing standards to assure safe delivery at destination.

D-2 The Contractor shall mark all shipments under this contract in accordance with the edition of ASTM-D-3951-90 "Standard Practice for Commercial Packaging" in effect on the date of the contract.

D-3 Specific information pertaining to the Packing and Marking of this requirement - Reference Specification Attachment No. 1, paragraph 3.2.7.1 and 3.2.7.2.

SECTION E
INSPECTION AND ACCEPTANCE

E-1 INSPECTION AND ACCEPTANCE CLAUSES BY REFERENCE:

FAR CLAUSE TITLE

52.246-7 - Inspection Of Research And Development - Fixed Price (AUG 1996)
52.246-16 - Responsibility For Supplies (APR 1984)

DFARS CLAUSE TITLE

252.246-7000 - Material Inspection And Receiving Report (DEC 1991)

E-2 INSPECTION AND ACCEPTANCE

Inspection and acceptance of the final delivery will be accomplished by the Technical Manager (TM) or Contracting Officer Representative (COR) designated in Section G of this contract . Inspection and acceptance will be performed at the Naval Research Laboratory, Washington DC 20375-5320.

Constructive acceptance, in accordance with FAR 32.905 (a) (1), shall be deemed to have occurred on the 14 day after the final delivery.

**SECTION F
DELIVERIES OR PERFORMANCE**

F-1 DELIVERIES OR PERFORMANCE CLAUSES BY REFERENCE:

FAR CLAUSE	TITLE
52.242-15	- Stop-Work Order (AUG 1989)
52.242-17	- Government Delay Of Work (APR 1984)
52.247-34	- F.O.B. Destination (NOV 1991)

F-2 FAR 52.211-9- DESIRED AND REQUIRED TIME OF DELIVERY (JUN 1997)

(a) The Government desires delivery to be made according to the following schedule:

DESIRED DELIVERY SCHEDULE		
<i>[Contracting Officer insert specific details]</i>		
Item No.	Quantity	Within Months After Date Of Contract
0001	2	18 months
OPTIONS		
0003	1	12 mo after exercise of option
0004	1	12 mo. after exercise of option

If the offeror is unable to meet the desired delivery schedule, it may, without prejudicing evaluation of its offer, propose a delivery schedule below. However, the offeror's proposed delivery schedule must not extend the delivery period beyond the time for delivery in the Government's required delivery schedule as follows:

REQUIRED DELIVERY SCHEDULE		
<i>[Contracting Officer insert specific details]</i>		
Item No.	Quantity	Within Months After Date Of Contract
0001	2	18 months
OPTIONS		
0003	1	12 mo after exercise of option
0004	1	12 mo. after exercise of option

Offers that propose delivery of a quantity under such terms or conditions that delivery will not clearly fall within the applicable required delivery period specified above, will be considered nonresponsive and rejected. If the offeror proposes no other deliver schedule, the desired delivery schedule above will apply.

OFFEROR'S PROPOSED DELIVERY SCHEDULE		
Item No.	Quantity	Within Months After Date Of Contract

- (b) Attention is directed to the Contract Award provision of the solicitation that provides that a written award or acceptance of offer mailed, or otherwise furnished to the successful offeror, results in a binding contract. The Government will mail or otherwise furnish to the offeror an award or notice of award not later than the day award is dated. Therefore, the offeror should compute the time available for performance beginning with the actual date of award, rather than the date the written notice of award is received from the Contracting Officer through the ordinary mails. However, the Government will evaluate an offer that proposes delivery based on the Contractor's date of receipt of the contract or notice of award by adding (i) five calendar days for delivery of the award through the ordinary mails

or (ii) one working day if the solicitation states that the contract or notice of award will be transmitted electronically. (The term "working day" excludes weekends and U.S. Federal holidays.) If, as so computed, the offered delivery date is later than the required delivery date, the offer will be considered nonresponsive and rejected.

F-3 DELIVERIES OR PERFORMANCE

(a) The principal place of performance of this contract shall be at contractor's facility.

F-4 PLACE OF DELIVERY - FOB DESTINATION

The contractor shall deliver supplies, all transportation charges paid, to destination in accordance with the clause in Section F of the Schedule titled FAR 52.247-34 FOB Destination (NOV 1991).

Receiving Officer
Naval Research Laboratory
Contract Number
ATTN: *
CODE: *
LOCATION: *
Bldg. 49
4555 Overlook Avenue, SW
Washington DC 20375-5320

(* To be filled in at time of award.)

SECTION G CONTRACT ADMINISTRATION DATA

G-1 PROCURING OFFICE REPRESENTATIVE

In order to expedite administration of the contract, the Administrative Contracting Officer (ACO) will direct inquiries to the appropriate office listed below. Please do not direct routine inquiries to the person listed in Item 20A on Standard Form 26.

Contract Matters- *

Security Matters- *

Safety Matters- *

Patent Matters- *

Release of Data- *

The ACO will forward invention disclosures and reports directly to the Associate Counsel for Patents, Code 1008.2, Naval Research Laboratory, Washington DC 20375-5320. The Associate Counsel for Patents will return the reports along with a recommendation to the Administrative Contracting Officer. The Associate Counsel for Patents will represent the Contracting Officer with regard to invention reporting matters arising under this contract.

(* To be filled in at time of award)

G-2 CONTRACTING OFFICER'S REPRESENTATIVE (COR) - FUNCTIONS AND LIMITATIONS

* is hereby designated the cognizant COR who will represent the Contracting Officer in the administration of technical details within the scope of this contract and inspection and acceptance. The COR is not otherwise authorized to make any representations or commitments of any kind on behalf of the Contracting Officer or the Government. The COR does not have the authority to alter the Contractor's obligations or change the specifications in the contract. If, as a result of technical discussions, it is desirable to alter contract obligations or statements of work, a modification must be issued in writing and signed by the Contracting Officer. The COR is responsible for reviewing the bills and charges submitted by the Contractor and informing the ACO of areas where exceptions are to be taken.

(* To be filled in at time of award)

G-3 TECHNICAL DIRECTION MEMORANDUM (TDM)

- (a) For the purposes of this clause, technical direction includes the following:
- (1) Direction to the Contractor which shifts work emphasis between work areas or tasks, requires pursuit of certain lines of inquiry, fills in details or otherwise describes work which will accomplish the objectives described in the statement of work;
 - (2) Guidelines to the Contractor which assist in interpretation of drawings, specifications or technical portions of work description.
- (b) Technical instructions must be within the scope of work stated in the contract. Technical instructions may not be used to:
- (1) Assign additional work under the contract;
 - (2) Direct a change as defined in the contract clause entitled "Changes";
 - (3) Increase or decrease the estimated contract cost, the fixed fee, or the time required for contract performance; or
 - (4) Change any of the terms, conditions or specifications of the contract
- (c) The TDM shall be written by the Contracting Officer's Representative (COR), with the original given to the Contractor and a copy retained in the CORs file. Technical direction may be issued orally only in emergency situations. If technical direction is issued orally, a TDM must follow within two (2) working days from the date of the oral direction. Amendments, corrections, or changes to TDMs shall also be in written format and shall include all the information set forth in paragraph (e) below.

- (d) A TDM shall be considered issued when the Government deposits it in the mail, or if transmitted by other means, when it is physically delivered to the contractor.
- (e) TDMs shall include, but not be limited to, the following information:
- (1) Date of TDM,
 - (2) Contract Number,
 - (3) Reference to the relevant portion or item in the Statement of Work,
 - (4) The specific technical direction or clarification, and
 - (5) The signature of the COR.
- (f) CORs shall retain all files containing TDMs for a period of two (2) years after the final contract completion date.
- (g) The only individual authorized in any way to amend or modify any of the terms of this contract shall be the Contracting Officer. When, in the opinion of the Contractor, any technical direction calls for effort outside the scope of the contract or inconsistent with this special provision, the Contractor shall notify the Contracting Officer in writing within ten (10) working days after its receipt.

G-4 NAPS 5252.232-9000 - SUBMISSION OF INVOICES (FIXED PRICE) (JUL 1992)

(a) "Invoices" as used in this clause does not include contractor's requests for progress payments.

(b) The contractor shall submit original invoices with 4 copies to the address identified in the solicitation/contract award form (SF 26-Block 10; SF 33-Block 23; SF 1447-Block 14), unless delivery orders are applicable, in which case invoices will be segregated by individual order and submitted to the address specified in the order (DD 1155-Block 13 or SF 26-Block 10).

(c) The use of copies of the Material Inspection and Receiving Report (MIRR), DD Form 250, as an invoice is encouraged. DFARS Appendix F-306 provides instructions for such use. Copies of the MIRR used as an invoice are in addition to the standard distribution stated in DFARS F-401.

(d) In addition to the requirements of the Prompt Payment clause of this contract, the contractor shall cite on each invoice the contract line item number (CLIN); the contract subline item number (SLIN), if applicable; the accounting classification reference number (ACRN) as identified on the financial accounting data sheets, and the payment terms.

(e) The contractor shall prepare:

- a separate invoice for each activity designated to receive the supplies or services.
- a consolidated invoice covering all shipments delivered under an individual order.
- either of the above.

(f) If acceptance is at origin, the contractor shall submit the MIRR or other acceptance verification directly to the designated payment office. If acceptance is at destination, the consignee will forward acceptance verification to the designated payment office.

G-5 INVOICING ADDRESS

With reference to paragraph (b) of the above provision, "Submission of Invoices(Fixed Price)", the contractor shall submit invoices to the address in Block 12 of the contract award form (SF26).

G-6 252.232-7007 -- LIMITATION OF GOVERNMENTS OBLIGATION (AUG 1993)

(a) Contract line item(s) * through * are incrementally funded. For these item(s), the sum of \$ * of the total price is presently available for payment and allotted to this contract. An allotment schedule is set forth in paragraph (i) of this clause.

(b) For item(s) identified in paragraph (a) of this clause, the Contractor agrees to perform up to the point at which the total amount payable by the Government, including reimbursement in the event of termination of those item(s) for the Government's convenience, approximates the total amount currently allotted to the contract. The Contractor will not be obligated to continue work on those item(s) beyond that point. The Government will not be obligated in any event to reimburse the Contractor in excess of the amount allotted to the contract for those item(s) regardless of anything to the contrary in the clause entitled "Termination for Convenience of the Government." As used in this clause, the total amount payable by the Government in the event of termination of applicable contract line item(s) for convenience includes costs, profit, and estimated termination settlement costs for those item(s).

(c) Notwithstanding the dates specified in the allotment schedule in paragraph (i) of this clause, the Contractor will notify the Contracting Officer in writing at least ninety days prior to the date when, in the Contractor's best judgment, the work will reach the point at which the total amount payable by the Government, including any cost for termination for convenience, will approximate 85 percent of the total amount then allotted to the contract for performance of the applicable item(s). The notification will state (1) the estimated date when that point will be reached and (2) an estimate of additional funding, if any, needed to continue performance of applicable line items up to the next scheduled date for allotment of funds identified in paragraph (i) of this clause, or to a mutually agreed upon substitute date. The notification will also advise the Contracting Officer of the estimated amount of additional funds that will be required for the timely performance of the item(s) funded pursuant to this clause, for a subsequent period as may be specified in the allotment schedule in paragraph (i) of this clause or otherwise agreed to by the parties. If after such notification additional funds are not allotted by the date identified in the Contractor's notification, or by an agreed substitute date, the Contracting Officer will terminate any item(s) for which additional funds have not been allotted, pursuant to the clause of this contract entitled "Termination for Convenience of the Government."

(d) When additional funds are allotted for continued performance of the contract line item(s) identified in paragraph (a) of this clause, the parties will agree as to the period of contract performance which will be covered by the funds. The provisions of paragraphs (b) through (d) of this clause will apply in like manner to the additional allotted funds and agreed substitute date, and the contract will be modified accordingly.

(e) If, solely by reason of failure of the Government to allot additional funds, by the dates indicated below, in amounts sufficient for timely performance of the contract line item(s) identified in paragraph (a) of this clause, the Contractor incurs additional costs or is delayed in the performance of the work under this contract and if additional funds are allotted, an equitable adjustment will be made in the price or prices (including appropriate target, billing, and ceiling prices where applicable) of the item(s), or in the time of delivery, or both. Failure to agree to

any such equitable adjustment hereunder will be a dispute concerning a question of fact within the meaning of the clause entitled "Disputes."

(f) The Government may at any time prior to termination allot additional funds for the performance of the contract line item(s) identified in paragraph (a) of this clause.

(g) The termination provisions of this clause do not limit the rights of the Government under the clause entitled "Default." The provisions of this clause are limited to the work and allotment of funds for the contract line item(s) set forth in paragraph (a) of this clause. This clause no longer applies once the contract is fully funded except with regard to the rights or obligations of the parties concerning equitable adjustments negotiated under paragraphs (d) and (e) of this clause.

(h) Nothing in this clause affects the right of the Government to terminate this contract pursuant to the clause of this contract entitled "Termination for Convenience of the Government."

(i) The parties contemplate that the Government will allot funds to this contract in accordance with the following schedule:

On execution of contract	\$ _____
(month) (day), 200x	\$ _____
(month) (day), 200y	\$ _____
(month) (day), 200z	\$ _____

(End of Clause)

G-7 Milestone Payment Schedule

1. Breakdown Without Exercising Options 1 and 2

- (a) Preliminary Design Review (2 Months ARO) – 10% of Contract
- (b) Various Analyses - Para. 6.6 of Specification (6 Months ARO) – 25% of Contract Value (No earlier than 6 Months ARO even if analyses completed earlier)
- (c) Two Flight Units (18 Months ARO) – 65% of Contract Value

2. Breakdown With Exercising Options 1 and 2 (both or one or the other)

- (a) Preliminary Design Review (2 Months ARO) – 10% of Contract
- (b) Various Analyses Para. 6.6 of Specification (6 Months ARO) – 15% of Contract Value (No earlier than 6 Months ARO even if analyses completed earlier)
- (c) Star Simulator and Engineering Development Unit (12 Months each) – 15 % Contract Value for both, if exercised, or if exercise one or the other.
- (d) Two Flight Units (18 Months ARO) – 60% of Contract Value

**SECTION H
SPECIAL CONTRACT REQUIREMENTS**

H-1 TYPE OF CONTRACT

(To be filled in at time of award)

H-2 REPRESENTATIONS AND CERTIFICATIONS

The Contractor's completed Representations, Certifications, and Other Statements of Offerors or Respondents is incorporated herein by reference in any resultant award.

H-3 OPTION(S)

The Government may require delivery of the optional items under this contract by the Contracting Officer's giving written notice anytime from date of contract award through final delivery of CLIN 0001.

H-4 ELECTRONIC AND INFORMATION TECHNOLOGY (EIT)

In accordance with Section 508 of the Rehabilitation Act of 1973 (29 U.S.C. 794d), all EIT supplies and services provided under this contract must comply with the applicable accessibility standards issued by the Architectural and Transportation Barriers Compliance Board at 36 CFR part 1194 (see FAR Subpart 39.2). Electronic and information technology (EIT) is defined at FAR 2.101.

**PART II - CONTRACT CLAUSES
SECTION I
CONTRACT CLAUSES**

I-1 52.252-2 - CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

<http://www.arnet.gov/far>

<http://heron.nrl.navy.mil/contracts/home.htm>

a. FEDERAL ACQUISITION REGULATION CLAUSES

<u>FAR CLAUSE</u>	<u>TITLE</u>
52.202-1	- Definitions (MAR 2001)
52.203-3	- Gratuities (APR 1984)
52.203-5	- Covenant Against Contingent Fees (APR 1984)
52.203-6	- Restrictions On Subcontractor Sales To The Government (JUL 1995)
52.203-7	- Anti-Kickback Procedures (JUL 1995)
52.203-8	- Cancellation, Rescission, And Recovery Of Funds For Illegal Or Improper Activity (JAN 1997)
52.203-10	- Price Or Fee Adjustment For Illegal Or Improper Activity (JAN 1997)
52.203-12	- Limitation On Payments To Influence Certain Federal Transactions (JUN 1997)
52.204-4	- Printed Or Copied Double-Sided On Recycled Paper (AUG 2000)
52.209-6	- Protecting The Government's Interest When Subcontracting With Contractors Debarred, Suspended, Or Proposed For Debarment (JUL 1995)
52.211-5	- Material Requirements (OCT 1997)
52.211-15	- Defense Priority And Allocation Requirements (SEP 1990)
52.215-2	- Audit And Records-Negotiation (JUNE 1999)
52.215-8	- Order Of Precedence - Uniform Contract Format (OCT 1997)
52.215-14	- Integrity Of Unit Prices (OCT 1997)
52.215-17	- Waiver Of Facilities Capital Cost Of Money (OCT 1997) (<i>will be included if the successful offeror does not propose facilities capital cost of money</i>)
52.215-21	- Requirements For Cost Or Pricing Data Or Information Other Than Cost Or Pricing Data -Modifications (OCT 1997)
52.219-4	- Notice Of Price Evaluation Preference For HUBZone Small Business Concerns (JAN 1999) <input type="checkbox"/> Offeror elects to waive the evaluation preference.
52.219-8	- Utilization Of Small Business Concerns (OCT 2000)
52.219-9	- Small Business Subcontracting Plan (OCT 2000)
52.219-16	- Liquidated Damages - Subcontracting Plan (JAN 1999)
52.222-1	- Notice To The Government Of Labor Disputes (FEB 1997)
52.222-3	- Convict Labor (AUG 1996)
52.222-19	- Child Labor – Cooperation With Authorities And Remedies (FEB 2001)
52.222-21	- Prohibition of Segregated Facilities (FEB 1999)
52.222-26	- Equal Opportunity (FEB 1999)
52.222-35	- Affirmative Action For Disabled Veterans And Veterans Of The Vietnam Era (APR 1998)
52.222-36	- Affirmative Action For Workers With Disabilities (JUN 1998)
52.222-37	- Employment Reports On Disabled Veterans And Veterans Of The Vietnam Era (JAN 1999)
52.223-6	- Drug-Free Workplace (MAR 2001)
52.223-14	- Toxic Chemical Release Reporting (OCT 2000)
52.225-8	- Duty-Free Entry (FEB 2000)
52.225-13	- Restrictions On Certain Foreign Purchases (JUL 2000)
52.226-1	- Utilization Of Indian Organizations And Indian-Owned Economic Enterprises (JUN

- 2000)
- 52.227-1 - Authorization And Consent (JUL 1995)
 - 52.227-2 - Notice And Assistance Regarding Patent And Copyright Infringement (AUG 1996)
 - 52.227-3 - Patent Indemnity (APR 1984)
 - 52.227-11 - Patent Rights - Retention By The Contractor (Short Form) (JUN 1997) *(will be included if the successful offeror is a small business or a non-profit organization)*
 - 52.227-12 - Patent Rights - Retention By The Contractor (Long Form) (JAN 1997) *(will be included if the successful offeror is not a small business or a non-profit organization)*
 - 52.229-3 - Federal, State, And Local Taxes (JAN 1991)
 - 52.229-5 - Taxes - Contracts Performed In U.S. Possessions Or Puerto Rico (APR 1984)
 - 52.229-6 - Taxes - Foreign Fixed-Price Contracts (JAN 1991)
 - 52.230-2 - Cost Accounting Standards (APR 1998)
 - 52.230-6 - Administration Of Cost Accounting Standards (NOV 1999)
 - 52.232-2 - Payments Under Fixed-Price Research And Development Contracts (APR 1984)
 - 52.232-8 - Discounts For Prompt Payment (MAY 1997)
 - 52.232-9 - Limitation On Withholding Of Payments (APR 1984)
 - 52.232-11 - Extras (APR 1984)
 - 52.232-17 - Interest (JUN 1996)
 - 52.232-23 - Assignment Of Claims (JAN 1986)
 - 52.232-25 - Prompt Payment (MAR 2001)
 - 52.232-33 - Payment By Electronic Funds Transfer-Central Contractor Registration (MAY 1999)
 - 52.233-1 - Disputes (DEC 1998)
 - 52.233-3 - Protest After Award (AUG 1996)
 - 52.242-13 - Bankruptcy (JUL 1995)
 - 52.243-1 - Changes - Fixed Price (AUG 1987) Alternate V (APR 1984)
 - 52.243-6 - Change Order Accounting (APR 1984)
 - 52.245-2 - Government Property (Fixed-Price Contracts) (DEC 1989)
 - 52.246-23 - Limitation Of Liability (FEB 1997)
 - 52.247-64 - Preference For Privately Owned U.S. Flag Commercial Vessels (JUN 2000)
 - 52.249-2 - Termination For Convenience Of The Government (Fixed Price) (SEP 1996)
 - 52.249-9 - Default (Fixed-Price Research And Development) (APR 1984)
 - 52.251-1 - Government Supply Sources (APR 1984)
 - 52.253-1 - Computer Generated Forms (JAN 1991)

DFARS CLAUSE TITLE

- 252.201-7000 - Contracting Officer's Representative (DEC 1991)
- 252.203-7001 - Prohibition On Persons Convicted Of Fraud Or Other Defense Contract Related Felonies (MAR 1999)
- 252.204-7000 - Disclosure Of Information (DEC 1991)
- 252.204-7003 - Control Of Government Personnel Work Product (APR 1992)
- 252.204-7004 - Required Central Contractor Registration (MAR 2000)
- 252.205-7000 - Provision Of Information To Cooperative Agreement Holders (DEC 1991)
- 252.209-7000 - Acquisition From Subcontractors Subject To On-Site Inspection Under The

- 252.209-7004 - Intermediate-Range Nuclear Forces (INF) Treaty (NOV 1995)
- 252.209-7004 - Subcontracting With Firms That Are Owned Or Controlled By The Government Of A Terrorist Country (MAR 1998)
- 252.219-7003 - Small, Small Disadvantaged And Women-Owned Small Business Subcontracting Plan (DoD Contracts) (APR 1996)
- 252.225-7001 - Buy American Act And Balance Of Payments Program (MAR 1998)
- 252.225-7002 - Qualifying Country Sources As Subcontractors (DEC 1991)
- 252.225-7009 - Duty-Free Entry - Qualifying Country Supplies (End Products And Components) (AUG 2000)
- 252.225-7010 - Duty-Free Entry - Additional Provisions (AUG 2000)
- 252.225-7012 - Preference For Certain Domestic Commodities (AUG 2000)
- 252.225-7016 - Restriction On Acquisition Of Ball And Roller Bearings (DEC 2000)
- 252.225-7025 - Restriction On Acquisition Of Forgings (JUN 1997)
- 252.225-7026 - Reporting Of Contract Performance Outside The United States (JUN 2000)
- 252.225-7031 - Secondary Arab Boycott Of Israel (JUN 1992)
- 252.225-7043 - Antiterrorism/Force Protection Policy For Defense Contractors Outside The United States (JUN 1998) (fill in : Naval Criminal Investigative Service (NCIS), Code 24, telephone, DSN 228-9113 or commercial (202)433-9113)
- 252.227-7000 - Non-Estoppel (OCT 1966)
- 252.227-7001 - Release Of Past Infringement (AUG 1984)
- 252.227-7013 - Rights In Technical Data--Noncommercial Items (NOV 1995)
- 252.227-7016 - Rights In Bid or Proposal Information (JUN 1995)
- 252.227-7030 - Technical Data--Withholding Of Payment (MAR 2000)
- 252.227-7034 - Patents--Subcontracts (APR 1984)
- 252.227-7036 - Certification Of Technical Data Conformity (JAN 1997)
- 252.227-7037 - Validation Of Restrictive Markings On Technical Data (SEP 1999)
- 252.227-7039 - Patents--Reporting of Subject Inventions (APR 1990)
- 252.231-7000 - Supplemental Cost Principles (DEC 1991)
- 252.233-7000 - Certification Of Claims And Requests For Adjustment Or Relief (MAY 1994)
- 252.235-7010 - Acknowledgment of Support and Disclaimer (MAY 1995)
- 252.242-7000 - Postaward Conference (DEC 1991)
- 252.242-7004 - Material Management And Accounting System (DEC 2000)
- 252.243-7001 - Pricing Of Contract Modifications (DEC 1991)
- 252.243-7002 - Requests For Equitable Adjustment (MAR 1998)
- 252.244-7000 - Subcontracts For Commercial Items And Commercial Components (DOD Contracts) (MAR 2000)
- 252.245-7001 - Reports Of Government Property (MAY 1994)
- 252.247-7023 - Transportation Of Supplies By Sea (MAR 2000)
- 252.247-7024 - Notification Of Transportation Of Supplies By Sea (MAR 2000) (*will be included if the successful offeror made a negative response to the inquiry at DFARS 252.247-7022*)
- 252.251-7000 - Ordering From Government Supply Sources (MAY 1995)

I-2 FAR 52.223-11 - OZONE-DEPLETING SUBSTANCES (MAR 2001)

(a) *Definitions.* "Ozone-depleting substance", as used in this clause, means any substance the Environmental Protection Agency designates in 40 CFR Part 82 as –

- (1) Class I, including, but not limited to, chlorofluorocarbons, halons, carbon tetrachloride, and methyl chloroform; or
- (2) Class II, including, but not limited to, hydrochlorofluorocarbons.

(b) The Contractor shall label products which contain or are manufactured with ozone-depleting substances in the manner and to the extent required by 42 U.S.C. 7671j (b), (c), and (d) and 40 CFR Part 82, Subpart E, as follows:

WARNING

Contains (or manufactured with, if applicable) * _____, a substance(s) which harm(s) public health and environment by destroying ozone in the upper atmosphere.

*The Contractor shall insert the name of the substance(s).

I-3 DFARS 252.225-7008 - SUPPLIES TO BE ACCORDED DUTY-FREE ENTRY (MAR 1998)

In accordance with paragraph (b) of the Duty-Free Entry clause of this contract, in addition to duty-free entry for all qualifying country supplies (end products and components) and all eligible end products subject to applicable trade agreements (if this contract contains the Buy American Act - Trade Agreements - Balance of Payments Program clause or the Buy American Act - North American Free Trade Agreement Implementation Act - Balance of Payments Program clause), the following foreign end products that are neither qualifying country end products nor eligible end products under a trade agreement, and the following nonqualifying country components, are accorded duty free entry.

PART III - LIST OF DOCUMENTS, EXHIBITS, AND OTHER ATTACHMENTS**SECTION J****LIST OF ATTACHMENTS**

- J-1** Attachment (1) - Specifications - 49 Pages, with Exhibit A - DD Form 1423, Contract Data Requirements 4 Pages.
- J-2** Attachment (2) - Accounting and Appropriation Data. 1 page

{use at time of award and is always the last attachment}

PART IV - REPRESENTATIONS AND INSTRUCTIONS**SECTION K****REPRESENTATIONS, CERTIFICATIONS
AND OTHER STATEMENTS OF OFFERORS OR RESPONDENTS****K-1 Representations, Certifications, and Other Statements of Offerors or Respondents**

Each Offeror must submit a completed Representations, Certifications, and Other Statements Of Offerors or Respondents with its proposal which is available electronically in full text at <http://heron.nrl.navy.mil/contracts/rep&certs.htm>

K-2 FILL IN FOR FAR 52.219-1 - SMALL BUSINESS PROGRAM REPRESENTATIONS (MAR 2001)

The fill in information is as follows:

The NAICS code for this acquisition is 334511

The small business size standard is 750

SECTION L**INSTRUCTIONS, CONDITIONS, AND NOTICES TO OFFERORS OR RESPONDENTS****L-1 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY REFERENCE (FEB 1998)**

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. The offeror is cautioned that the listed provisions may include blocks that must be completed by the offeror and submitted with its quotation or offer. In lieu of submitting the full text of those provisions, the offeror may identify the provision by paragraph identifier and provide the appropriate information with its quotation or offer. Also, the full text of a solicitation provision may be accessed electronically at this/these address(es):

<http://www.arnet.gov/far>

<http://heron.nrl.navy.mil/contracts/home.htm>

FAR CLAUSE	TITLE
52.204-6	- Data Universal Numbering System (DUNS) Number (JUNE 1999)
52.214-34	- Submission Of Offers In The English Language (APR 1991)
52.214-35	- Submission Of Offers In U.S. Currency (APR 1991)
52.215-1	- Instructions To Offerors- Competitive Acquisition (Mar 2001)
52.215-16	- Facilities Capital Cost Of Money (OCT 1997)

L-2 FAR 52.211-14 - NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE (SEP 1990)

Any contract awarded as a result of this solicitation will be a DX rated order; DO rated order certified for national use under the Defense Priorities and Allocations system (DPAS) (15 CFR 700), and the Contractor will be required to follow all of the requirements of this regulation.

L-3 FAR 52.215-20 REQUIREMENTS FOR COST OR PRICING DATA OR INFORMATION OTHER THAN COST OR PRICING DATA (OCT 1997)

(a) *Exceptions from cost or pricing data.* (1) In lieu of submitting cost or pricing data, offerors may submit a written request for exception by submitting the information described in the following subparagraphs. The Contracting Officer may require additional supporting information, but only to the extent necessary to determine whether an exception should be granted, and whether the price is fair and reasonable.

(i) *Identification of the law or regulation establishing the price offered.* If the price is controlled under law by periodic rulings, reviews, or similar actions of a governmental body, attach a copy of the controlling document, unless it was previously submitted to the contracting office.

(ii) *Commercial item exception.* For a commercial item exception, the offeror shall submit, at a minimum, information on prices at which the same item or similar items have previously been sold in the commercial market that is adequate for evaluating the reasonableness of the price for this acquisition. Such information may include--

(A) For catalog items, a copy of or identification of the catalog and its date, or the appropriate pages for the offered items, or a statement that the catalog is on file in the buying office to which the proposal is being submitted. Provide a copy or describe current discount policies and price lists (published or unpublished), e.g., wholesale, original equipment manufacturer, or reseller. Also explain the basis of each offered price and its relationship to the established catalog price, including how the proposed price relates to the price of recent sales in quantities similar to the proposed quantities.

(B) For market priced items, the source and date or period of the market quotation or other basis for market price, the base amount, and applicable discounts. In addition, describe the nature of the market.

(C) For items included on an active Federal Supply Service Multiple Award Schedule contract, proof that an exception has been granted for the schedule item.

(2) The offeror grants the Contracting Officer or an authorized representative the right to examine, at any time before award, books, records, documents, or other directly pertinent records to

verify any request for an exception under this provision, and the reasonableness of price. For items priced using catalog or market prices, or law or regulation, access does not extend to cost or profit information or other data relevant solely to the offeror's determination of the prices to be offered in the catalog or marketplace.

(b) *Requirements for cost or pricing data.* If the offeror is not granted an exception from the requirement to submit cost or pricing data, the following applies:

(1) The offeror shall prepare and submit cost or pricing data and supporting attachments in accordance with Table 15-2 of FAR 15.408.

(2) As soon as practicable after agreement on price, but before contract award (except for unpriced actions such as letter contracts), the offeror shall submit a Certificate of Current Cost or Pricing Data, as prescribed in FAR 15.406-2.

L-4 FAR 52.216-1 - TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a Firm Fixed Price Supply contract with milestone payment resulting from this solicitation.

L-5 FAR 52.233-2 - SERVICE OF PROTEST (AUG 1996)

(a) Protests, as defined in Section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO) shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from the Control Desk, Code 3200, Bldg. 222, Rm. 115, Naval Research Laboratory, 4555 Overlook Ave., S.W., Washington DC 20375-5326.

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

L-6 DFARS 252.227-7017 - IDENTIFICATION AND ASSERTION OF USE, RELEASE, OR DISCLOSURE RESTRICTIONS (JUN 1995)

(a) The terms used in this provision are defined in following clause or clauses contained in this solicitation--

- (1) If a successful offeror will be required to deliver technical data, the Rights in Technical Data--Noncommercial Items clause, or, if this solicitation contemplates a contract under the Small Business Innovative Research Program, the Rights in Noncommercial Technical Data and Computer Software--Small Business Innovative Research (SBIR) Program clause.
- (2) If a successful offeror will not be required to deliver technical data, the Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation clause, or, if this solicitation contemplates a contract under the Small Business Innovative Research Program, the Rights in Noncommercial Technical Data and Computer Software--Small Business Innovative Research (SBIR) Program clause.

(b) The identification and assertion requirements in this provision apply only to technical data, including computer software documents, or computer software to be delivered with other than

unlimited rights. For contracts to be awarded under the Small Business Innovative Research Program, the notification requirements do not apply to technical data or computer software that will be generated under the resulting contract. Notification and identification is not required for restrictions based solely on copyright.

- (c) Offers submitted in response to this solicitation shall identify, to the extent known at the time an offer is submitted to the Government, the technical data or computer software that the Offeror, its subcontractors or suppliers, or potential subcontractors or suppliers, assert should be furnished to the Government with restrictions on use, release, or disclosure.
- (d) The Offeror's assertions, including the assertions of its subcontractors or suppliers or potential subcontractors or suppliers shall be submitted as an attachment to its offer in the following format, dated and signed by an official authorized to contractually obligate the Offeror: Identification and Assertion of Restrictions on the Government's Use, Release, or Disclosure of Technical Data or Computer Software.

The Offeror asserts for itself, or the persons identified below, that the Government's rights to use, release, or disclose the following technical data or computer software should be restricted:

Technical Data or Computer Software to be Furnished With Restrictions*	Basis for Assertion**	Asserted Rights Category***	Name of Person Asserting Restrictions****
(LIST)*****	(LIST)	(LIST)	(LIST)

* For technical data (other than computer software documentation) pertaining to items, components, or processes developed at private expense, identify both the deliverable technical data and each such items, component, or process. For computer software or computer software documentation identify the software or documentation.

** Generally, development at private expense, either exclusively or partially, is the only basis for asserting restrictions. For technical data, other than computer software documentation, development refers to development of the item, component, or process to which the data pertain. The Government's rights in computer software documentation generally may not be restricted. For computer software, development refers to the software. Indicate whether development was accomplished exclusively or partially at private expense. If development was not accomplished at private expense, or for computer software documentation, enter the specific basis for asserting restrictions.

*** Enter asserted rights category (e.g., government purpose license rights from a prior contract, rights in SBIR data generated under another contract, limited, restricted, or government purpose rights under this or a prior contract, or specially negotiated licenses).

**** Corporation, individual, or other person, as appropriate.

***** Enter "none" when all data or software will be submitted without restrictions.

Date _____

Printed Name and Title _____

Signature _____

(End of identification and assertion)

- (e) An offeror's failure to submit, complete, or sign the notification and identification required by paragraph (d) of this provision with its offer may render the offer ineligible for award.
- (f) If the Offeror is awarded a contract, the assertions identified in paragraph (d) of this provision shall be listed in an attachment to that contract. Upon request by the Contracting Officer, the Offeror shall provide sufficient information to enable the Contracting Officer to evaluate any listed assertion.

L-7 DFARS 252.227-7028 - TECHNICAL DATA OR COMPUTER SOFTWARE PREVIOUSLY DELIVERED TO THE GOVERNMENT (JUN 1995)

The Offeror shall attach to its offer an identification of all documents or other media incorporating technical data or computer software it intends to deliver under this contract with other than unlimited rights that are identical or substantially similar to documents or other media that the Offeror has produced for, delivered to, or is obligated to deliver to the Government under any contract or subcontract. The attachment shall identify - -

- (a) The contract number under which the data or software were produced;
- (b) The contract number under which, and the name and address of the organization to whom, the data or software were most recently delivered or will be delivered; and
- (c) Any limitations on the Government's rights to use or disclose the data or software, including, when applicable, identification of the earliest date the limitations expire.

L-8 GOVERNMENT-FURNISHED PROPERTY

No material, labor, or facilities will be furnished by the Government unless provided for in the solicitation.

L-9 INQUIRIES CONCERNING THE RFP

Any questions concerning the RFP must be submitted in writing to the Contracting Officer at the location noted in blocks 7 and 9 of the Standard Form 33, "Solicitation, Offer and Award," no less than fifteen (15) days before closing. The Government will not consider questions received after this date. Offerors are cautioned against directing any questions concerning this RFP to technical personnel at the Naval Research Laboratory.

L-10 INSTRUCTIONS FOR SUBMISSION AND INFORMATION REQUIRED TO EVALUATE PROPOSALS

(1) Information for the technical/management proposal shall be placed in Volume I and be completely separate from the business proposal (Volume II).

(2) Proposal Identification/Mailing - The proposal should be packaged for delivery so as to permit safe and timely arrival at destination. The proposal package should be sent to the address shown in Block 7 of the RFP face page and marked:

Solicitation No. N00173-01-R-CB06

Closing Date: 23 July 2001

(As specified in Block 9, RFP face page)

Attn: Code 3230.CB

(3) Proposal Format and Length - No attempt is made to restrict the proposal format and style. However, the proposal should be written and organized so as to be compatible with the RFP. Offerors are encouraged to use recycled paper and maximize the use of double sided copying when preparing responses to solicitations.

L-11 VOLUME I - TECHNICAL/MANAGEMENT PROPOSAL

REQUIRED COPIES: 1 ORIGINAL AND 5 COPIES .

(1) Include a matrix indicating proposed labor hours by skill category required to perform the statement of work.

(2) The following information is required for evaluation of your technical/management :

A. TECHNICAL DESCRIPTION

The proposer should provide appropriate descriptive materials, including drawings, schematics, and parts list, which proves that the offeror's hardware is capable of meeting the performance requirements. In addition, the materials should show that the design will be based on an existing star sensor. The proposer should include a description of design modifications to the previously built unit that will be required to meet the specification requirements. The proposer should provide a specific statement whether or not the technical proposal complies with the Specification, and a full description of any and all exceptions that the offeror takes with the Specification.

B. CAPACITIES AND EXPERIENCE

The proposer should provide a brief history of the offeror's firm including technology and manufacturing experience with emphasis on a description of the company's experience in producing hardware for projects similar to this requirement. The proposer should provide a listing of recent Department of Defense or other Government or commercial contracts under which the offeror has designed, developed, or fabricated similar products, which prove the

offeror's past experience with star sensor systems. Also, the proposer should provide a statement of names and telephone numbers of customers and technical personnel involved in the contract. The proposer should provide the years of experience in designing and developing similar products or technology. The proposer should provide a full description of the offeror's capabilities to support the proposed task, including information on available facilities and equipment and previous performance with any subcontractors or suppliers that will be used. The proposer should describe the adequacy of personnel experience on applicable projects as evidenced by a narrative description of the experience. This experience should clearly show the relationship to the SOW/Specification.

C. PROGRAM PLAN

The proposer should provide a program/management plan sufficiently detailed to clearly demonstrate consideration of all the details of the specification in the areas of schedule and risk: This plan should address detailed information regarding the proposed (1) schedule, (2) manufacturing plan, and (3) quality assurance plan.

D. PAST PERFORMANCE INFORMATION

a) Offerors shall submit the following information as part of their proposal. (Offerors are encouraged to submit the information prior to other parts of the proposal to assist the government in reducing the length of the evaluation period.) List the last three contracts or subcontracts completed by the offeror or predecessor companies during the past four years for services similar in nature to this requirement. Of these include any current contracts or subcontracts for similar services that were awarded at least one year prior to the date of this solicitation. Offerors that have no similar previous or current contracts should provide the requested information for proposed subcontractors that will perform major or critical aspects of the requirement or for the proposed project manager or key personnel responsible for major or critical aspects of the requirement.

1. Name of contracting organization.
2. Contract number
3. Contract type
4. Total contract value
5. Description of the contract work
6. Contracting officer and telephone number
7. Contracting officer's representative, program manager, or similar official and telephone number

(b) Offerors shall contact the contracting organizations identified pursuant to paragraph (a) as soon as possible and request them to send past performance information on the identified contracts to the address in Block 7 of the face page of this solicitation. The past performance report which is available electronically in full text at <http://heron.nrl.navy.mil/contracts/home.htm> is to be provided to the contracting organization for this purpose. If the contracting organization has already collected past performance information on the contract pursuant to FAR Subpart 42.15, the format used to collect the information may be used instead of the past performance report.

(c) Offerors may include in their proposals specific information relating to problems encountered in performing the identified contracts and any corrective actions by the offeror. Offerors should not provide general information on their performance on the identified contracts as this will be obtained from the contracting organizations.

L-12 VOLUME II - BUSINESS PROPOSAL

REQUIRED COPIES: 1 ORIGINAL AND 4 COPIES

(1) PRICE PROPOSAL

The offeror shall submit a business proposal that includes a price proposal with supporting information. The supporting breakdown should include such elements as materials, direct labor, indirect cost, and other costs such as travel. The offeror shall provide exhibits as necessary to substantiate the price.

(2) SMALL BUSINESS PARTICIPATION

(a) In addition to complying with the clause at FAR 52.219-9, Small Business Subcontracting Plan (Oct 2000), proposals must include information to permit evaluation of the extent of participation of small businesses and historical black colleges or universities and minority institutions in performance of the contract. Participation to be identified may be in the form of a joint venture, teaming arrangement, or subcontract. Small business concerns that are not required by FAR 52.219-9 to submit a subcontracting plan must indicate the extent to which proposed joint ventures, teaming arrangements, or subcontracts are with historically black colleges or universities and minority institutions. Information provided should include the extent of participation of such firms in terms of the value of the total acquisition and the complexity and variety of the work such firms are to perform.

SECTION M EVALUATION FACTORS FOR AWARD

M-1 EVALUATION

Award will be made to that offeror whose proposal is determined to be the best value to the Government, proposed price and other factors considered. The Government reserves the right to make award to other than the low offeror.

M-2 EVALUATION FACTORS FOR AWARD

Proposals will be evaluated in accordance with the following criteria. The technical factor is more

important than the price factor. The technical subfactors are listed in descending order of importance with first subfactor (Technical Description) being more important than the second factor.

M-2-1. TECHNICAL/MANAGEMENT

(A) TECHNICAL DESCRIPTION

The proposal will be evaluated on the offeror's demonstrated ability to meet the requirements of the specification with a minimum amount of modification, as shown by (1) the development and qualification status of the hardware, (2) technical compliance, (3) technical risk, (4) supporting analyses, (5) drawings and schematics, (6) understanding of the requirement, (7) maturity of the design, and (8) arts list. Preference will be given to proposed designs based on an existing star sensor.

(B) CAPABILITIES AND EXPERIENCE

The proposal will be evaluated on the offeror's demonstrated: (1) company experience in successfully manufacturing and assembling closely similar systems, (2) ability to produce the units for this procurement, as surmised by information they provide on (1) facilities and equipment available, (2) major suppliers developed, and (3) personnel qualifications through adequacy of skills and experience of personnel.

(C) PROGRAM PLAN

The proposal will be evaluated on the adequacy of the offeror's program/management plan in the areas of schedule and risk.

(D) PAST PERFORMANCE

Past performance will be evaluated on the basis of the quality of the work performed or supplies delivered and timeliness of performance or delivery. The evaluation will be based on the information provided pursuant to Section L and other sources if available. The evaluation will take into account past performance information regarding predecessor companies, subcontractors that will perform major or critical aspects of the requirement, or the proposed project manager or key personnel responsible for major or critical aspects of the requirement. Offerors that have no relevant performance history or for which past performance information is not available will not be evaluated favorably or unfavorably on past performance. The government may begin proposal evaluation prior to receipt of past performance information. If, after completion of proposal evaluation except evaluation of past performance, the contracting officer determines that evaluation of past performance will not affect the outcome of competitive selection, the contracting officer may waive its evaluation in accordance with FAR 15.304(c)(3)(iii).

M-2-2 PRICE TO THE GOVERNMENT

Proposed estimated price to the Government.

M-2-3 SMALL BUSINESS PARTICIPATION

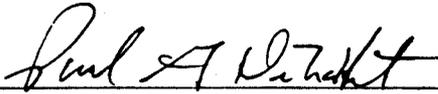
(a) The extent of participation of small businesses and historically black colleges or universities and minority institutions in performance of the contract will be evaluated on the basis of the proposed extent of participation of such firms in terms of the value of the total acquisition and the complexity and variety of the work such firms are to perform.

M-3 FAR 52.217-5 - EVALUATION OF OPTIONS (JUL 1990)

Except when it is determined in accordance with FAR 17.206(b) not to be in the Government's best interests, the Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement. Evaluation of options will not obligate the Government to exercise the option(s).

NAVAL RESEARCH LABORATORY
NAVAL CENTER
FOR
SPACE TECHNOLOGY

Star Tracker Specification
for the
Full-sky Astrometric Mapping Explorer (FAME)
NCST-S-FM003 1 June 2001

Approved By:  Date: 6-6-01
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Approved By:  Date: 6-6-01
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Approved By:  Date: 6/6/01
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4555 Overlook Avenue, S.W.
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SOLICITATION NO. N00173-01-R-CB06

RECORD OF CHANGES

REVISION LETTER	DATE	TITLE OR BRIEF DESCRIPTION	ENTERED BY
—	30 April 2001	Initial Draft	P. DeLaHunt
—	21 May 2001	Initial Draft	M. Ream
—	30 May 2001	Initial Draft	M. Ream

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1.0 SCOPE

1.1 Identification

This specification establishes the top level functional performance, design, manufacture, verification, and acceptance requirements for the Full-sky Astrometric Mapping Explorer (FAME) Star Tracker (ST).

1.1.1 Flight Unit

The ST Flight Unit shall meet all the requirements of this specification and shall be tested to the performance and acceptance environmental tests of section 4.0.

1.1.2 Qualification Unit

The ST Qualification Unit shall meet all the requirements of this specification and shall be tested to the performance and qualification environmental tests of 4.0.

1.1.3 Engineering Development Unit

The Engineering Development Model (EDM) shall meet the form, fit, and function of the Flight Unit. The EDM will be used to verify mechanical and electrical compatibility with FAME's mechanical and electrical systems. The EDM shall not be required to meet the environmental requirements called out in this specification.

1.1.4 Star Simulator Unit

The Star Simulator Unit shall be a piece of ground test equipment that is capable of verifying the functional performance of the ST. The star simulator will be used during ground functional checkout of the ST while the ST is mounted on the FAME satellite. The FAME flight hardware and computer shall be used to collect data from the ST. The star simulator will provide a simulated star field to be imaged by the ST.

1.2 Purpose

This specification establishes the performance, design, manufacture, verification, and acceptance requirements for the ST of the FAME observatory.

1.3 Document Overview

This specification establishes the performance, design, manufacture, verification, and acceptance requirements for the ST of the FAME observatory. This document is organized as follows:

- a. Section 1.0, *Scope*: Purpose and contents of this document.
- b. Section 2.0, *Referenced Documents*: A list of documents referenced in or required for use with this document.
- c. Section 3.0, *Requirements*:
 1. Paragraph 3.1 provides a comprehensive definition of the ST.
 2. Paragraph 3.2 specifies the performance and physical characteristics of the ST.
 3. Paragraph 3.3 specifies the minimum design and construction requirements for the ST.
 4. Paragraph 3.4 describes the documentation that the Contractor must provide with the ST.
- d. Section 4.0, *Quality Assurance Provisions*: Details the tests to be conducted and the methods of test verification that will be employed.
- e. Section 5.0, *Preparation for Delivery*: Provides guidance for preparing the ST for delivery.
- f. Section 6.0, *Deliverables and Tasks*, describes the deliverable data that the Contractor must furnish with the ST.
- g. Section 7.0, *Notes*: Provides additional information that is not contractually binding. Included are a glossary and list of acronyms.

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The performance requirements herein are applicable during nominal operations, maintenance, or contingency events. Requirements for earlier or other staged events are noted. Each requirement, unless otherwise noted, represents the required performance of the ST from the time of its activation through end of mission life.

2.0 APPLICABLE DOCUMENTS

2.1 Government Documents

The following documents of the exact issue shown form a part of this document to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement. Copies of specifications, standards, drawings, and publications required by Contractors in connection with specified procurement functions should be obtained from the contracting agency or as directed by the contracting officer. Documents beginning with the control number "SSD" and "NCST" are program documents controlled by the Naval Research Laboratory (NRL).

2.1.1 Military Specifications

Most active military specifications are available on-line from: <http://astimage.daps.dla.mil/quicksearch/>

Number	Title	Paragraph Reference
MIL-DTL-31000A	Technical Data Packages	3.4.2
MIL-PRF-38534D	Hybrid Microcircuits, General Specification for	3.3.1.1.2
MIL-PRF-38535E	Integrated Circuits (Microcircuits) Manufacturing, General Specification for	3.3.1.1.2

2.1.2 Military Standards

Most active military standards are available on-line from: <http://astimage.daps.dla.mil/quicksearch/>

Number	Title	Paragraph Reference
MIL-STD-1522B	Standard General Requirements for Safe Design and Operation of Pressurized Missile and Space Systems	3.3.1.2.2
MIL-STD-1686C	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment	3.3.1.1.4
MIL-STD-461C	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference	3.3.2.1, 3.3.2.2, 3.3.2.3.1
MIL-STD-461D	Requirements for the Control of Electromagnetic Interference Emissions and Susceptibility	
MIL-STD-462	Measurement of Electromagnetic Interference Characteristics	3.3.2.1, 3.3.2.2, 3.3.2.3.1
MIL-STD-883E	Test Methods and Procedures for Microelectronics	3.3.1.1.2
MIL-STD-961D	Specification Practices	3.4.1
MIL-STD-1629A	Procedure for Performing Failure Modes, Effects and Criticality Analysis	3.2.3.2

2.1.3 Military Handbooks

Most active military handbooks are available on-line from: <http://astimage.daps.dla.mil/quicksearch/>

Number	Title	Paragraph Reference
MIL-HDBK-217F	Reliability Prediction of Electronic Equipment	3.2.3.1
MIL-HDBK-1547A	Electronic Parts, Materials, & Processes for Space & Launch Vehicles	3.3.1.1.3

2.1.4 Other Publications

Number	Title	Paragraph Reference
EWRR 127-1	Eastern and Western Range Regulation 127-1, Range Safety Requirements	3.3.1.2.2
GSFC 311-INST-001A	Instructions for EEE Parts Selection, Screening, and Qualification Available from: http://epims.gsfc.nasa.gov/ctre/parts/inst/prd.htm	3.3.1.1.1, 3.3.1.1.2
GSFC-410-MIDEX-001	MIDEX Assurance Guidelines	3.2.6.2.2.3, 3.3.1, 3.3.1.1.2
MSFC-SPEC-522B	Design Criteria for Controlling Stress Corrosion Cracking	3.3.1.2.2, 3.3.1.2.6
NASA-STD-2100-91	NASA Software Documentation Standard Available from: http://satc.gsfc.nasa.gov/assure/docstd.html	3.4.1, 3.4.3
SP-R-0022	Vacuum Stability Requirements of Polymeric Material for Spacecraft Applications, Specifications for	3.3.1.2.1
SSD-D-IM007	ICM Worst Case Analysis	3.2.3.4, 3.3.1.1.3

2.1.5 NASA Technical Standards

NASA Technical Standards are available on-line from: <http://www.hq.nasa.gov:80/office/codeq/doctree/qdoc.pdf>

Number	Title	Paragraph Reference
NASA-STD-8739.1	Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies	3.3.1.3.1
NASA-STD-8739.2	Workmanship Standard for Surface Mount Technology	3.3.1.3.1
NASA-STD-8739.3	Soldered Electrical Connections	3.3.1.3.1
NASA-STD-8739.4	Crimping, Interconnecting Cables, Harnesses, and Wiring	3.3.1, 3.3.1.3.1
NASA-STD-8739.7	Standard for Electrostatic Discharge Control (Excluding Electrically Initiated Explosive Devices)	3.3.1.1.4

2.1.6 FAME Project Documents

Available to registered users at <http://team8200.nrl.navy.mil/>

Number	Title	Paragraph Reference
NCST-D-FM007	FAME Contamination Control Plan	3.2.6.1.1, 3.2.6.1.2, 3.2.6.1.3, 3.2.6.2.1
NCST-D-FM018	FAME EMI/EMC Control Plan	3.3.2

2.2 Non-Government Documents

The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of the request for proposal shall apply. In the event of conflict between the documents referenced herein and the contents of this specification, this specification shall take precedence. Copies of specifications, standards, drawings, and publications required by Contractors in connection with specified procurement functions should be obtained from the contracting agency or as directed by the contracting officer.

2.2.1 Specifications

Not applicable.

2.2.2 Standards

Not applicable.

2.2.3 Other Publications

Number	Title	Paragraph Reference
ANSI/J-STD-001	Requirements for Soldered Electrical and Electronic Assemblies	3.3.1.3.1
ANSI/J-STD-002	Solderability Tests for Component Leads, Terminations, Lugs, Terminals and Wires	3.3.1.3.1
ANSI/J-STD-003	Solderability Test Methods for Printed Wiring Boards	3.3.1.3.1
ANSI/J-STD-004	Requirements for Soldering Fluxes	3.3.1.3.1
ANSI/J-STD-005	Requirements for Soldering Pastes	3.3.1.3.1
ANSI/J-STD-006	Requirements for Electronic Grade Solder Alloys and Fluxed and Non-fluxed Solid Solders for Electronic Soldering Applications	3.3.1.3.1
EIA-625	Requirements for Handling Electrostatic Discharge Sensitive Devices	3.3.1.1.4
IEEE/EIA 12207.0	Standard for Information Technology - Software Life Cycle Processes	3.4.1, 3.4.3
IEEE/EIA 12207.1	Standard for Information Technology - Software Life Cycle Processes - Life Cycle Data	3.4.1, 3.4.3
IEEE/EIA 12207.2	Standard for Information Technology - Software Life Cycle Processes - Implementation Considerations	3.4.1, 3.4.3
IPC-A-600D	Acceptability of Printed Wiring Boards Available from: http://www.ipc.org	3.3.1.3.1
IPC-D-275	Standard for PCB Design and Assembly Available from: http://www.ipc.org	3.3.1.3.1
IPC-FC-250	Performance Specification for Single and Double-Sided Flexible Printed Boards Available from: http://www.ipc.org	3.3.1.3.1
IPC-FC-250A-86	Specification for Single and Double-Sided Flexible Wiring Available from: http://www.ipc.org	3.3.1.3.1

2.3 Order of Precedence

In the event of a conflict between the text of this specification and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3.0 REQUIREMENTS

This section specifies the functional, performance, interface, logistic, quality factor, and design requirements for the Star Tracker (ST). The terms used to define the scope and the extent of the system requirements herein are defined in Section 6.0.

3.1 Item Definition

The item specified herein is the Star Tracker, an element of the FAME attitude determination system. The ST shall satisfy the requirements for examination, analysis, and test as specified in section 4.0. The ST shall perform the function of attitude measurement in three mutually orthogonal axes. Any calibration and compensation necessary to meet the performance requirements shall reside in the ST. With each delivered ST, the contractor shall provide the hardware and software associated with this function. The software shall include the star catalog and processing algorithms required to provide the specified output.

3.2 Characteristics

3.2.1 Performance Characteristics

The ST shall meet the performance requirements and capabilities specified within this specification.

3.2.1.1 Output

The ST's output shall be in the form of an attitude quaternion. The quaternion will describe the orientation of the ST coordinate frame with respect to the J2000 frame.

3.2.1.2 Accuracy

The ST shall provide an accuracy of the calculated attitude for body rates of < 0.3 degree/second as follows:

- a. Pitch < 5 arcsec (1 sigma)
- b. Yaw < 5 arcsec (1 sigma)
- c. Roll < 15 arcsec (1 sigma)

3.2.1.3 Body Rates

The ST shall operate at full performance levels called out in paragraph 3.2.1.2 at rates up to 0.3 degree/second. The ST shall operate at degraded performance levels up to 1.0 degree/second.

3.2.1.4 Time Determination

The ST shall provide a time tag accurate to 1 msec or better for each attitude quaternion output.

3.2.1.5 Optical Alignment Cube

The ST shall incorporate a alignment cube to be used as a reference for defining the ST coordinate frame. The ST alignment cube shall be used for alignment of the ST coordinate frame to the spacecraft reference frame. The location and size of the alignment cube shall be subject to approval by the Contracting Officer's Representative (COR) to allow adequate clearance and visibility for alignment purposes once the ST is integrated into the spacecraft. The location of the cube shall be specified in the contractor provided Interface Control Document (ICD).

3.2.1.6 Bright Object Rejection

The ST shall provide the capability of rejecting planets within its field of view (FOV) during attitude determination processing.

3.2.1.7 Sun Exposure

The ST shall not be permanently damaged by indefinite sun exposure within its FOV.

3.2.1.8 Shade Rejection Angles

The ST shall provide full accuracy when the sun is ≥ 45 degrees from boresight and when the earth or moon limb is ≥ 35 degrees from boresight.

3.2.1.9 Recovery Time

The ST shall have a recovery time upon removal of a bright object of ≤ 60 seconds.

3.2.1.10 Coordinate System

The ST coordinate system shall be specified in the contractor provided ICD. The selected ST coordinate system shall be right-handed and unambiguous. The coordinate system shall be referenced to the optical alignment cube.

3.2.1.11 Warm-up Time

The ST shall provide operational performance fully compliant with the requirements specified herein within one minute after application of power.

3.2.1.12 Integration Time

The ST integration time shall be selectable through ground command.

3.2.1.13 Operation Modes**3.2.1.13.1 Autonomous Attitude Acquisition Mode**

The ST shall be capable of acquiring attitude after reset without a priori knowledge in less than 10 seconds at the maximum tracking rate specified in paragraph 3.2.1.3. The resulting attitude quaternion shall be provided as output.

3.2.1.13.2 Track Mode

The ST shall incorporate a track mode that uses a priori knowledge established during autonomous attitude acquisition. During track mode, the ST shall be capable of providing attitude quaternion output at a minimum rate of 1 Hz, at the maximum tracking rate specified in paragraph 3.2.1.3. The ST shall provide the capability to enable and disable track mode upon command. The ST shall terminate track mode and re-enter autonomous attitude acquisition under the following conditions:

- a. Upon receipt of a ground (or on-board computer) initiated command.
- b. Upon loss of track due to spacecraft slew rates in excess of the maximum tracking rate specified in paragraph 3.2.1.3.
- c. Upon loss of track due to sun or plant albedo present within ST field of view.
- d. Upon loss of track due to internal ST (or algorithm) failure.

3.2.1.14 Software

All software required to support ST normal operations and the requirements specified herein shall be in the ST.

3.2.1.15 Software Upload Capability

The ST shall be capable of software uploads as needed to modify algorithms or upload new or modified star catalogs.

3.2.1.16 Star Catalog

The star catalog and/or catalog updates required to support the ST shall be referenced to the J2000 frame and be valid through the year 2010.

3.2.1.17 Electrical Interfaces**3.2.1.17.1 Data Outputs**

Telemetry and Command (T&C) interfaces between the ST and the spacecraft controller shall be via Mil-Std-1553 or RS-422 compatible interface. The sample period of the ST output shall be less than one second and the requirements of paragraph 3.2.1 shall be met using this sample period. The timing relationships and interfaces shall be specified in the contractor provided ICD.

3.2.1.17.2 ST Processor

The ST processor shall be qualified for flight use and meet the radiation hardness requirements specified herein. The processor shall provide a throughput margin of 50% over anticipated software computational needs. The processor shall incorporate a watchdog timer. The processor shall be supported by an acceptable higher order language compiler. The processor's memory shall be remotely configurable for new software uploads with a combination of ROM and RAM for instructions and data storage via the T&C interface with the spacecraft controller. All RAM shall be protected by Error Detection and Correction (EDAC) circuitry.

3.2.1.18 Power

The ST shall be a self-contained unit. Nominal power will be 28 Vdc under normal circumstances. All internally used secondary voltages of the ST shall be generated by power converters contained within the ST. Primary and backup power supplies may be used within the ST to meet reliability requirements. After spacecraft power is applied, the ST shall be ready for operation within 10 seconds. The ST shall operate within specification during inadvertent spacecraft power interruptions of up to 10 microseconds.

3.2.1.18.1 Input Bus

The input bus voltage range is 24-36 Vdc. The ST is expected to operate over the entire range with no degradation of design parameters.

3.2.1.18.2 Output Voltages

The ST power supply shall provide all output voltages and output power required to run the ST in all modes of operation.

3.2.1.18.3 Power Limitation

The ST shall not exceed 13 W of input power under all conditions.

3.2.1.18.4 Power Feed

The ST shall receive a single power feed (consisting of two positive wires and two return wires) per ST electronics unit.

3.2.1.18.5 Fusing

The power feed shall be fused by the spacecraft power distribution system (external to the ST).

3.2.1.18.6 Input Power Switching

The power feed delivered to the ST shall be switched externally to the ST.

3.2.1.18.7 Primary DC Power Grounding

The ST shall be designed to operate with the ST's primary power return lead grounded only at the 24-36 Vdc bus' single point ground point. All primary power shall be isolated from chassis, signal, and secondary power return by minimum of 1.0 megohm. Under no circumstances shall structure be used as an intentional current carrying conductor.

3.2.2 Physical Characteristics

3.2.2.1 Mass Properties Control and Reporting

The mass properties of the ST shall be reported and controlled in the contractor provided ICD.

3.2.2.1.1 Weight Limits

The weight of the ST shall not exceed the values listed in Table 3-1 and shall be provided in the contractor provided ICD.

Table 3-1. ST Weight Limits

Unit	Weight	Mass
Star Tracker	8.8 lb	4 kg

3.2.2.2 Dimensions and Envelope

Overall dimensions (including thermal effects and dynamic motion in the launch configuration) shall be reported and controlled in the contractor provided ICD.

3.2.2.3 Coordinate System

Reference axes notation shall use the right-hand rule and be defined in the contractor provided ICD.

3.2.2.4 Minimum Frequency

The stiffness of the ST shall be such that it produces only fundamental frequencies above 50 Hz in all three axes hard-mounted at its interface.

3.2.2.5 Center of Gravity (CG) Limits

The CG limits shall be defined in the contractor provided ICD.

3.2.3 System Quality Factors

3.2.3.1 Reliability

As part of the design process, the Contractor shall perform a reliability analysis on the ST using the parts failure rates of MIL-HDBK-217. As a goal, the ST design shall be such that a failure in one component does not propagate to other components. As a goal, the ST shall, when practical, be capable of detecting malfunctions and automatically initiating protective measures to avoid loss of the mission.

3.2.3.2 Failure Modes, Effects, and Criticality Analysis

A failure modes, effects and criticality analysis shall be provided on the ST in accordance with MIL-STD-1629A.

3.2.3.3 Electrical Stress Analysis

An electrical stress analysis shall be provided in accordance with SSD-D-IM007, ICM Worst Case Analysis.

3.2.3.4 Worst Case Analysis

A worst case analysis shall be provided in accordance with SSD-D-IM007, ICM Worst Case Analysis.

3.2.3.5 Radiation Analysis

A radiation analysis shall be provided to meet the requirements of paragraph 3.2.6.2.2.3.

3.2.4 Maintainability

No scheduled and preventive maintenance shall be required to meet the performance requirements specified herein.

3.2.5 Fault Detection Capability

As a goal, fault detection, isolation, and checkout capability shall be provided to the subassembly or component level. As a goal, on-orbit fault detection and isolation shall be provided to the component level.

3.2.6 Environmental Conditions

The ST shall be designed to operate within specification limits during and after exposure, as applicable, to all creditable combinations of operating and non-operating environments. The ST shall be protected during ground handling and transportation so that the environmental conditions do not exceed flight or orbital conditions. These constraints shall not be interpreted as precluding environmental testing of the ST. The following subparagraphs describe the general requirements for the environmental conditions that are applicable to the observatory space segment.

3.2.6.1 Non-Operating Environment

The ST shall meet the requirements of this document without refurbishment or adjustment after exposure to any combination of the environments specified herein for integration and test (I&T) facility (paragraph 3.2.6.1.1), ground handling and transportation (paragraph 3.2.6.1.2), and/or prelaunch (paragraph 3.2.6.1.3).

3.2.6.1.1 Integration and Test Facility Environment

The ST shall meet the requirements of this document without refurbishment or adjustment after exposure to any combination of the I&T environments listed below:

- a. *Ambient Air Temperature*: The ambient air temperature may vary from 7°C to 39°C.
- b. *Ambient Pressure*: Naturally occurring at sea level and at 5,000 feet.
- c. *Humidity*: The relative humidity may vary between 2% to 98%, non-condensing.
- d. *Acceleration, Vibration, Shock, and Loads*: Not applicable.
- e. *Cleanliness*: Flight hardware will be maintained in accordance with the requirements of NCST-D-FM007.

3.2.6.1.2 Ground Handling and Transportation

The ST shall meet the requirements of this document without refurbishment or adjustment after exposure to any combination of the ground handling and transportation environments listed below:

- a. *Ambient Air Temperature*: External environment is uncontrolled and will range from -25°C to +40°C.
- b. *Ambient Pressure*: Naturally occurring at sea level to 50,000 feet.
- c. *Humidity*: The relative humidity may vary between 2% to 98%, non-condensing. Internal shipping container environment controlled to prevent condensation of moisture or frost on flight hardware.
- d. *Acceleration, Vibration, Shock, and Loads*: The ST shall not be exposed to environments greater than those experienced during launch and ascent.
- e. *Cleanliness*: Protective container or packaging to maintain flight hardware at the cleanliness level specified in NCST-D-FM007.

3.2.6.1.3 Prelaunch

The ST shall meet the requirements of this document without refurbishment or adjustment after exposure to any combination of prelaunch environments (environments that occur from arrival at the Expendable Launch Vehicle [ELV] launch site to launch) listed below:

- a. *Ambient Air Temperature*: Maintained from 7°C to 39°C.
- b. *Ambient Pressure*: Naturally occurring at sea level and at 5,000 feet.
- c. *Humidity*: Maintained between 2% and 98%. Appropriate measures will be implemented to prevent the formation of condensation on the observatory, test equipment, or protective covers.

- d. *Acceleration, Vibration, Shock, and Loads*: Observatory shall not be exposed to environments greater than those experienced during launch and ascent.
- e. *Cleanliness*: Assembly, test, and preparation area controlled to meet the environment specified in NCST-D-FM007.

3.2.6.2 Operating Environment

The ST shall be designed to perform as specified for 5 years after exposure to the environments specified herein for launch and ascent (paragraph 3.2.6.2.1) and on-orbit operations (paragraph 3.2.6.2.2).

3.2.6.2.1 Launch and Ascent

The launch and ascent phase covers those environments that occur between terminal countdown and separation from the third stage. The ST shall meet the requirements of this document without refurbishment or adjustment after exposure to the environments listed below:

- a. *Temperature*: The temperature of the surrounding area and the baseplate will be maintained at any temperature between -20°C to $+55^{\circ}\text{C}$.
- b. *Pressure*: The pressure decay curve in the launch vehicle fairing is defined in Figure 3-1. The ST shall operate at pressures less than 1×10^{-5} torr.
- c. *Acceleration and Loads*: For design purposes, component accelerations are provided in Figure 3-2. The design factor of safety requirements for the quasi-static loads and the design limit load factors for the ST are listed in Table 3-2.
- d. *Pyrotechnic Shock*: The ST shall withstand the pyroshock environment as shown in Figure 3-3. The design factor of safety requirements for the quasi-static loads and the design limit load factors for the ST are listed in Table 3-2. Pyroshock testing will be done at the system level with the spacecraft.
- e. *Random Vibration*: The ST shall withstand the random vibration environment as shown in Figure 3-4 and Figure 3-5. The design factor of safety requirements for the quasi-static loads and the design limit load factors for the ST are listed in Table 3-2.
- f. *Cleanliness*: Assembly, test, and preparation area controlled to meet the environment specified in NCST-D-FM007.

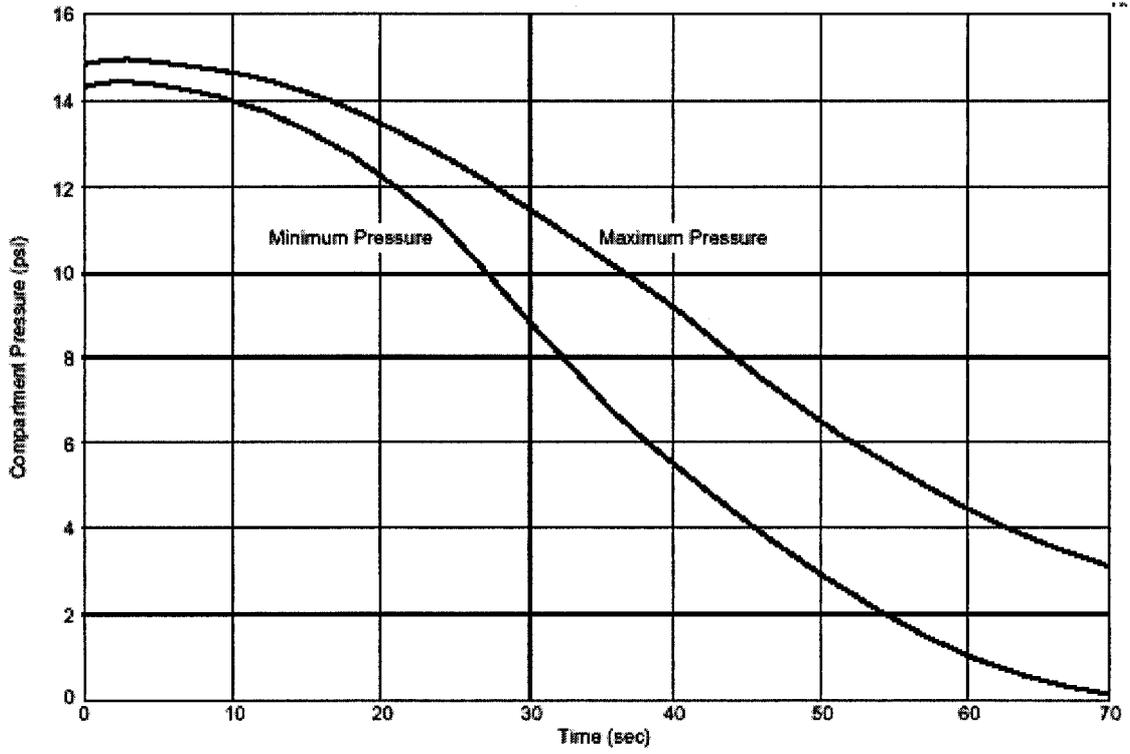
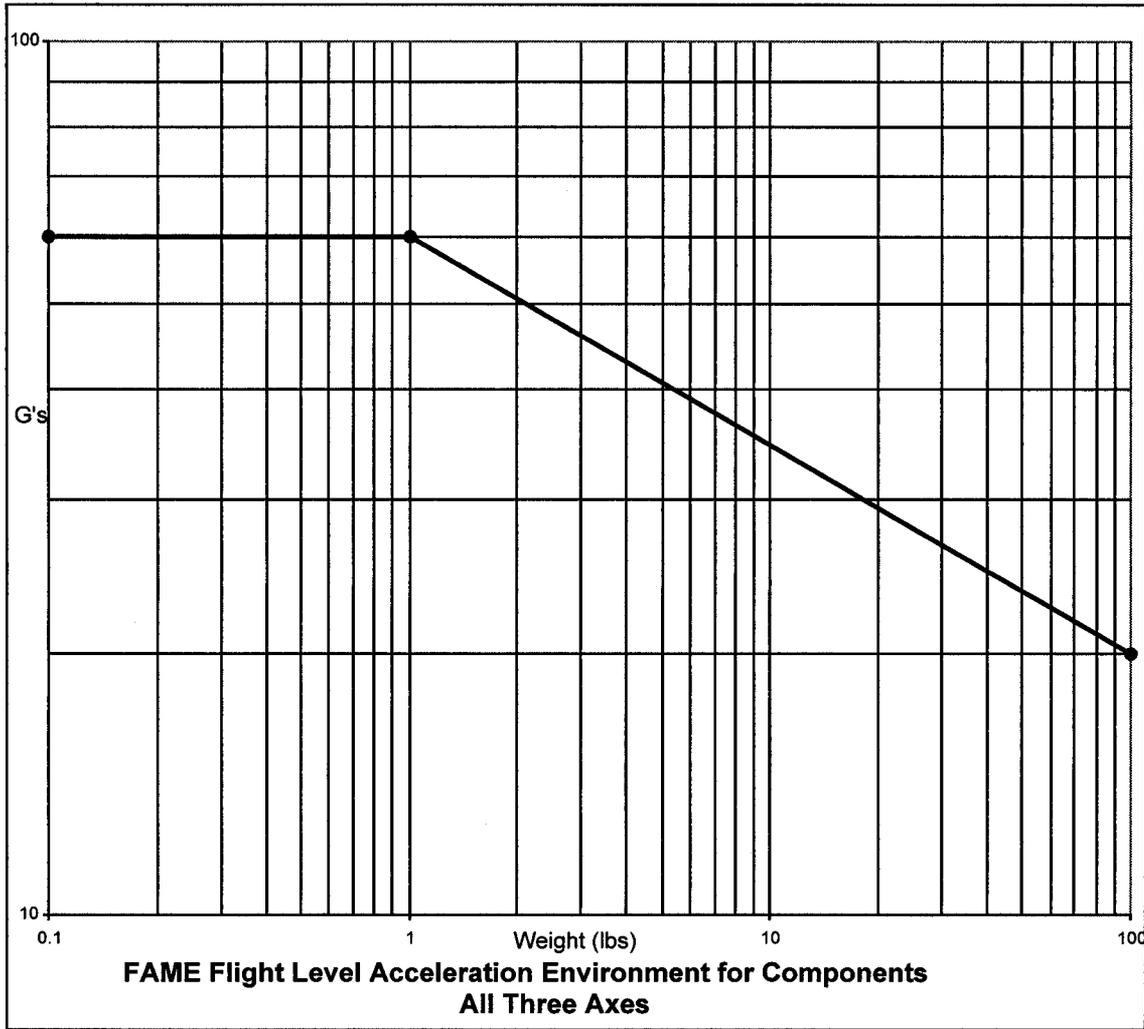


Figure 3-1. Pressure Decay Curve



Design Accelerations	
Component Wt. (Lbs)	G's
0.1	60
1	60
100	20

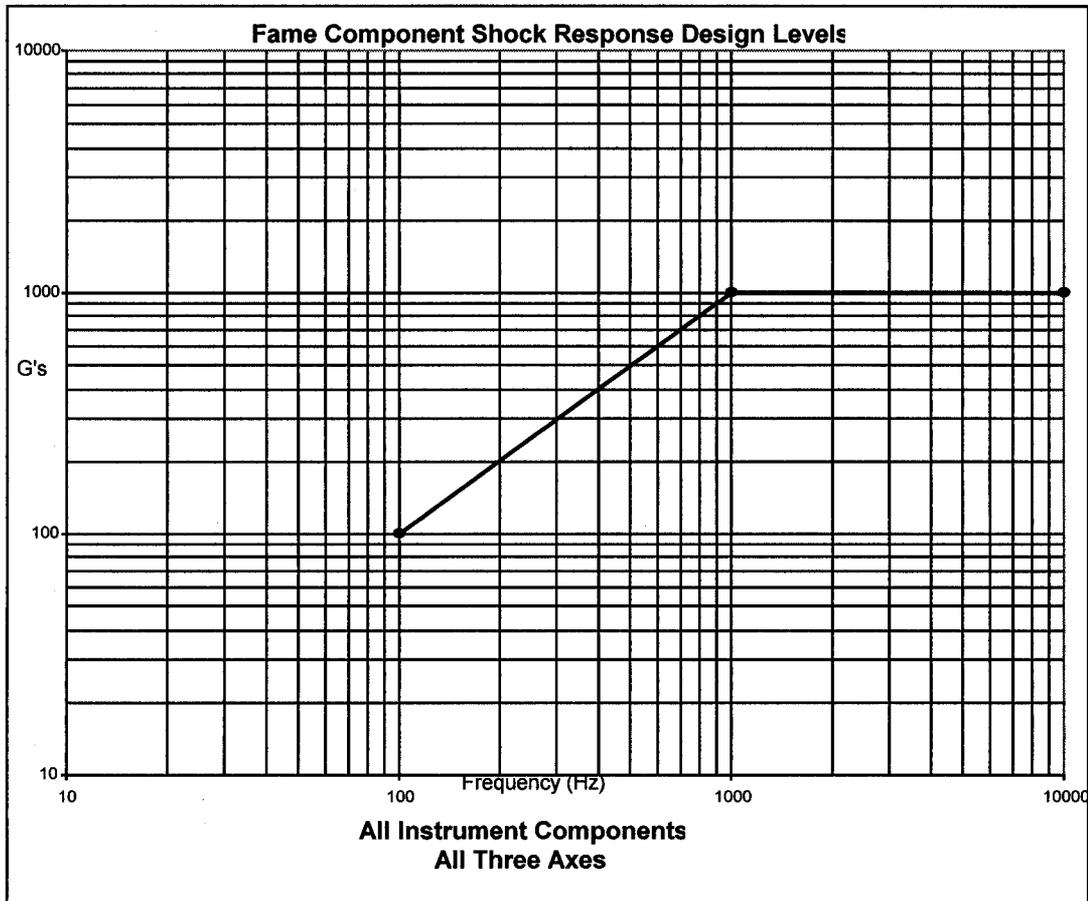
Design Acceleration Philosophy

- * These accelerations are to be used for component testing by sine burst or centrifuge,
- Appropriate factors of safety shall be applied to these accelerations
- For designated components, the acceleration level from this curve may also be used for vibration test tailoring

Figure 3-2. Component Accelerations

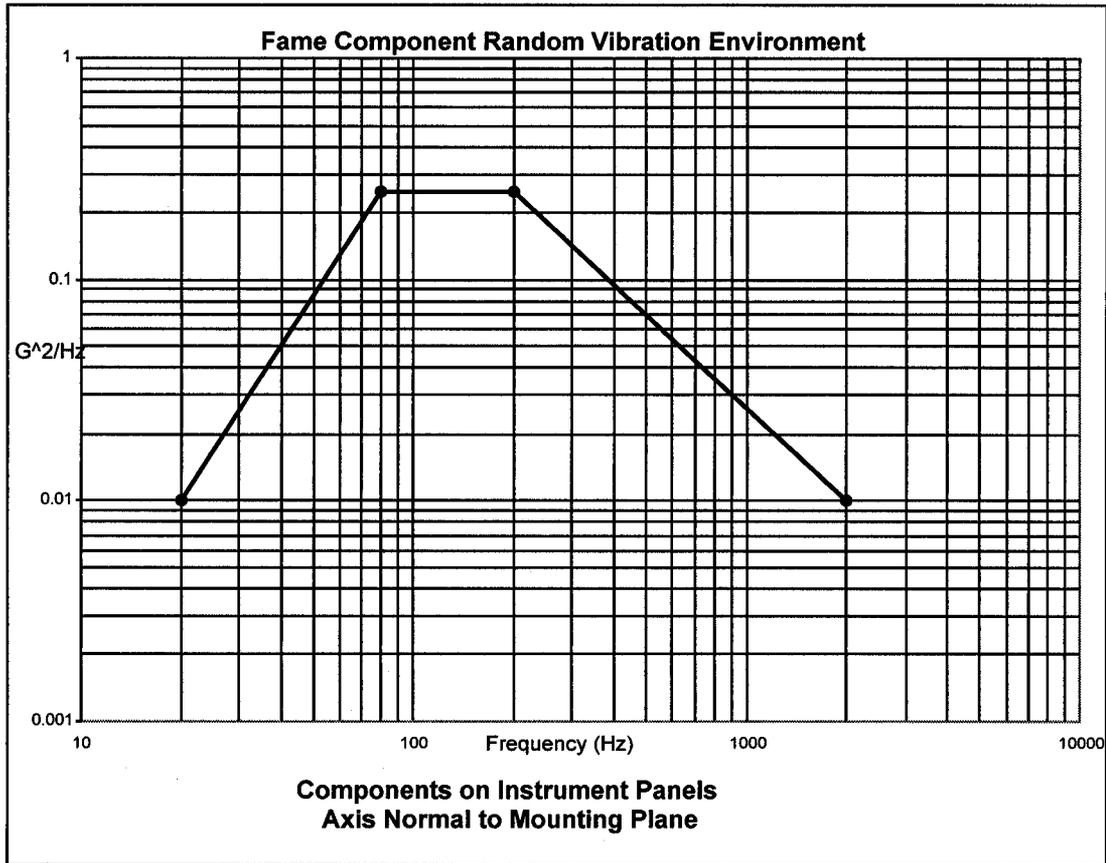
Table 3-2. Quasi-Static Loads and Design Limit Load Factors

	With Test
Yield	1.10
Ultimate	1.40
Fatigue	4.00



Design Environment Shock Response Spectrum Levels		Test Levels	
Frequency (Hz)	G's	Flight	1 Shock per Axis
100	100	Protoflight	2 Shocks per Axis
1000	1000	Qualification	3 Shocks per Axis
10000	1000		
Q = 10			

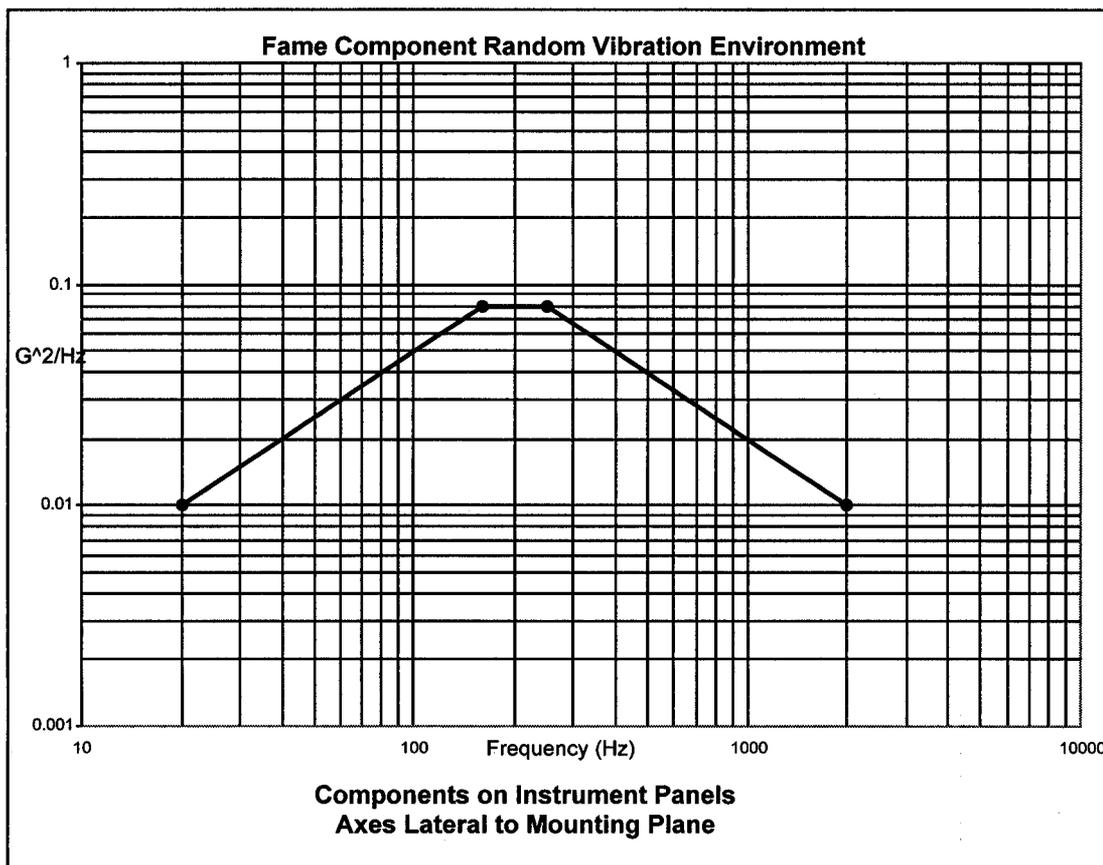
Figure 3-3. Pyroshock Environment



Flight Level Environment	
Frequency (Hz)	G ² /Hz
20	0.01
80	0.25
200	0.25
2000	0.01
10.6 Grms	

Test Levels		
	Margin Above Flight Level (dB)	Duration (Minutes)
Non-Flight Prototypes (Design & Qualification Level)	6	2
Flight Units (Protoflight Acceptance Test)	3	2

Figure 3-4. Random Vibration Environment, Axis Normal To Mounting Plane



Flight Level Environment	
Frequency (Hz)	G ² /Hz
20	0.01
160	0.08
250	0.08
2000	0.01
7.4 Grms	

Test Levels		
	Margin Above Flight Level (dB)	Duration (Minutes)
Non-Flight Prototypes (Design & Qualification Level)	6	2
Flight Units (Protoflight Acceptance Test)	3	2

Figure 3-5. Random Vibration Environment, Axes Lateral To Mounting Plane

3.2.6.2.2 Orbital Operations

The orbital operations phase covers those environments that occur when the observatory reaches geosynchronous altitudes. The ST shall meet the requirements of this document without refurbishment or adjustment during exposure to any combination of the following environments:

3.2.6.2.2.1 Temperature

The ST baseplate temperature will be maintained to -20°C to +55°C. Full performance as specified in paragraph 3.2.1 is required for ST baseplate temperatures -20°C to 0°C with reduced performance allowed for temperatures above 0°C.

3.2.6.2.2.2 Pressure

The ST shall meet the requirements of this document while operating in a hard vacuum of less than 1×10^{-5} torr.

3.2.6.2.2.3 Particle Radiation

The FAME observatory will be subjected to galactic cosmic radiation, geomagnetically trapped particle radiation, and solar particle event (SPE) radiation (Table 3-3). It is imperative that mission critical electronics continue to operate within specifications until the end of the 5 year extended mission and during the worst case solar activity. Therefore, design requirements shall address Total Ionizing Dose (TID) and Single Event Effects (SEE) as required by paragraph 5.8 of GSFC-410-MIDEX-001. The anticipated 5 year observatory radiation environment is shown in Figure 3-6.

Table 3-3. FAME Radiation Dose Estimates and Requirements for 5-Year Mission Duration Beginning in November 2004

Hemisphere Aluminum Shielding Thickness	Total Dose +0% Margin for 5 Year Mission
mils(Al)	rads(Si)
0.5	4.68E+08
5.0	1.15E+08
10.0	5.25E+07
25.0	1.14E+07
50.0	2.47E+06
75.0	8.37E+05
100.0	3.36E+05
125.0	1.46E+05
150.0	6.66E+04
175.0	3.27E+04
200.0	1.82E+04
225.0	1.14E+04
250.0	7.79E+03
275.0	5.65E+03
300.0	4.35E+03
350.0	3.06E+03
400.0	2.56E+03

Note 1. The $2\text{-}\pi$ hemispherical shielding assumes that substantial satellite structures attenuate the radiation environment in the other hemisphere (e.g. boxes near a surface). $4\text{-}\pi$ geometry may be a more appropriate where structures are deep within the satellite.

Note 2. Spherical shielding is usually a conservative assumption, and refined dose estimates based on ray tracing sector analyses will lead to lower doses for box geometries of equal thickness.

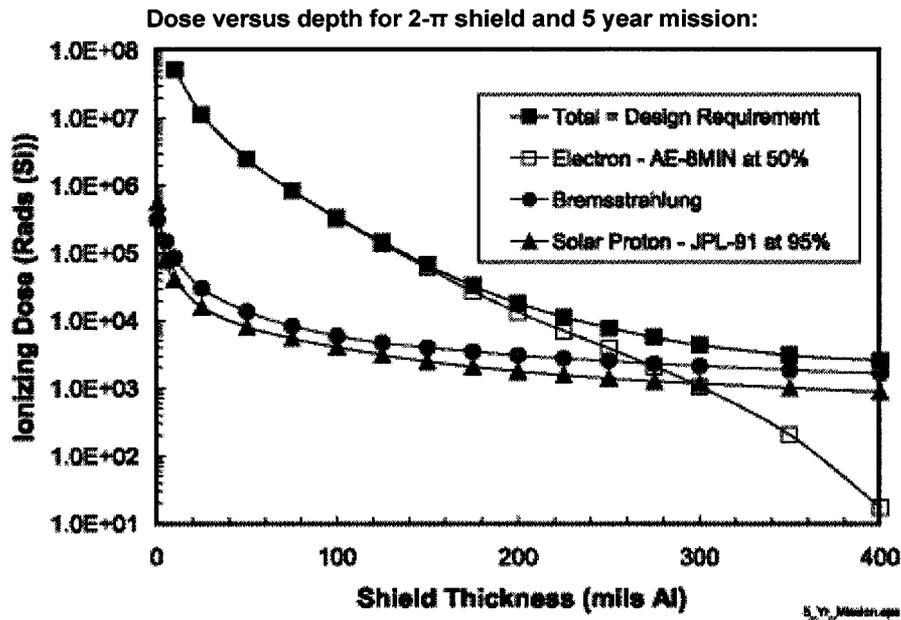


Figure 3-6. Observatory Radiation Environment

3.2.6.2.2.3.1 Total Ionizing Dose

- a. Any part used in the observatory shall meet the requirements of this document at a minimum TID failure level of 18.2 krad(Si). This level is arrived at using the depth-dose relation of Figure 3-6 with an assumed hemispherical shield thickness of 200 mils Al. The minimum hardness level of 18.2 krad(Si) also includes a factor of 2 that is recommended for uncertainty in the environment.
- b. Any part that does not meet this minimum requirement of 18.2 krad(Si) shall be identified in the Preliminary Design Review (PDR).

3.2.6.2.2.3.2 Single Event Effects

SEE shall be considered for the galactic cosmic ray environment and for the worst expected SPE.

- a. The galactic cosmic ray design environment for the nominal case of 200 mils Al shielding during solar minimum conditions is a Linear Energy Transfer of 35 MeV cm²/mg.
- b. The observatory will be subjected to occasional SPE producing high fluxes (>10⁵ p/cm²/s) for short periods and with elevated levels for periods of up to several days. While the science mission may be interrupted during SPE, the events must not compromise the survival of the observatory or the completion of the science mission objectives.

3.2.6.2.2.3.2.1 Single Event Induced Destructive Failure

- a. The ST shall not be susceptible to single event induced failure (including latchup, burnout, gate rupture, and secondary breakdown) unless the Single Event Latchup (SEL) effects can be mitigated by design.
- b. Where single event failure cannot be ruled out the part shall be identified at PDR and its use, along with mitigation approach, justified.

3.2.6.2.2.3.2.2 Single Event Induced Non-Destructive Failures

- a. The use of parts with these non-destructive failure modes may be allowed if analyses can show that they do not cause uncorrectable errors or affect system performance. Such parts shall be identified at PDR, along with failure effect and mitigation strategy (e.g., watchdog timer with autonomous power cycle or reset command).

3.2.6.2.2.3.2.3 Single Event Induced Soft Errors

- a. Nondestructive SEE (including Single Event Upsets [SEU] or transients in linear devices) shall not cause ST failure, compromise ST health, or affect ST performance.
- b. The use of parts with soft error modes may be allowed if analyses show that uncorrectable errors or effects to system performance do not occur. Such parts shall be identified at PDR/FDR, along with failure effect and mitigation strategy (e.g., Error Detection and Correction [EDAC] on memories or filters on linears).

3.2.6.2.2.4 Acceleration

The accelerations experienced by the ST during orbital operations will not exceed launch loads in any direction.

3.2.6.2.2.5 Pyrotechnic Shock

The pyrotechnic shock environment experienced by the ST during orbital operations will not exceed the launch and ascent environment.

3.2.6.2.2.6 Random Vibration

The random vibration environment experienced by the ST during orbital operations will not exceed the launch and ascent environment.

3.2.7 Transportability**3.2.7.1 Packaging and Transportation**

Packaging shall be sufficient to ensure that the ST is received in working condition and is free of damage or defects caused by transportation. If required, a packaging and transportation plan or procedure shall be developed. The plan shall address special handling requirements as applicable to the unit being delivered. Transportation of any explosive devices (i.e., ordnance) shall be in accordance with the requirements of the applicable carrier.

3.2.7.2 Marking

Marking for shipment shall be appropriate for the mode of shipment.

3.3 Design and Construction

The following paragraphs describe the general requirements for design and construction that are applicable to the ST.

3.3.1 Parts, Materials, and Processes

The Contractor shall implement a Parts, Materials, and Processes (PMP) in accordance with the guidelines contained in GSFC-410-MIDEX-001, paragraph 5.1, *Parts*, and paragraph 5.2, *Materials and Processes*.

- a. The radiation hardness characteristics of all EEE parts shall be established, implemented, and maintained. Resultant data shall be presented for review at the PDR and the Final Design Review (FDR).
- b. Interconnecting cables, harnesses, and wiring shall be selected in accordance with the guidelines of NASA-STD-8739.4.
- c. Electronic parts and materials that have been permanently installed in an assembly and which are then removed from an assembly for any reason shall not be used in any item of spaceflight hardware.

3.3.1.1 Parts**3.3.1.1.1 EEE Standard Parts Selection Criteria**

The goal of the EEE parts program is to provide the highest reliability level available within the program and schedule limitations.

- a. The Contractor shall select standard EEE parts in accordance with GSFC 311-INST-001A with a quality level no lower than Level 2.
- b. All other parts selection shall be considered nonstandard and shall be presented for review at the PDR and FDR.

3.3.1.1.2 EEE Parts Procurement, Processing, and Screening

The Contractor shall use the following guidelines for establishment of their parts program:

- a. EEE parts shall be procured and screened as specified herein, except that rescreening of JANTXV devices is not required, and requirements for a coordinated parts procurement do not apply. A parts control board is optional.
- b. Specific FAME program parts screening requirements are as follows:
 - 1. The parts program shall provide for a review of Government-Industry Data Exchange Program (GIDEP) alerts, notices, and advisories and provide notification to NRL on affected parts and assemblies.
 - 2. Microcircuits and semiconductors shall be subjected to radiographic (X-ray) inspection and Particle Impact Noise Detection (PIND) as appropriate to their construction.
 - 3. Parts screening guidelines shall be required for all nonstandard parts.
 - 4. Microcircuits per MIL-PRF-38534 or MIL-PRF-38535 are preferred. However, microcircuits that are fully compliant with paragraph 1.2.1 of MIL-STD-883 may be used with approval from the FAME Project Management Office (PMO). If a microcircuit is not a Qualified Parts List (QPL) class B part or purchased from a Qualified Manufacturer List (QML) vendor, then it shall be considered as nonstandard and subject to review at the PDR and FDR.
 - 5. The decision criteria to perform Destructive Physical Analysis (DPA) will be in accordance with the guidelines provided in GSFC 311-INST-001A for a quality level no lower than Level 2. Except as otherwise specified in paragraph 5.2 of GSFC-410-MIDEX-001, a DPA should not be required unless it is deemed necessary as indicated by failure history, GIDEP alert, or a parts control board.
 - 6. The parts program shall ensure that the results of receiving inspection, parts tests, material review boards, and parts problems reported from system testing are documented and periodically reviewed.

3.3.1.1.3 EEE Parts Stress Derating

As part of the design process, the Contractor shall derate all EEE parts such that the applied stresses do not exceed the derating criteria guidelines of SSD-D-IM007 (as tailored for the FAME program) and MIL-HDBK-1547.

3.3.1.1.4 Electrostatic Discharge Sensitive EEE Parts

- a. All electrical components using ESD parts shall provide adequate protection to preclude part failure resulting from handling, shipment, or storage situation.
- b. ESD protection shall be in accordance with approved processes and procedures that implement NASA-STD-8739.7, MIL-STD-1686, or EIA-625 guidelines.

3.3.1.2 Materials

3.3.1.2.1 Outgassing

- a. Materials exhibiting total mass loss (TML) of 1.0% or less and collected volatile condensable material (CVCM) values of 0.1% or less shall be used in accordance with SP-R-0022.
- b. Any materials that fail to meet these criteria shall be identified to the FAME PMO.

3.3.1.2.2 Structural and Metallic Materials

MSFC-SPEC-522 Table I materials are strongly preferred. MSFC-SPEC-522 Table II and Table III materials should receive careful consideration and shall be identified at the PDR and FDR.

- a. Metallic materials shall be corrosion resistant by nature or shall be corrosion inhibited by means of protective coatings.
- b. Base metals intended for intermetallic contact that form galvanic couples shall be plated with those metals that reduce the potential difference or shall be suitably insulated by a nonconducting finish.
- c. Electrical bonding methods shall include provisions for corrosion protection of mating surfaces. Use of dissimilar metals shall be avoided.
- d. Pressurized systems shall meet the requirements of MIL-STD-1522 and EWRR 127-1.

3.3.1.2.3 Magnetic Materials

The residual dipole of the FAME space segment must be minimized and the use of magnetic materials should be avoided whenever possible. When magnetic materials must be used they shall be identified, along with the field intensity caused by the material, at the PDR and FDR.

3.3.1.2.4 Finishes

- a. Cadmium and zinc coatings shall not be used.
- b. Pure tin coated components shall not be used within electronic boxes.

3.3.1.2.5 Toxic Products and Formulations

Toxic products and formulations shall meet the applicable OSHA and launch site safety requirements.

3.3.1.2.6 Stress Corrosion

Materials shall be selected to control stress corrosion cracking in accordance with MSFC-SPEC-522.

3.3.1.2.7 Polymer Materials

Uralane 5750 (B/A) shall be used for conformal coating applications.

3.3.1.3 Processes

3.3.1.3.1 Soldering and Other Processes

Soldering and other processes shall be specified in NRL-approved process specifications. NRL reserves the right to inspect and approve all process specifications.

- a. Special processes (e.g., adhesive bonding, plating, etc.) shall be in accordance with NRL-approved process specifications.
- b. Soldering of electrical connections shall be in accordance with ANSI/J-STD-001 (High Reliability Class) and the applicable associated standards ANSI/J-STD-002 through -006 or to process specifications that implement NASA-STD-8739.3 and NASA-STD-8739.4 guidelines.
- c. Crimping of electrical connections shall be in accordance with process specifications that implement NASA-STD-8739.4 guidelines.
- d. Conformal coating and staking of printed wiring boards and electronic assemblies shall be in accordance with process specifications that implement NASA-STD-8739.1 guidelines.
- e. Printed Circuit Boards (PCBs) used in the fabrication of the equipment shall conform to the requirements of IPC-D-275, IPC-FC-250, IPC-FC-250A-86, and IPC-A-600D (or their NRL-approved equivalents) or NASA-STD-8739.2.

3.3.1.3.2 Traceability Process

The Contractor shall maintain a system for categorizing PMP and EEE parts into sets of homogeneous groups and tracing those parts through the fabrication, assembly, test, and delivery cycles.

- a. The ST PMP shall be traceable from the initial vendor of part, material, or component through the completed hardware item.
- b. EEE parts shall be traced by part number, serial number (when available), and lot number.
 - 1. The Contractor shall maintain fabrication records (i.e., travelers) that provide two-way traceability from the first stages of assembly through final acceptance testing.
 - 2. Specific entries shall be made on the fabrication record as parts are installed.
 - 3. Traceability records shall be as shown in Table 3-4.

Table 3-4. Traceability and Lot Control

Part	Relevant Information
Electronic Piece Parts	Mfg/Date/Lot Code
Printed Circuit Boards	Serial Number
Potting/Adhesives/Coatings	Batch Number
Plating of Electronic Housings	Production/Manufacturer Lot Number
Modules and Assemblies	Serial Number
Connectors	Manufacturer Lot Number and Date Code
Chassis Case and Structures	Lot or Heat Treat Number

- c. All electronics piece parts installed shall be identified and documented in order to be traceable to a specific manufacturer, lot number, or date/lot code.
- d. The Contractor shall maintain coupons for all Printed Wiring Boards (PWBs) used in each final assembly. The coupons shall have traceability as defined in paragraph 3.3.1.3.2.c.

3.3.1.3.3 Failure Reporting and Corrective Action System

- a. The Contractor shall establish and maintain a closed loop failure reporting and corrective action system (FRACAS) for reporting, analysis, and corrective action of failures occurring during the acceptance testing phases and continuing until integration with the ELV.
- b. The FRACAS shall determine whether failures are caused by design deficiencies, human error, defective parts, infant mortality, test equipment, environmental exposure, or software.

3.3.2 Electromagnetic Environment

The ST shall be designed and constructed such that each item is compatible with itself and with its known environments.

3.3.2.1 Conducted Emission

The ST shall meet the conducted emissions levels defined in Figure 3-7 and Figure 3-8 for FAME. The requirements are modifications of the MIL-STD-461C limits. MIL-STD-462 test methods shall be used.

3.3.2.2 Conducted Susceptibility

The ST shall not exhibit malfunctions, degradation of performance, or deviation from specification when subjected to the levels defined in Figure 3-9 for CS01 or 0.18 Vrms (0.5 Vp-p) from a 50 Ohm source for CS02 frequency range of 50 kHz to 400 MHz. The requirements are modifications of the MIL-STD-461C limits. MIL-STD-462 test methods shall be used.

3.3.2.3 Radiated Emissions.

The subsystem shall be designed to limit radiated emissions to the levels specified herein.

3.3.2.3.1 Narrowband Emissions

The apparent field strength of narrowband emissions at one meter from the ST shall be limited to the values shown in Figure 3-10. The requirement is a modification of MIL-STD-461C Part 3, Curve #1. A notch was included for the frequency range of 2015 - 2130 MHz. MIL-STD-462 test methods shall be used.

3.3.2.3.2 Broadband Emissions

Not applicable.

3.3.2.4 Radiated Susceptibility

The ST shall be designed to operate without malfunction, undesirable response, or deviation from specified performance tolerances when subjected to the radiated emissions specified herein.

3.3.2.4.1 Narrowband Susceptibility

The ST shall withstand a modified MIL-STD-461D RS103 level of 20 V/m, 1 kHz pulse modulation for frequencies from 10 kHz to 18 GHz, with a 40 V/m notch at 2200 to 2300 MHz. MIL-STD-462 test methods shall be used.

3.3.2.4.2 Broadband Susceptibility

Not applicable.

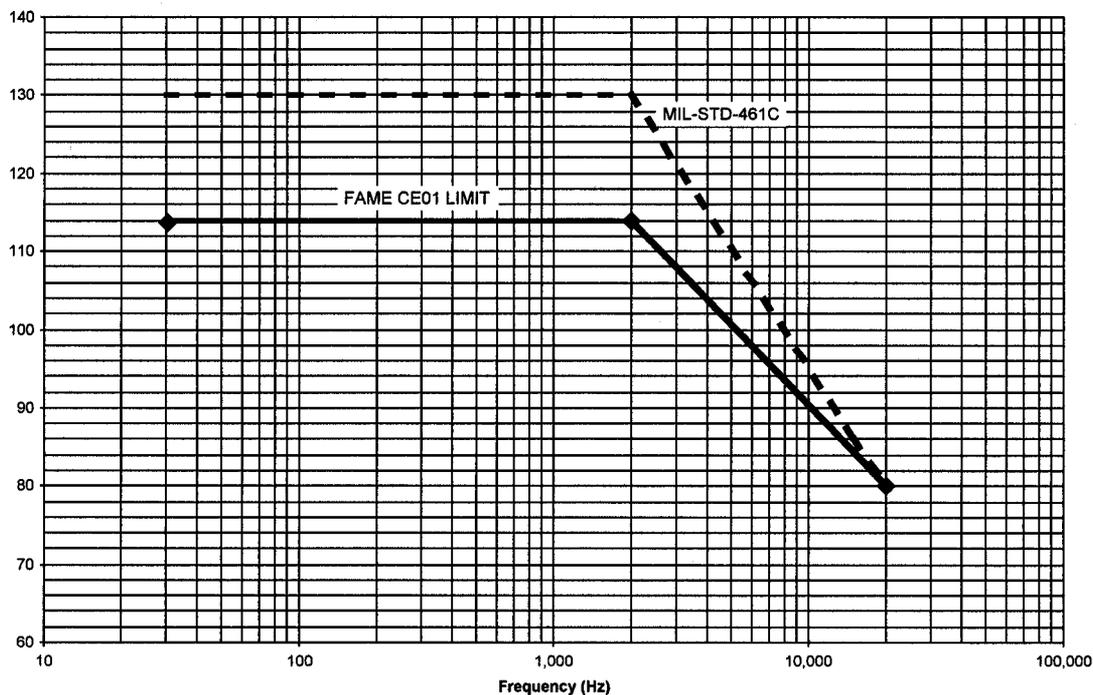


Figure 3-7. Limit for CE01 Narrowband Emissions

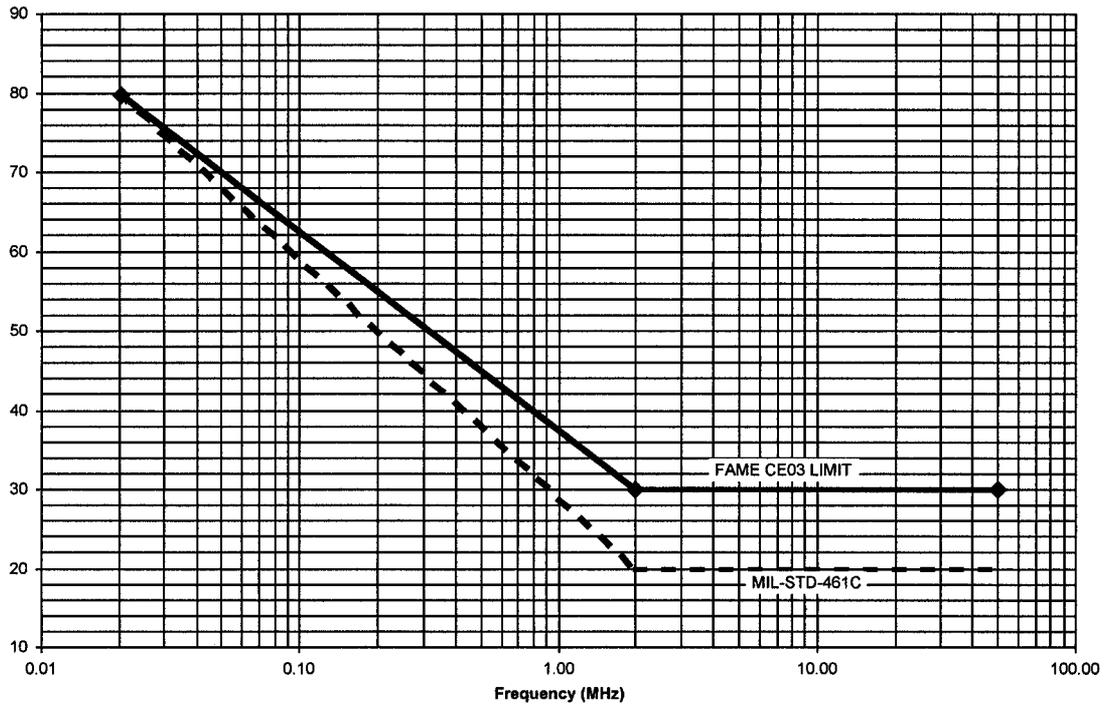


Figure 3-8. Limit for CE03 Narrowband Emissions

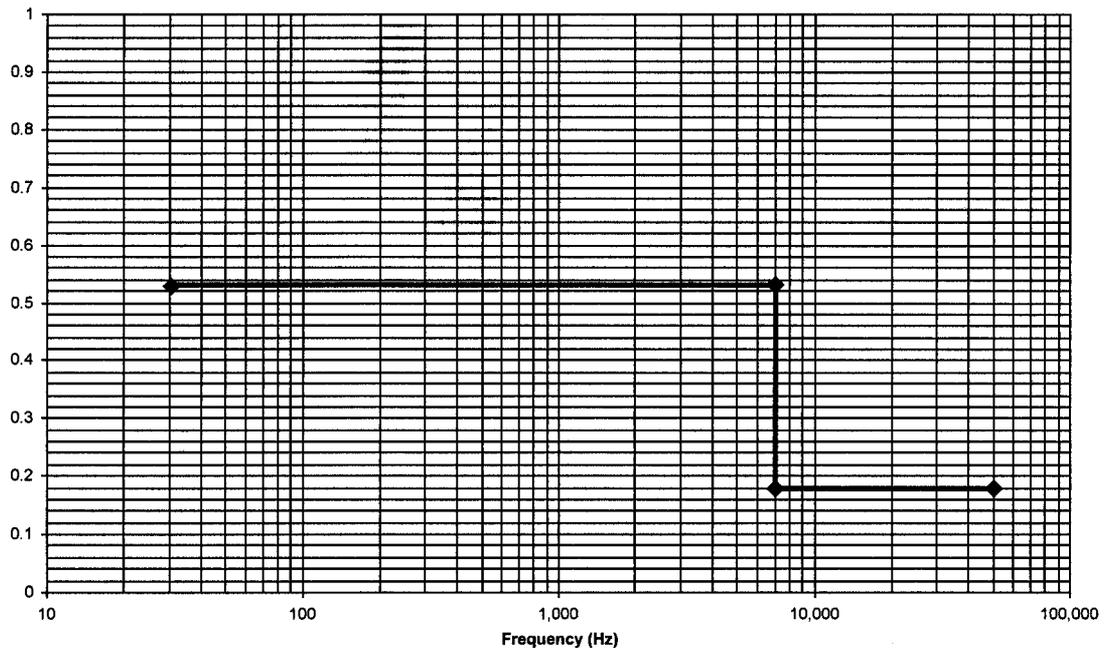


Figure 3-9. CS01 Voltage Injection Levels (30 Hz to 50 kHz)

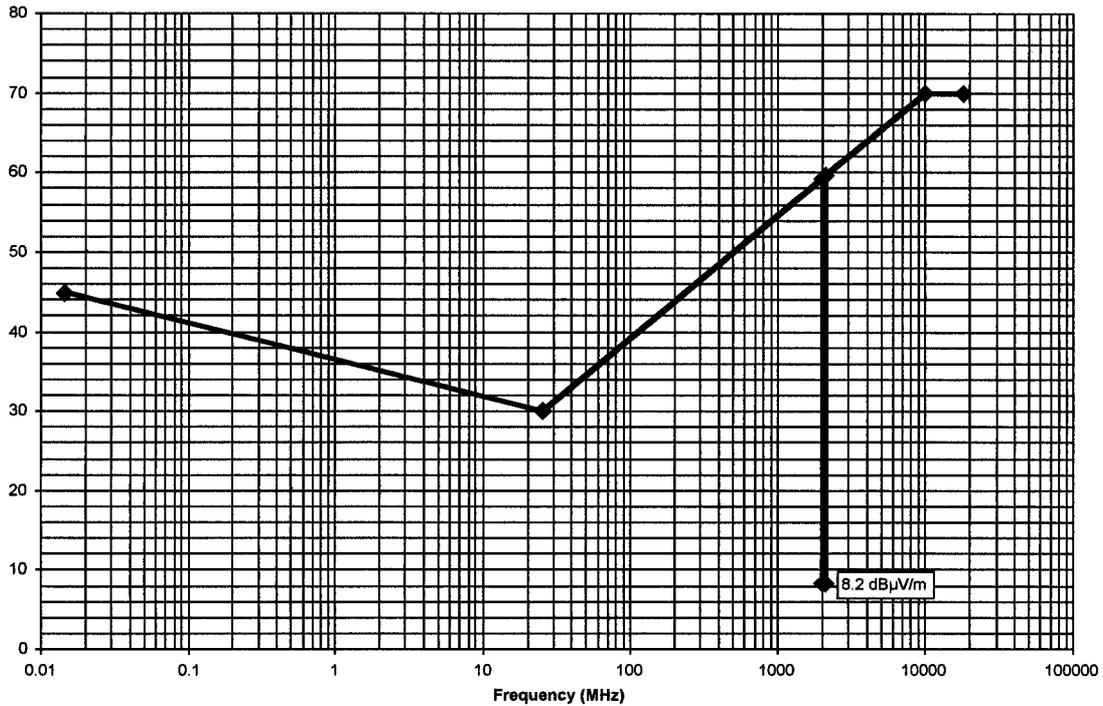


Figure 3-10. Limit for RE02 Narrowband Emissions (14 kHz to 18 GHz)

3.3.3 Corona Suppression

The ST shall be designed to minimize the occurrence of corona discharge in all normal operating environments.

3.3.4 Nameplate and Product Marking

ST components that are interchangeable shall be identified by part number and serial number or lot number.

3.3.5 Workmanship

- a. All parts and assemblies shall be designed and manufactured in accordance with NRL-approved process specifications or drawings.
- b. All parts and assemblies shall be free of defects that would interfere with operational use, such as excessive scratches, nicks, burrs, loose material, contamination, and corrosion.
- c. Equipment shall be manufactured, processed, tested, and handled such that finished items are of sufficient quality to ensure reliable operation, safety, and service life in the operational environments.

3.3.6 Interchangeability

Assemblies, components, and parts having identical part numbers shall, where practicable, meet the requirements for an interchangeable item as defined in paragraph 6.1.3.

3.3.7 Safety

The ST shall not present non-controllable health hazards associated with electrical discharge, ionizing or non-ionizing radiation, noise, or other emissions. The ST shall be designed such that no single failure or single operator error can result in a critical hazard. The Contractor shall document any hazards to provide a basis for reducing risk to an acceptable level, along with any necessary personnel protection procedures. No health hazards shall exist when the ST is removed, maintained, installed, or in storage. The ST and its associated ground support equipment (GSE)

shall be capable of being safely stored, handled, transported, installed, and checked out at all times prior to launch, in accordance with procedures agreed to between NRL and the Contractor.

3.4 Documentation

Documentation shall be prepared according to the Contractor's established practices for spaceflight equipment. The documents shall meet the intent of NRL's internal methods and practices for control of spaceflight hardware. The results of trades studies, analyses, and development efforts shall be documented to support critical design decisions and milestone technical reviews during the course of the system development.

3.4.1 Specifications

- a. Specifications shall be prepared in accordance with MIL-STD-961 and the appropriate Data Item Descriptions (DIDs) or their NRL-approved equivalents.
- b. Software specifications shall be prepared in accordance with NASA-STD-2100-91, IEEE/EIA 12207.0, IEEE/EIA 12207.1, IEEE/EIA 12207.2, or their NRL-approved equivalents.
- c. These documents shall be subject to change control procedures and every proposed engineering change shall consider the effect of that change on these documents so that compatibility is maintained.

3.4.2 Drawings

- a. Specifications and hardware shall be supported by drawings in accordance with MIL-DTL-31000 or NRL-approved equivalent.
- b. The final system documentation shall be such that subsequent production items can be produced or procured that are essentially equivalent in all respects to those initially tested or delivered.
- c. This final documentation shall also be adequate to allow the rapid incorporation of changes and modifications that have been approved by the procuring activity.
- d. Documentation describing space segment operational procedures shall include contingency procedures to minimize the effect of possible on-orbit anomalies.

3.4.3 Test Plans and Procedures

- a. All test plans and procedures shall be documented so that testing can be accomplished on site by skilled engineering personnel.
- b. Software test plans, descriptions, and procedures shall be prepared in accordance with NASA-STD-2100-91, IEEE/EIA 12207.0, IEEE/EIA 12207.1, and IEEE/EIA 12207.2.

3.4.4 Precedence

The order of precedence of the requirements specified herein is:

- a. Safety;
- b. Mission;
- c. Design to cost;
- d. Performance;
- e. Quality factors; and
- f. All other requirements are considered equal in order of precedence.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 General

This section describes the analyses, tests, and inspections required for the ST verification process. Verification of ST design, construction, and performance will assure that the hardware and software conform to the requirements stated herein. The preferred method is test, where practical, to obtain empirical data to support verification. However, to meet program technical, schedule, and cost objectives, reuse of previously qualified flight equipment may dictate use of other verification methods (e.g., inspection, analysis, and review of design documentation). The analyses, tests, and inspections specified in Table 4-1 (included at the end of this section) will be conducted to verify that all requirements specified in Section 3.0 have been achieved.

4.1.1 Responsibility for Tests

The Contractor will perform all or any of the verification requirements of this specification. Except as otherwise specified, the Contractor may use its own or any other facilities suitable for performance of the inspection and test requirements specified herein, unless disapproved by the government. The FAME PMO reserves the right to perform any tests or inspections set forth herein when deemed necessary to ensure that supplies and services conform to prescribed requirements. Ultimate responsibility for proper operation of each component or subsystem remains with the NRL subsystem manager.

4.2 Quality Assurance Program Requirements

The Contractor's quality assurance program shall provide control of the following areas:

- a. Reliability (paragraph 3.2.2.1);
- b. Parts, materials, and processes (paragraph 3.3.1);
- c. Workmanship (paragraph 3.3.5);
- d. Nonconforming material (paragraph 4.2.1); and
- e. Verification of design requirements (paragraph 4.3).

4.2.1 Control and Use of Nonconforming Material

Non-conforming material shall not be used without NRL approval. All nonconforming material used in the final product shall be adequately documented. Nonconforming material shall be stored in a controlled area until disposition can be made.

4.3 Verification and Verification Documentation

The requirements of Section 3.0 shall be verified by one or more of the methods detailed in the Verification Requirements Checklist (Table 4-1).

- a. Similarity;
- b. Analysis;
- c. Inspection;
- d. Validation of Records;
- e. Demonstration and Measurement;
- f. Simulation;
- g. Review of Design Documentation; and
- h. Test.

Verification will be documented using the Verification Matrix. The matrix will include a separate record for each paragraph. Each record will include the requirement, verification description, compliance data, and approval block. All verification documentation will be made available to inspection, test, and assessment personnel. Applicable

verification drawings, specifications, and procedures will be physically located at the verification site at the time of the verification event.

4.3.1 Verification by Similarity

Verification by similarity is a method of verification that verifies a requirement based on existing results from components and assemblies of like kind and includes a review of prior relevant hardware configurations and applications. Hardware of similar design and manufacturing process that have been qualified to equivalent or more stringent specifications may be verified by similarity.

4.3.2 Verification by Analysis

A method of verification, taking the form of the processing and accumulated results and conclusions, intended to provide proof that verification of a requirement(s) has been accomplished. The analytical results may be based on engineering study, compilation or interpretation of existing information, similarity to previously verified requirements, or derived from lower level examinations, tests, demonstrations, or analyses. Analyses will be performed as specified in Table 4-1 to verify applicable requirements of Section 3.0. The analytical methods that may be used include engineering analyses in the specified technical discipline, similarity to a previously verified requirement, review of drawings and data, use of experience, or prior testing. When an analysis is specified in Table 4-1, a detailed engineering study to verify compliance with Section 3.0 of this document will be performed and documented.

4.3.3 Verification by Inspection

An element of verification consisting of investigation, without the use of special laboratory appliances or procedures, to determine compliance with requirements. Examination is nondestructive and includes (but is not limited to) visual inspection, simple physical manipulation, gauging and measurement. Inspections will be performed as specified in Table 4-1 to verify applicable requirements of Section 3.0. These inspections are to be performed before unit qualification or acceptance testing as part of the normal quality control inspection process.

4.3.4 Validation of Records

Validation of records is a method of verification that consists of a systematic review of all relevant records to demonstrate compliance with a requirement. This method occurs as part of the hardware and software buy-off process. For requirements verified by this method, the approved buy-off package will serve to certify verification.

4.3.5 Demonstration or Measurement

A method of verification that is limited to readily observable functional operation to determine compliance with requirements. This method will not require the use of special equipment or sophisticated instrumentation.

4.3.6 Simulation

Verification by simulation is a process of verifying a requirement through the use of a representative device or system that emulates the behavior of a device or system to be verified. This method is often used when direct measurements is not possible.

4.3.7 Review of Design Documentation

Verification by the review of design documentation is a method of verification that consists of a systematic review of design documentation to determine compliance with a requirement.

4.3.8 Verification by Test

A method of verification that employs technical means, including (but not limited to) the evaluation of functional operation by use of special equipment or instrumentation, simulation techniques and the application of established principles and procedures, to determine compliance with requirements. The analysis of data derived from test is an integral part of this verification method.

Verification performed by test will be conducted in accordance with NRL-approved test procedures. Criteria and procedures for critical parameters monitoring during test will be developed and include, as appropriate, test chamber

temperature, test article temperature, pressure, test voltages and currents, test acoustic spectrum and level, test vibration spectrum and level, illumination, particle or radiation flux, instrument response and telemetry, and contamination. The FAME program will use the four types of tests specified below:

- a. Functional tests to verify in an abbreviated fashion that the unit or system is functioning;
- b. Performance tests to demonstrate and quantify the specified optical, electrical and/or mechanical performance parameters of the unit or system;
- c. Qualification tests to verify inherent functional performance capabilities in excess of the design requirements over the specified environment, including special interface qualification tests performed at Kennedy Space Center (KSC) or NRL using flight equivalent units; and
- d. Acceptance tests to gain confidence that each unit has achieved the inherent design capability verified on a sample basis.

4.3.8.1 Functional/Performance Tests

Functional or performance tests will be performed before, during, and after environmental exposures as part of the acceptance and qualification test sequences. This performance check will be made in accordance with approved test procedures. A record will be made of all data necessary to determine complete operational and performance characteristics.

4.3.8.2 Environmental Tests

4.3.8.2.1 Acceptance Tests

Acceptance tests will be conducted to demonstrate acceptability of an item for movement to the next stage of testing or buy-off. Acceptance tests are intended to act as a quality screening and process control tool to detect deficiencies of workmanship, material, and quality. The following acceptance tests shall be performed as detailed in Table 4-1.

4.3.8.2.1.1 Physical Test

The values and parameters specified in this specification for weight, center of gravity, moment of inertia, and envelope shall be verified.

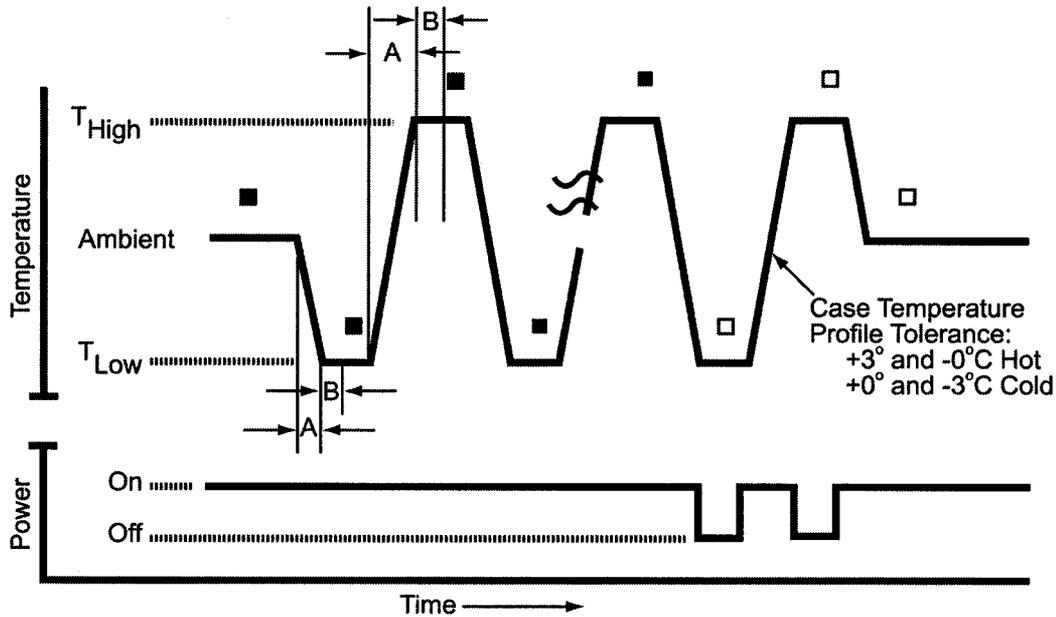
4.3.8.2.1.2 Random Vibration

Random vibration levels shall be at flight levels plus 3 dB, 1 minute duration in each of three axes. Testing shall be accomplished in each of three mutually perpendicular axes. Verification shall be conducted to assure compliance with paragraph 3.2.6.2.1.

4.3.8.2.1.3 Thermal Cycling

The thermal cycling test demonstrates the ability of ST components to operate under the anticipated temperature extremes plus a 5°C design margin and may reveal latent workmanship defects or marginal EEE parts. Components shall exhibit normal turn-on characteristics at the specified high and low temperatures. This shall be demonstrated during the last high and low temperature dwell after the ST has been in an unpowered state for at least 0.5 hour. Additionally, functional tests shall be performed at the hot and cold dwells during the first and last cycle and after return of the ST to ambient temperature. Thermal cycling requirements are shown in Figure 4-1.

Procedure	No. of Cycles	T _{High}	T _{Low}
Qualification	13	65°C	-30°C
Acceptance	7	60°C	-25°C



- Performance Test
- Functional Test
- A Transition Rates as High as Practical, Not to Exceed 5°C/Min
- B Two Hours Minimum for Temperature Stabilization

Notes:

1. Specimen Performance Will Be Monitored During Temperature Transients When Power Is On.
2. At the End of Testing Day, Temperatures May Be Allowed to Return to Ambient Without Regard to Rate.
3. Functional Test at the First and Last Thermal Cycle Shall Be Run at 24, 28, and 36 Volts.

tmp_cyc2.eps

Figure 4-1. Thermal Cycling Profile

4.3.8.2.1.4 Thermal Vacuum

Tests shall be conducted to verify compliance with paragraph 3.2.6.2.1 and 3.2.6.2.2.1. Baseplate temperature limits shall be 5°C above and 5°C below flight temperature extremes. The pressure shall be 1 x 10⁻⁵ torr or less. The number of cycles shall be at least one and the dwell time at high and low temperature extremes shall not be less than 6 hours or the time required to verify subsystem performance. Critical parameter monitoring shall be accomplished during temperature transients. Thermal vacuum requirements are shown in Figure 4-2.

Procedure	No. of Cycles	T _{High}	T _{Low}
Qualification	3	+65°C	-30°C
Acceptance	1	+60°C	-25°C

□ Performance Test (Acceptance)

A Maintain System Temperature Until Interior Temperature Stabilizes

B Operate Over Flight Period

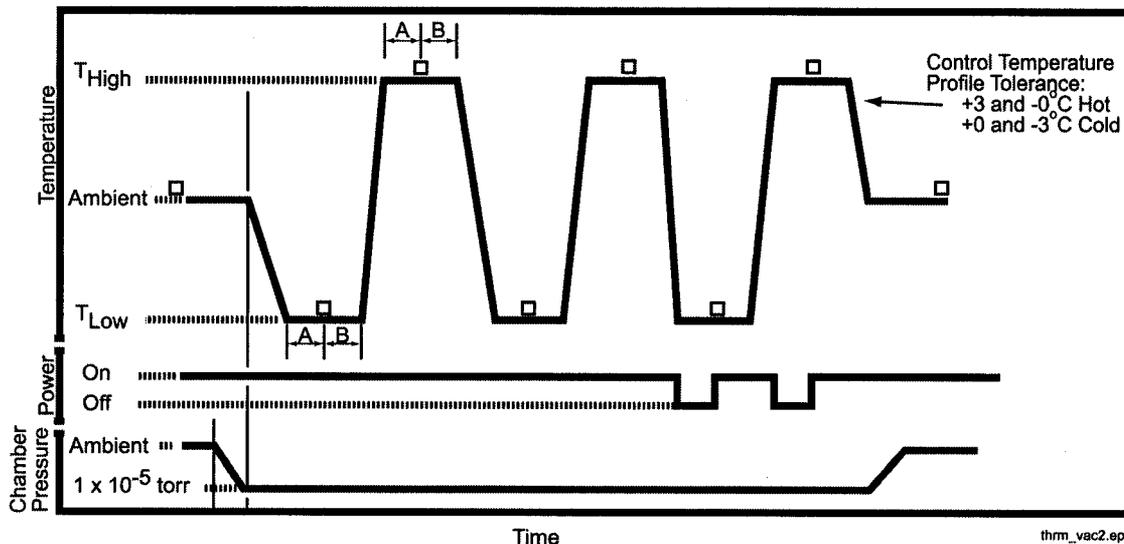


Figure 4-2. Thermal Vacuum Profile

4.3.8.2.1.5 Burn-In Tests

The burn-in test shall be performed to reveal material or workmanship defects that may occur early in the life of the component. Burn-in testing shall only be required on EEE components containing active parts. The total operating time for component burn-in shall be 200 hours including the operating time during thermal and thermal-vacuum cycling. Additional test time beyond that required for thermal cycling shall be conducted at ambient temperatures. The final 50 hours of the component burn-in test shall be failure-free.

4.3.8.2.2 Qualification Tests

Qualification tests will be conducted to demonstrate that the design and manufacturing methods used in the construction of the ST have resulted in an item that meets the specified requirements and has suitable margins when exposed to the expected operating environments. The following qualification tests shall be performed as detailed in the Verification Requirements Checklist (Table 4-1).

4.3.8.2.2.1 Random Vibration

Random vibration levels shall be at flight levels plus 6dB, 2 minute duration in each of three axes. Testing shall be accomplished in each of three mutually perpendicular axes. Verification shall be conducted to assure compliance with paragraph 3.2.6.2.1.

4.3.8.2.2.2 Pyrotechnic Shock

The pyroshock test shall demonstrate the capability of the component to withstand the expected pyrotechnic shock environment. The test may be conducted at the ST or after integration at the spacecraft (system) level by actuating devices that produce shock external to the ST. Verification shall be conducted to assure compliance with paragraph 3.2.6.2.1.

4.3.8.2.2.3 Thermal Stability

Tests shall be conducted to verify that the ST alignments remain within the stated requirement during expected thermal states.

4.3.8.2.2.4 Thermal Cycling

The thermal cycling test demonstrates the ability of ST components to operate under the anticipated temperature extremes plus an 10°C design margin and may reveal latent workmanship defects or marginal EEE parts. Components shall exhibit normal turn-on characteristics at the specified high and low temperatures. This shall be demonstrated during the last high and low temperature dwell after the ST has been in an unpowered state for at least 0.5 hour. Additionally, functional tests shall be performed at the hot and cold dwells during the first and last cycle and after return of the ST to ambient temperature. Thermal cycling requirements are shown in Figure 4-1.

4.3.8.2.2.5 Thermal Vacuum

The thermal vacuum test demonstrates the capability of the ST to perform in a thermal vacuum environment that simulates the design environment extremes plus a 10°C design margin. Tests shall be conducted to verify compliance with paragraph 3.2.6.2.2.1. Critical parameter monitoring shall be accomplished during temperature transients. Thermal vacuum requirements are shown in Figure 4-2.

4.3.8.2.2.6 Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC)

The EMI/EMC test demonstrates that the electromagnetic interference characteristics (emission and susceptibility) of the component under normal operating conditions does not result in malfunction or the ST, and that the component does not emit, radiate, or conduct interference that results in malfunction of other system components. Tests shall be conducted to verify compliance with paragraph 3.3.2.

4.3.9 Verification of Safety Requirements

Safety related requirements will be verified as part of the range safety process.

Table 4-1. Verification Requirements Checklist

Requirement		Verification Method									
Paragraph No.	Title	Not Applicable	Similarity	Analysis	Inspection	Validation of Records	Demonstration or Measurement	Simulation	Review of Design Documentation	Acceptance Test	Qualification Test
3.0	REQUIREMENTS	X									
3.1	Item Definition	X									
3.2	Characteristics	X									
3.2.1	Performance Characteristics	X									
3.2.1.1	Output				X						
3.2.1.2	Accuracy									X	
3.2.1.3	Body Rates									X	
3.2.1.4	Time Determination			X							
3.2.1.5	Optical Alignment Cube			X						X	
3.2.1.6	Bright Object Rejection									X	
3.2.1.7	Sun Exposure									X	
3.2.1.8	Shade Rejection Angles									X	
3.2.1.9	Recovery Time									X	
3.2.1.10	Coordinate System			X							
3.2.1.11	Warm-up Time									X	
3.2.1.12	Integration Time									X	
3.2.1.13	Operation Modes	X									
3.2.1.13.1	Autonomous Attitude Acquisition Mode									X	
3.2.1.13.2	Track Mode									X	
3.2.1.14	Software								X		
3.2.1.15	Software Upload Capability									X	
3.2.1.16	Star Catalog			X							
3.2.1.17	Electrical Interfaces	X									
3.2.1.17.1	Data Outputs				X		X				
3.2.1.17.2	ST Processor			X					X	X	
3.2.1.18	Power	X									
3.2.1.18.1	Input Bus						X				
3.2.1.18.2	Output Voltages								X		
3.2.1.18.3	Power Limitation			X							
3.2.1.18.4	Power Feed								X		
3.2.1.18.5	Fusing								X		
3.2.1.18.6	Input Power Switching	X									
3.2.1.18.7	Primary DC Power Grounding						X				
3.2.2	Physical Characteristics	X									
3.2.2.1	Mass Properties Control and Reporting					X					
3.2.2.1.1	Weight Limits				X						

Requirement		Verification Method									
Paragraph No.	Title	Not Applicable	Similarity	Analysis	Inspection	Validation of Records	Demonstration or Measurement	Simulation	Review of Design Documentation	Acceptance Test	Qualification Test
3.2.2.2	Dimensions and Envelope				X						
3.2.2.3	Coordinate System			X							
3.2.2.4	Minimum Frequency			X							
3.2.2.5	Center of Gravity (CG) Limits			X							
3.2.3	System Quality Factors	X									
3.2.3.1	Reliability			X							
3.2.3.2	Failure Modes, Effects, and Criticality Analysis			X							
3.2.3.3	Electrical Stress Analysis			X							
3.2.3.4	Worst Case Analysis			X							
3.2.3.5	Radiation Analysis			X							
3.2.4	Maintainability	X									
3.2.5	Fault Detection Capability								X		
3.2.6	Environmental Conditions	X									
3.2.6.1	Non-Operating Environment	X									
3.2.6.1.1	Integration and Test Facility Environment			X							
3.2.6.1.2	Ground Handling and Transportation			X							
3.2.6.1.3	Prelaunch			X							
3.2.6.2	Operating Environment	X									
3.2.6.2.1	Launch and Ascent									X	X
3.2.6.2.2	Orbital Operations	X									
3.2.6.2.2.1	Temperature			X							
3.2.6.2.2.2	Pressure			X							
3.2.6.2.2.3	Particle Radiation			X							
3.2.6.2.2.3.1	Total Ionizing Dose			X							
3.2.6.2.2.3.2	Single Event Effects			X							
3.2.6.2.2.3.2.1	Single Event Induced Destructive Failure			X							
3.2.6.2.2.3.2.2	Single Event Induced Non-Destructive Failures			X							
3.2.6.2.2.3.2.3	Single Event Induced Soft Errors			X							
3.2.6.2.2.4	Acceleration	X									
3.2.6.2.2.5	Pyrotechnic Shock	X									
3.2.6.2.2.6	Random Vibration	X									
3.2.7	Transportability	X									
3.2.7.1	Packaging and Transportation			X							
3.2.7.2	Marking				X						
3.3	Design and Construction	X									
3.3.1	Parts, Materials, and Processes			X					X		
3.3.1.1	Parts	X									
3.3.1.1.1	EEE Standard Parts Selection Criteria			X					X		

Requirement		Verification Method									
Paragraph No.	Title	Not Applicable	Similarity	Analysis	Inspection	Validation of Records	Demonstration or Measurement	Simulation	Review of Design Documentation	Acceptance Test	Qualification Test
3.3.1.1.2	EEE Parts Procurement, Processing, and Screening			X					X		
3.3.1.1.3	EEE Parts Stress Derating			X					X		
3.3.1.1.4	Electrostatic Discharge Sensitive EEE Parts				X				X		
3.3.1.2	Materials	X									
3.3.1.2.1	Outgassing			X					X		
3.3.1.2.2	Structural and Metallic Materials				X				X		
3.3.1.2.3	Magnetic Materials			X					X		
3.3.1.2.4	Finishes				X				X		
3.3.1.2.5	Toxic Products and Formulations				X				X		
3.3.1.2.6	Stress Corrosion				X				X		
3.3.1.2.7	Polymer Materials				X				X		
3.3.1.3	Processes	X									
3.3.1.3.1	Soldering and Other Processes				X				X		
3.3.1.3.2	Traceability Process				X				X		
3.3.1.3.3	Failure Reporting and Corrective Action System			X	X						
3.3.2	Electromagnetic Environment	X									
3.3.2.1	Conducted Emission										X
3.3.2.2	Conducted Susceptibility										X
3.3.2.3	Radiated Emissions.	X									
3.3.2.3.1	Narrowband Emissions										X
3.3.2.3.2	Broadband Emissions	X									
3.3.2.4	Radiated Susceptibility	X									
3.3.2.4.1	Narrowband Susceptibility										X
3.3.2.4.2	Broadband Susceptibility	X									
3.3.3	Corona Suppression			X							
3.3.4	Nameplate and Product Marking				X						
3.3.5	Workmanship				X						
3.3.6	Interchangeability			X							
3.3.7	Safety			X							
3.4	Documentation	X									
3.4.1	Specifications				X				X		
3.4.2	Drawings				X				X		
3.4.3	Test Plans and Procedures				X				X		
3.4.4	Precedence	X									

5.0 PREPARATION FOR DELIVERY

This section provides guidance for preparing the ST for delivery.

5.1 Packaging and Transportation

Packaging and transportation of the ST for delivery shall be in accordance with paragraph 3.2.7.

5.2 Containers

The Contractor shall use customer approved industry standard containers for aerospace electronics suitable for hand carrying the packaged item.

6.0 Deliverables and Tasks

6.1 Monthly Status Reports

The Contractor shall provide a monthly status report via DD Form 1423, Contract Data Requirements List (CDRL) A001, identifying progress to date, planned efforts for the next reporting period, and program issues and problems.

6.2 Program Support Documentation

The Contractor shall provide the necessary planning and schedule to meet the delivery requirements. The Contractor shall comment on any potential problems in the schedule and provide a detailed plan of attack for solving those problems. A detailed schedule must be prepared, maintained, and provided to the COR, with schedule changes and/or updates provided. The data shall be provided monthly starting 60 days after award of contract (DAC) via DD Form 1423, A001. The Contractor shall inform the COR within seven days of any and all events or delays at the Contractor's facility that may impact schedule, performance, quality, delivery, or cost. If any delays occur or are anticipated to occur, the Contractor shall notify the COR by phone, following up with a written notification to the Contract Negotiator (identified in Section G of the contract). The Contractor shall provide a copy of the written notification to the COR.

6.3 Interface Control Document

The ST Interface Control Document (ICD), DD Form 1423, A009, shall provide all of the electrical and mechanical interfaces for the ST. This shall include schematics, timing diagrams, pinouts, and command and control requirements. The Contractor shall deliver a complete ICD 45 days after contract.

6.4 Design Packages

6.4.1 Preliminary Design Review Package

A Preliminary Design Review (PDR) package, DD Form 1423, A002, consisting of engineering drawings, schematics, analyses, and schedule in accordance with this specification, shall be furnished to the COR seven days prior to the scheduled PDR. A summary of actions and action items resulting from the PDR shall be furnished to the COR within two weeks after the PDR.

6.4.2 Final Design Review Package

A Final Design Review (FDR) package, DD Form 1423, A003, consisting of engineering drawings, schematics, analyses, and schedule in accordance with this specification, shall be furnished to the COR seven days prior to the FDR. A summary of actions and action items resulting from the FDR shall be furnished to the COR within two weeks after the FDR.

6.4.3 Drawings

6.4.3.1 Assembly

The Contractor shall deliver a complete set of all assembly drawings for the ST, DD Form 1423, A004, seven days prior to the scheduled PDR. If changes to the drawings are required, revised drawings will be sent to the COR.

6.4.3.2 Schematics and Parts List

The Contractor shall deliver a complete parts list for the ST, DD Form 1423, A005, along with annotated schematics seven days prior to the scheduled PDR. If any changes are required, a revised parts list and annotated schematics will be sent to the COR.

6.4.3.3 Engineering Changes

The ST shall be fabricated and assembled in accordance with drawings, parts lists, processes, and other documents listed on Contractor drawings. These documents shall be submitted to and approved by the COR. Upon establishment of the baseline configuration between the Contractor and the COR, the Contractor shall make no

changes to any of these without written approval from the COR via a Change Control Notice (CCN). When changes need to be made they will be provided according to DD Form 1423, A006.

6.5 Testing Packages

6.5.1 Test Procedures

Test procedures, DD Form 1423, A007, shall be prepared by the Contractor and submitted for COR approval 14 days prior to testing.

6.5.2 Test Reports

Test reports, DD Form 1423, A008, shall be generated by the Contractor and submitted 14 days after completion of testing. Test reports shall document all test failures and anomalies. Test reports shall include assembly and test log books. A Certificate of Compliance with the specification shall be provided with the test reports and unit tested.

6.6 System Effectiveness

6.6.1 Worst Case Analysis

The Contractor shall deliver a worst case analysis 180 days after contract award, per DD Form 1423, A010.

6.6.2 Electrical Stress Analysis

The Contractor shall deliver a stress analysis 180 days after contract award, per DD Form 1423, A011.

6.6.3 Worst Case Timing Analysis

The Contractor shall deliver a worst case timing analysis 180 days after contract award, per DD Form 1423, A012.

6.6.4 Reliability Analysis

The Contractor shall deliver a reliability analysis 180 days after contract award, per DD Form 1423, A013.

6.6.5 Failure Modes and Effects Criticality Analysis

The Contractor shall deliver a failure modes and effects criticality analysis 180 days after contract award, per DD Form 1423, A014.

6.6.6 Radiation Analysis

The Contractor shall deliver a radiation analysis 180 days after contract award, per DD Form 1423, A015.

6.7 Tasks

6.7.1 Kick-Off Meeting

The Kick-Off Meeting will be held at the Contractor's facility 14 days after contract award.

6.7.2 Preliminary Design Meeting

The Preliminary Design Review will be held at the Contractor's facility 60 days after contract award.

6.7.3 Final Design Review

The Final Design Review will be held at the Contractor's facility 30 days prior to start of testing.

7.0 NOTES

This section provides additional information that is not contractually binding. Included are a glossary and list of acronyms.

7.1 Definitions

7.1.1 Contractor

A Contractor shall be an organization awarded a contract to supply a product or service.

7.1.2 Production Hardware

Hardware fabricated and inspected to production drawings, identical in performance, configuration, and fabrication to the article to be flown.

7.1.3 Interchangeable Items

When two or more items possess such functional and physical characteristics as to be equivalent in performance and durability and are capable of being exchanged one for the other without alteration of the items themselves or of adjoining items except for adjustment, and without selection for fit or performance, the items are interchangeable.

7.1.4 Replacement Item

An item that is functionally interchangeable with another item, but which differs physically from the original part in that the installation of the replacement part requires operations such as drilling, reaming, cutting, filing, shimming, etc. in addition to the normal applications and methods of attachment.

7.1.5 Part

One piece or two or more pieces joined together that are not normally subject to disassembly without destruction of designed use.

7.1.6 Device

Electromechanical or mechanical items that perform a specific function and are intermediate in complexity between piece parts and components. For example: valves, small motors, relays, gyros, connectors, vidicon tubes, batteries, etc.

7.1.7 Component

A combination of parts, devices, and structures, usually self-contained, that perform a distinctive function in the operation of the overall equipment; i.e., a "black box."

7.1.8 Operating Failure Rate

The operating failure rate represents a mathematical combination of failure rates associated with a part's failure modes that may occur in an operation sequence under laboratory conditions.

7.1.9 Cycle

A cycle (e.g., thermal vacuum testing) shall be defined as the transition from a nominal to a positive or negative extreme, and the transition to the opposite extreme and back to nominal.

7.2 Acronyms and Abbreviations

AKM	Apogee Kick Motor
CCN	Configuration Change Notice
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CG	Center of Gravity

NCST-S-FM003

COR	Contracting Officer's Representative
CVCM	Collected Volatile Condensable Material
DAC	Days After Contract
DID	Data Item Description
DPA	Destructive Physical Analysis
EDAC	Error Detection and Correction
EEE	Electrical, Electronic, and Electromechanical
ELV	Expendable Launch Vehicle
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
FAME	Full-sky Astrometric Mapping Explorer
FDR	Final Design Review
FMECA	Failure Modes, Effects, and Criticality Analysis
FOV	Field of View
FRACAS	Failure Reporting and Corrective Action System
GIDEP	Government-Industry Data Exchange Program
GSE	Ground Support Equipment
I&T	Integration and Test
ICD	Interface Control Document
KSC	Kennedy Space Center
LET	Linear Energy Transfer
MIDEX	Medium Class Explorer
NRL	Naval Research Laboratory
PCB	Printed Circuit Board
PDR	Preliminary Design Review
PIND	Particle Impact Noise Detection
PMO	Project Management Office
PMP	Parts, Materials, and Processes
PWB	Printed Wiring Board
QML	Qualified Materials List
QPL	Qualified Parts List
SEE	Single Event Effects
SEFI	Single Event Functional Interrupt
SEL	Single Event Latchup
SEU	Single Event Upset
SPE	Solar Particle Event
ST	Star Tracker
T&C	Telemetry and Command
TID	Total Ionizing Dose
TML	Total Mass Loss

CONTRACT DATA REQUIREMENTS LIST

Form Approved
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1. DATA ITEM NO. A002	2. TITLE OF DATA ITEM PRELIMINARY DESIGN REVIEW PACKAGE			3. SUBTITLE																							
4. AUTHORITY (Data Acquisition Document No.) N/A			5. CONTRACT REFERENCE SPEC PARA 6.4.1		6. REQUIRING OFFICE NRL - CODE 8231																						
7. DD 250 REQ LT	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY 1 TIME		12. DATE OF FIRST SUBMISSION BLOCK 16		14. DISTRIBUTION																					
8. APP CODE N/A		11. AS OF DATE N/A		13. DATE OF SUBSEQUENT SUBMISSION N/A		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td rowspan="2" style="width:15%;">a. ADDRESSEE</td> <td rowspan="2" style="width:5%;">Draft</td> <td colspan="2" style="text-align:center;">b. COPIES</td> </tr> <tr> <td style="width:10%;"></td> <td style="width:10%;"></td> </tr> <tr> <td></td> <td></td> <td style="text-align:center;">Reg</td> <td style="text-align:center;">Repro</td> </tr> <tr> <td colspan="2">COR</td> <td style="text-align:center;">0</td> <td style="text-align:center;">2</td> <td style="text-align:center;">0</td> </tr> <tr> <td colspan="2">15. TOTAL →</td> <td style="text-align:center;">0</td> <td style="text-align:center;">2</td> <td style="text-align:center;">0</td> </tr> </table>		a. ADDRESSEE	Draft	b. COPIES						Reg	Repro	COR		0	2	0	15. TOTAL →		0	2	0
a. ADDRESSEE	Draft	b. COPIES																									
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COR		0	2	0																							
15. TOTAL →		0	2	0																							
16. REMARKS Block 12 - 7 DAYS PRIOR TO PDR																											
1. DATA ITEM NO. A003	2. TITLE OF DATA ITEM FINAL DESIGN REVIEW PACKAGE			3. SUBTITLE																							
4. AUTHORITY (Data Acquisition Document No.) N/A			5. CONTRACT REFERENCE SPEC PARA 6.4.2		6. REQUIRING OFFICE NRL - CODE 8231																						
7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY 1 TIME		12. DATE OF FIRST SUBMISSION BLOCK 16		14. DISTRIBUTION																					
8. APP CODE N/A		11. AS OF DATE N/A		13. DATE OF SUBSEQUENT SUBMISSION N/A		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td rowspan="2" style="width:15%;">a. ADDRESSEE</td> <td rowspan="2" style="width:5%;">Draft</td> <td colspan="2" style="text-align:center;">b. COPIES</td> </tr> <tr> <td style="width:10%;"></td> <td style="width:10%;"></td> </tr> <tr> <td></td> <td></td> <td style="text-align:center;">Reg</td> <td style="text-align:center;">Repro</td> </tr> <tr> <td colspan="2">COR</td> <td style="text-align:center;">0</td> <td style="text-align:center;">2</td> <td style="text-align:center;">0</td> </tr> <tr> <td colspan="2">15. TOTAL →</td> <td style="text-align:center;">0</td> <td style="text-align:center;">2</td> <td style="text-align:center;">0</td> </tr> </table>		a. ADDRESSEE	Draft	b. COPIES						Reg	Repro	COR		0	2	0	15. TOTAL →		0	2	0
a. ADDRESSEE	Draft	b. COPIES																									
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COR		0	2	0																							
15. TOTAL →		0	2	0																							
16. REMARKS Block 12 - 7 DAYS PRIOR TO PDR																											
1. DATA ITEM NO. A004	2. TITLE OF DATA ITEM DRAWINGS (ASSEMBLY)			3. SUBTITLE																							
4. AUTHORITY (Data Acquisition Document No.) N/A			5. CONTRACT REFERENCE SPEC PARA 6.4.3.1		6. REQUIRING OFFICE NRL - CODE 8231																						
7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY ONE/R		12. DATE OF FIRST SUBMISSION BLOCK 16		14. DISTRIBUTION																					
8. APP CODE N/A		11. AS OF DATE N/A		13. DATE OF SUBSEQUENT SUBMISSION N/A		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td rowspan="2" style="width:15%;">a. ADDRESSEE</td> <td rowspan="2" style="width:5%;">Draft</td> <td colspan="2" style="text-align:center;">b. COPIES</td> </tr> <tr> <td style="width:10%;"></td> <td style="width:10%;"></td> </tr> <tr> <td></td> <td></td> <td style="text-align:center;">Reg</td> <td style="text-align:center;">Repro</td> </tr> <tr> <td colspan="2">COR</td> <td style="text-align:center;">0</td> <td style="text-align:center;">2</td> <td style="text-align:center;">0</td> </tr> <tr> <td colspan="2">15. TOTAL →</td> <td style="text-align:center;">0</td> <td style="text-align:center;">2</td> <td style="text-align:center;">0</td> </tr> </table>		a. ADDRESSEE	Draft	b. COPIES						Reg	Repro	COR		0	2	0	15. TOTAL →		0	2	0
a. ADDRESSEE	Draft	b. COPIES																									
		Reg	Repro																								
COR		0	2	0																							
15. TOTAL →		0	2	0																							
16. REMARKS Block 12 - 7 DAYS PRIOR TO PDR																											
G. PREPARED BY NRL - Code 8231			H. DATE 5/21/01		I. APPROVED BY		J. DATE																				

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CONTRACT DATA REQUIREMENTS LIST

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A. CONTRACT LINE ITEM NO. 0002		B. EXHIBIT A		C. CATEGORY: TDP _____ TM _____ OTHER _____		
D. SYSTEM / ITEM 0001			E. CONTRACT / PR NO.		F. CONTRACTOR	
1. DATA ITEM NO. A005	2. TITLE OF DATA ITEM DRAWINGS (SCHEMATICS & PARTS LIST)			3. SUBTITLE		
4. AUTHORITY (Data Acquisition Document No.) N/A		5. CONTRACT REFERENCE SPEC PARA 6.4.3.2		6. REQUIRING OFFICE NRL - CODE 8231		
7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY ONE/R	12. DATE OF FIRST SUBMISSION BLOCK 16	14. DISTRIBUTION		
8. APP CODE N/A	11. AS OF DATE N/A	13. DATE OF SUBSEQUENT SUBMISSION N/A	a. ADDRESSEE	Draft	b. COPIES	
					Final	
					Reg	Repro
16. REMARKS Block 12 - 7 DAYS PRIOR TO PDR			COR	0	2	0
			15. TOTAL	0	2	0
1. DATA ITEM NO. A006	2. TITLE OF DATA ITEM DRAWINGS (ENGINEERING CHANGES)			3. SUBTITLE		
4. AUTHORITY (Data Acquisition Document No.) N/A		5. CONTRACT REFERENCE SPEC PARA 6.4.3.3		6. REQUIRING OFFICE NRL - CODE 8231		
7. DD 250 REQ LT	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY ASREQ	12. DATE OF FIRST SUBMISSION N/A	14. DISTRIBUTION		
8. APP CODE N/A	11. AS OF DATE N/A	13. DATE OF SUBSEQUENT SUBMISSION N/A	a. ADDRESSEE	Draft	b. COPIES	
					Final	
					Reg	Repro
16. REMARKS Block 10 - TO BE PROVIDED WHENEVER CHANGES MADE			COR	0	2	0
			15. TOTAL	0	2	0
1. DATA ITEM NO. A007	2. TITLE OF DATA ITEM TEST PROCEDURES			3. SUBTITLE		
4. AUTHORITY (Data Acquisition Document No.) N/A		5. CONTRACT REFERENCE SPEC PARA 6.5.1		6. REQUIRING OFFICE NRL - CODE 8231		
7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY ONE/R	12. DATE OF FIRST SUBMISSION ASREQ	14. DISTRIBUTION		
8. APP CODE N/A	11. AS OF DATE 14DPTT	13. DATE OF SUBSEQUENT SUBMISSION N/A	a. ADDRESSEE	Draft	b. COPIES	
					Final	
					Reg	Repro
16. REMARKS BLOCK 12 - TO BE PROVIDED WHEN PROCEDURES CHANGE			COR	0	2	0
			15. TOTAL	0	2	0
1. DATA ITEM NO. A008	2. TITLE OF DATA ITEM TEST REPORTS			3. SUBTITLE		
4. AUTHORITY (Data Acquisition Document No.) N/A		5. CONTRACT REFERENCE SPEC PARA 6.5.2		6. REQUIRING OFFICE NRL - CODE 8231		
7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY 1 TIME	12. DATE OF FIRST SUBMISSION N/A	14. DISTRIBUTION		
8. APP CODE N/A	11. AS OF DATE 14 DATC	13. DATE OF SUBSEQUENT SUBMISSION N/A	a. ADDRESSEE	Draft	b. COPIES	
					Final	
					Reg	Repro
16. REMARKS			COR	0	2	0
			15. TOTAL	0	2	0
G. PREPARED BY NRL - CODE 8231		H. DATE 5/21/01	I. APPROVED BY		J. DATE	

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A. CONTRACT LINE ITEM NO. 0002		B. EXHIBIT A		C. CATEGORY: TDP _____ TM - _____ OTHER _____	
D. SYSTEM / ITEM 0001			E. CONTRACT / PR NO.		F. CONTRACTOR
1. DATA ITEM NO. A009	2. TITLE OF DATA ITEM INTERFACE CONTROL DOCUMENT			3. SUBTITLE	
4. AUTHORITY (Data Acquisition Document No.) N/A		5. CONTRACT REFERENCE SPEC PARA 6.3		6. REQUIRING OFFICE NRL - CODE 8231	
7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY ONE/R	12. DATE OF FIRST SUBMISSION 45DAC	14. DISTRIBUTION	
8. APP CODE N/A	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBMISSION ASREQ	a. ADDRESSEE	Draft	Final Reg Repro
16. REMARKS BLOCK 13 - UPDATES PROVIDED AS CHANGES ARE MADE				COR	0 2 0
				15. TOTAL →	0 2 0
1. DATA ITEM NO. A010	2. TITLE OF DATA ITEM WORST CASE ANALYSIS			3. SUBTITLE	
4. AUTHORITY (Data Acquisition Document No.) N/A		5. CONTRACT REFERENCE SPEC PARA 6.6.1		6. REQUIRING OFFICE NRL - CODE 8231	
7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY 1TIME	12. DATE OF FIRST SUBMISSION N/A	14. DISTRIBUTION	
8. APP CODE N/A	11. AS OF DATE 180DAC	13. DATE OF SUBSEQUENT SUBMISSION N/A	a. ADDRESSEE	Draft	Final Reg Repro
16. REMARKS				COR	0 2 0
				15. TOTAL →	0 2 0
1. DATA ITEM NO. A011	2. TITLE OF DATA ITEM ELECTRICAL STRESS ANALYSIS			3. SUBTITLE	
4. AUTHORITY (Data Acquisition Document No.) N/A		5. CONTRACT REFERENCE SPEC PARA 6.6.2		6. REQUIRING OFFICE NRL - CODE 8231	
7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY 1TIME	12. DATE OF FIRST SUBMISSION N/A	14. DISTRIBUTION	
8. APP CODE N/A	11. AS OF DATE 180DAC	13. DATE OF SUBSEQUENT SUBMISSION N/A	a. ADDRESSEE	Draft	Final Reg Repro
16. REMARKS				COR	0 2 0
				15. TOTAL →	0 2 0
1. DATA ITEM NO. A012	2. TITLE OF DATA ITEM WORST CASE TIMING ANALYSIS			3. SUBTITLE	
4. AUTHORITY (Data Acquisition Document No.) N/A		5. CONTRACT REFERENCE SPEC PARA 6.6.3		6. REQUIRING OFFICE NRL - CODE 8231	
7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY 1TIME	12. DATE OF FIRST SUBMISSION N/A	14. DISTRIBUTION	
8. APP CODE N/A	11. AS OF DATE 180DAC	13. DATE OF SUBSEQUENT SUBMISSION N/A	a. ADDRESSEE	Draft	Final Reg Repro
16. REMARKS				COR	0 2 0
				15. TOTAL →	0 2 0
G. PREPARED BY NRL - CODE 8231		H. DATE 5/21/01	I. APPROVED BY		J. DATE

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A. CONTRACT LINE ITEM NO. 0002		B. EXHIBIT A		C. CATEGORY: TDP _____ TM - _____ OTHER _____	
D. SYSTEM / ITEM 0001			E. CONTRACT / PR NO.		F. CONTRACTOR
1. DATA ITEM NO. A013	2. TITLE OF DATA ITEM RELIABILITY ANALYSIS			3. SUBTITLE	
4. AUTHORITY (Data Acquisition Document No.) N/A		5. CONTRACT REFERENCE SPEC PARA 6.6.4		6. REQUIRING OFFICE NRL - CODE 8231	
7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY 1TIME	12. DATE OF FIRST SUBMISSION N/A	14. DISTRIBUTION	
8. APP CODE N/A	11. AS OF DATE 180DAC	13. DATE OF SUBSEQUENT SUBMISSION N/A	a. ADDRESSEE	Draft	Final
			Reg	Repro	
16. REMARKS				COR	0
				15. TOTAL →	0
					2
					0
1. DATA ITEM NO. A014	2. TITLE OF DATA ITEM FMECA			3. SUBTITLE	
4. AUTHORITY (Data Acquisition Document No.) N/A		5. CONTRACT REFERENCE SPEC PARA 6.6.5		6. REQUIRING OFFICE NRL - CODE 8231	
7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY 1TIME	12. DATE OF FIRST SUBMISSION N/A	14. DISTRIBUTION	
8. APP CODE N/A	11. AS OF DATE 180DAC	13. DATE OF SUBSEQUENT SUBMISSION N/A	a. ADDRESSEE	Draft	Final
			Reg	Repro	
16. REMARKS FAILURE MODES AND EFFECTS CRITICALITY ANALYSIS				COR	0
				15. TOTAL →	0
					2
					0
1. DATA ITEM NO. A015	2. TITLE OF DATA ITEM RADIATION ANALYSIS			3. SUBTITLE	
4. AUTHORITY (Data Acquisition Document No.) N/A		5. CONTRACT REFERENCE SPEC PARA 6.6.6		6. REQUIRING OFFICE NRL - CODE 8231	
7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED N/A	10. FREQUENCY 1TIME	12. DATE OF FIRST SUBMISSION N/A	14. DISTRIBUTION	
8. APP CODE N/A	11. AS OF DATE 180DAC	13. DATE OF SUBSEQUENT SUBMISSION N/A	a. ADDRESSEE	Draft	Final
			Reg	Repro	
16. REMARKS				COR	0
				15. TOTAL →	0
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1. DATA ITEM NO.	2. TITLE OF DATA ITEM			3. SUBTITLE	
4. AUTHORITY (Data Acquisition Document No.)		5. CONTRACT REFERENCE		6. REQUIRING OFFICE	
7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION	14. DISTRIBUTION	
8. APP CODE	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBMISSION	a. ADDRESSEE	Draft	Final
			Reg	Repro	
16. REMARKS					
				15. TOTAL →	
G. PREPARED BY NRL - CODE 8231		H. DATE 5/21/01	I. APPROVED BY		J. DATE

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