

NNG07CA21C

Mechanical Systems

Engineering Services

II/A (MSES #1A)

CONTRACT

3/27/07

2. CONTRACT NO. NNG07CA21C 3. EFFECTIVE DATE May 15, 2007 4. REQUISITION/PURCHASE REQUEST/PROJECT NO. 4200172520

5. ISSUED BY NASA Goddard Space Flight Center, Attn: Kathleen Pierson, Code 210.3, Greenbelt, MD 20771
 CODE 210.M 6. ADMINISTERED BY Kathleen Pierson, Contracting Officer, Phone: 301-286-5257, E-mail: kathleen.m.pierson@nasa.gov

7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, country, State and ZIP Code) SGT, Inc., 701 Greenbelt Road, Suite 400, Greenbelt, MD 20770
 8. DELIVERY FOB ORIGIN OTHER (See below)
 9. DISCOUNT FOR PROMPT PAYMENT

10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN: SEE CLAUSE G.7

11. SHIP TO/MARK FOR CODE SEE CLAUSE F.3 - IF APPLICABLE FACILITY CODE
 12. PAYMENT WILL BE MADE BY CODE 155
 NASA Goddard Space Flight Center, Code 155, Cost and Commercial Accounts, Building 17, Greenbelt, MD 20771

13. AUTHORITY FOR USING OTHER THAN FULL & OPEN COMPETITION: 10 U.S.C. 2304(c) () 41 U.S.C. 253(c) ()
 14. ACCOUNTING AND APPROPRIATION DATA

15A. ITEM NO.	15B. SUPPLIES/SERVICES	15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	Cost Plus Award Fee Indefinite Delivery Indefinite Quantity (CPAF IDIQ) for Mechanical Systems Engineering Services II/A (MSES II/A)				
15G. TOTAL AMOUNT OF CONTRACT >					

16. TABLE OF CONTENTS

(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
PART I - THE SCHEDULE				PART II - CONTRACT CLAUSES			
<input checked="" type="checkbox"/>	A	SOLICITATION/CONTRACT FORM		<input checked="" type="checkbox"/>	I	CONTRACT CLAUSES	55-74
<input checked="" type="checkbox"/>	B	SUPPLIES OR SERVICES AND PRICES/COSTS	5-14	PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.			
<input checked="" type="checkbox"/>	C	DESCRIPTION/SPECS./WORK STATEMENT	15-16	<input type="checkbox"/>	J	LIST OF ATTACHMENTS	
<input checked="" type="checkbox"/>	D	PACKAGING AND MARKING	17	PART IV - REPRESENTATIONS AND INSTRUCTIONS			
<input checked="" type="checkbox"/>	E	INSPECTION AND ACCEPTANCE	18-23	<input type="checkbox"/>	K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
<input checked="" type="checkbox"/>	F	DELIVERIES OR PERFORMANCE	24-27	<input type="checkbox"/>	L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
<input checked="" type="checkbox"/>	G	CONTRACT ADMINISTRATION DATA	28-42	<input type="checkbox"/>	M	EVALUATION FACTORS FOR AWARD	
<input checked="" type="checkbox"/>	H	SPECIAL CONTRACT REQUIREMENTS	43-54				

CONTRACTING OFFICER WILL COMPLETE ITEM 17 OR 18 AS APPLICABLE

17. CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return 2 copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (attachments are listed herein.)
 18. AWARD (Contractor is not required to sign this document.) Your offer on Solicitation Number _____, including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your offer, and (b) this award/contract. No further contractual document is necessary.

19A. NAME AND TITLE OF SIGNER (Type or print) KAMAL S. GAFFARIAN / EXEC VP / CDO
 20A. NAME OF CONTRACTING OFFICER (Type or print) Kathleen M. Pierson
 19B. NAME OF CONTRACTOR BY [Signature] (Signature of person authorized to sign)
 19C. DATE SIGNED 3/29/07
 20B. UNITED STATES OF AMERICA BY [Signature] (Signature of Contracting Officer)
 20C. DATE SIGNED 3/29/07

FILE COPY

INDEX OF CLAUSES FOR NNG07CA21C

SECTION B--SUPPLIES OR SERVICES AND PRICE/COST

B. 1 DELIVERABLE REQUIREMENTS (GSFC 52.211-90) (OCT 1988) 5
B. 2 MINIMUM/MAXIMUM AMOUNT OF SUPPLIES OR SERVICES 7
B. 3 LIMITATION OF INDIRECT COSTS (GSFC 52.231-90) (FEB 1995) 7
B. 4 ESTIMATED COST INCREASES 8
B. 5 ORDERING (52.216-18) (OCT 1995) 10
B. 6 ORDER LIMITATIONS (52.216-19) (OCT 1995) 10
B. 7 INDEFINITE QUANTITY (52.216-22) (OCT 1995) 11
B. 8 PAYMENT FOR OVERTIME PREMIUMS (52.222-2) (JUL 1990) 11
B. 9 ESTIMATED COST AND AWARD FEE (1852.216-85) (SEP 1993) 12
B.10 CONTRACT FUNDING (1852.232-81) (JUN 1990) 13
B.11 SUPPLEMENTAL TASK ORDERING PROCEDURES 13

SECTION C--DESCRIPTION/SPECIFICATIONS/WORK STATEMENT

C. 1 SCOPE OF WORK (GSFC 52.211-91) (FEB 1991) 15
C. 2 REPORTS OF WORK 15
C. 3 COMPUTER SOFTWARE AND DATA RIGHTS 16

SECTION D--PACKAGING AND MARKING

D. 1 PACKAGING, HANDLING, AND TRANSPORTATION (1852.211-70) (SEP 2005) .17

SECTION E--INSPECTION AND ACCEPTANCE

E. 1 MATERIAL INSPECTION AND RECEIVING REPORT NOT REQUIRED
(GSFC 52.246-94) (APR 1989) 18
E. 2 INSPECTION SYSTEM (SUBCONTRACTS) (GSFC 52.246-100) (JUL 2000) .. 18
E. 3 INSPECTION SYSTEM RECORDS (GSFC 52.246-102) (OCT 1988) 18
E. 4 INSPECTION OF SERVICES-COST-REIMBURSEMENT (52.246-5) (APR 1984) 18
E. 5 INSPECTION OF RESEARCH AND DEVELOPMENT-COST-REIMBURSEMENT
(52.246-8) (MAY 2001) 19
E. 6 HIGHER-LEVEL CONTRACT QUALITY REQUIREMENT (52.246-11) (FEB 1999) 22
E. 7 MATERIAL INSPECTION AND RECEIVING REPORT (1852.246-72)
(AUG 2003) 21
E. 8 ACCEPTANCE--SINGLE LOCATION (GSFC 52.246-92) (SEP 1989) 23

SECTION F--DELIVERIES OR PERFORMANCE

F. 1 PLACE OF PERFORMANCE--SERVICES (GSFC 52.237-92) (OCT 1988) 24
F. 2 EFFECTIVE ORDERING PERIOD 24
F. 3 SHIPPING INSTRUCTIONS--CENTRAL RECEIVING (GSFC 52.247-94)
(JUL 1993) 24
F. 4 STOP-WORK ORDER (52.242-15) (AUG 1989)--ALTERNATE I (APR 1984) 25
F. 5 F.O.B. DESTINATION (52.247-34) (NOV 1991) 26

INDEX OF CLAUSES FOR NNG07CA21C

SECTION G--CONTRACT ADMINISTRATION DATA

G. 1 FINANCIAL MANAGEMENT REPORTING (GSFC 52.242-90) (FEB 2004) 28
G. 2 CONTRACTOR USE OF GSFC LIBRARY (GSFC 52.245-90) (AUG 1993) 29
G. 3 PROPERTY CLAUSE APPLICABILITY--ON-SITE AND OFF-SITE
(GSFC 52.245-96) (JUL 2004) 29
G. 4 CONTRACTOR ACQUIRED PROPERTY--NASA CONDITIONS (GSFC 52.245-97)
(SEP 1998) 30
G. 5 AWARD FEE FOR SERVICE CONTRACTS (1852.216-76) (JUN 2000) 31
G. 6 AWARD FEE FOR END ITEM CONTRACTS (1852.216-77) (JUN 2000)32
G. 7 SUBMISSION OF VOUCHERS FOR PAYMENT (18-52.216-87) (MAR 1998) ... 34
G. 8 DESIGNATION OF NEW TECHNOLOGY REPRESENTATIVE AND PATENT
REPRESENTATIVE (1852.227-72) (JUL 1997) 35
G. 9 NASA CONTRACTOR FINANCIAL MANAGEMENT REPORTING (1852.242-73)
(NOV 2004) 35
G.10 CONTRACTOR REQUESTS FOR GOVERNMENT-OWNED EQUIPMENT (1852.245-70)
(JUL 1997) 36
G.11 INSTALLATION-ACCOUNTABLE GOVERNMENT PROPERTY (1852.245-71)
(NOV 2004) 37
G.12 FINANCIAL REPORTING OF NASA PROPERTY IN THE CUSTODY OF
CONTRACTORS (1852.245-73) (OCT 2003) 39
G.13 LIST OF GOVERNMENT-FURNISHED PROPERTY (1852.245-76) (OCT 1988).....40
G.14 LIST OF INSTALLATION-ACCOUNTABLE PROPERTY AND SERVICES
(1852.245-77) (JUL 1997) 41
G.15 ACCOUNTABILITY OF COSTS/SEGRATION OF TASK ORDER42

SECTION H--SPECIAL CONTRACT REQUIREMENTS

H. 1 SECTION H CLAUSES INCORPORATED BY REFERENCE 43
H. 2 CONTRACTOR PERSONNEL--IDENTIFICATION, ONSITE REPORTING, AND
CHECKOUT PROCEDURES (GSFC 52.204-99) (SEPT 2006) 43
H. 3 GOVERNMENT PREMISES--PHYSICAL ACCESS AND COMPLIANCE WITH
PROCEDURES (GSFC 52.211-95) (SEPT 2006) 44
H. 4 REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFEROR
(GSFC 52.215-90) (NOV 1999) 46
H. 5 SAFETY AND HEALTH--ADDITIONAL REQUIREMENTS (GSFC 52.223-91)
(OCT 2002) 46
H. 6 LIMITATION OF FUTURE CONTRACTING (1852.209-71) (DEC 1988) 46
H. 7 TASK ORDERING PROCEDURE (1852.216-80) (OCT 1996) 47
H. 8 EXPORT LICENSES (1852.225-70) (FEB 2000) 49
H. 9 ACCESS TO SENSITIVE INFORMATION (1852.237-72) (JUNE 2005) 49
H.10 RELEASE OF SENSITIVE INFORMATION (1852.237-73) (JUNE 2005)50
H.11 NON-PERSONAL SERVICES53
H.12 TRAVEL, SUBSISTENCE, CONUS, OCONUS PRICING54

INDEX OF CLAUSES FOR NNG07CA21C

SECTION I--CONTRACT CLAUSES

I. 1 SECTION I CLAUSES INCORPORATED BY REFERENCE..... 55
I. 2 LIMITATIONS ON SUBCONTRACTING (52.219-14) (DEC 1996)..... 58
I. 3 NOTIFICATION OF EMPLOYEE RIGHTS CONCERNING PAYMENT OF UNION
DUES OR FEES (52.222-39) (DEC 2004) 58
I. 4 HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA
(52.223-3) (JAN 1997)--ALTERNATE I (JUL 1995)..... 61
I. 5 NOTICE OF RADIOACTIVE MATERIALS (52.223-7) (JAN 1997)..... 63
I. 6 LIMITATION ON WITHHOLDING OF PAYMENTS (52.232-9) (APR 1984) ... 64
I. 7 NOTIFICATION OF CHANGES (52.243-7) (APR 1984)..... 65
I. 8 SUBCONTRACTS FOR COMMERCIAL ITEMS (52.244-6) (SEPT 2006) 68
I. 9 CLAUSES INCORPORATED BY REFERENCE (52.252-2) (FEB 1998)..... 69
I.10 COMPUTER GENERATED FORMS (52.253-1) (JAN 1991)..... 69
I.11 SECURITY CLASSIFICATION REQUIREMENTS (1852.204-75) (SEP 1989) . 70
I.12 USE OF RURAL AREA SMALL BUSINESSES (1852.219-74) (SEP 1990) ... 70
I.13 NASA 8 PERCENT GOAL (1852.219-76) (JUL 1997)..... 70
I.14 MINIMUM INSURANCE COVERAGE (1852.228-75) (OCT 1988)..... 72
I.15 CENTER FOR AEROSPACE INFORMATION (1852.235-70) (FEB 2003) 73
I.16 EMERGENCY EVACUATION PROCEDURES (1852.237-70) (DEC 1988)..... 73

SECTION J--LIST OF ATTACHMENTS

J. 1 LIST OF ATTACHMENTS (GSFC 52.211-101) (OCT 1988)..... 74

**SECTION B OF NNG07CA21C
SUPPLIES OR SERVICES AND PRICE/COST**

B.1 DELIVERABLE REQUIREMENTS (GSFC 52.211-90) (OCT 1988)

The Contractor shall provide the services to NASA's Goddard Space Flight Center as described in Section C of this contract and the Contractor shall deliver the following documentations and reports:

Item	Description	Reference	Schedule	Delivery Method/Addressee(s)
1	Services and Deliverables In Accordance With Statement of Work and Task Orders	As defined in individual task orders	As defined in individual task orders.	See Task Order(s)
2	Task Plans	Clauses B.11, H.7	14 days after receipt of request for task plan	Web-based Task Order Management System (TOMS)
3	Monthly Progress Reports	Clause C.2	15 th calendar day of each month	Electronic Format/ COTR (Code 540); Task Monitor; & CO (letter transmittal only)
4	Final Task Report	Clause C.2	Due 5 days prior to task order end date	Electronic Format/ COTR; Task Monitor; CO (letter transmittal only); & Hard Copy/CASI
5	NASA Financial Management Reports	Clauses G.1, G.9	Monthly and Quarterly	Electronic Format/ CO; COTR; TM; Resource Analyst (Code 540) & Finance Office (Code 155)
6	DD Form 1419 - DOD Industrial Plant Equipment Requisition	Clause G.10	30 days prior to approval need date	DD Form 1419 - Hard Copy/CO & Industrial Property Officer (Code 273)
7	Financial Report of NASA Property in the Custody of Contractors (NF 1018)	Clause G.12	Annual Report Due By October 15th and Final Report Due As Specified	NF 1018 - Hard Copy /Code 157; DCMA-Property Administrator; & Code 273

**SECTION B OF NNG07CA21C
SUPPLIES OR SERVICES AND PRICE/COST**

Item	Description	Reference	Schedule	Delivery Method/Addressee (s)
8	Safety & Health Reporting	Clause H.1 1852.223-70 & Clause H.5	Quarterly in accordance with Clause H.5	<i>Electronic Format /Code 205.2; & CO</i>
9	GSFC Form 24-27 (LISTS Form) & Personal Identity Verification (PIV)	Clause H.2	As required in accordance with Clause H.2	<i>GSFC 24-27 & PIV Documentation - Electronic Format /COTR; CO; & Code 240</i>
10	LISTS Report	Clause H.2	10th calendar day of each month	<i>Electronic Format /COTR; & Code 240</i>
11	Equal Opportunity Reports	Clause I.1, 52.222-26	As Specified	<i>Electronic Format</i>
12	Insurance Notification	Clause I.1, 52.228-7	As Required	<i>Electronic Format</i>
13	Subcontract Notification	Clause I.1 52.244-2	30 days prior to subcontract award date	<i>Electronic Format / Contracting Officer (CO)</i>
14	IT Security Plan & Assessment Plans	Clause I.1 1852.204-76 (Deviation)	30 days after contract award	<i>Electronic Format / Contracting Officer (CO)</i>
15	Organizational Conflict of Interest Avoidance Plan	Clause H.9 1852.237-72	30 days after contract award	<i>Hard Copy Contracting Officer (CO)</i>

NOTE: Transportation Classification: Item 1, Deliverable(s) designated Class I, II and III, shall be in accordance with Clause D.1, all others, unless specified (electronic format, etc.), are considered Class IV; Items 2 through 15, Deliverables, unless specified (electronic format, etc.), are considered Class IV and shall be shipped via the most advantageous commercial transportation means considered to be in the best interest of the Government.

(End of clause)

**SECTION B OF NNG07CA21C
SUPPLIES OR SERVICES AND PRICE/COST**

B.2 MINIMUM/MAXIMUM AMOUNT OF SUPPLIES OR SERVICES

(a) The minimum amount of supplies or services that shall be ordered during the effective period of this contract is **\$1,000,000**. The maximum amount of supplies or services that may be ordered during the effective period of this contract is **\$400,000,000**.

(b) The minimum amount is reached when the sum of the dollar amounts of all ordered supplies or services, except for any adjustments made pursuant to the Limitation of Cost or Limitation of Funds clause, equals or exceeds the minimum amount stated in paragraph (a).

(c) The maximum amount is reached when the sum of the dollar amounts of all ordered supplies or services, except for any adjustments made pursuant to the Limitation of Cost or Limitation of Funds clause, equals the maximum amount stated in paragraph (a).

(d) The maximum amount, if reached, precludes the issuance of further orders for supplies or services under this contract. However, reaching the maximum amount does not preclude adjustments to the dollar amounts of existing placed orders, for actions that are within the scope of the placed orders, and which are made pursuant to existing contract authority, such as the Changes clause.

(e) The Contracting Officer may adjust the maximum ordering value unilaterally on an annual basis. Historic, current and/or projected workload requirements will be used to determine the amount of upward adjustment. In no event shall the adjustment exceed **30%** of the awarded (\$400M) maximum ordering value.

(End of text)

B.3 LIMITATION OF INDIRECT COSTS (GSFC 52.231-90) (FEB 1995)

a. Within each of the Contractor's fiscal years, the Contractor shall not charge or be reimbursed by the Government, under this or any other Government contract, for indirect costs in excess of the individual indirect expense dollars derived by the application of the following indirect cost ceiling rates to the appropriate base(s) set forth below.

**SECTION B OF NNG07CA21C
SUPPLIES OR SERVICES AND PRICE/COST**

Indirect Cost	Base of Application	Percentage or Dollars						
		*CFY1	CFY 2	CFY 3	CFY 4	CFY 5	CFY 6	CFY 7
Overhead	MSES Direct Labor Dollars							
Procurement Burden	Subcontract & Material Dollars							
Facility (**)	SGT & Sub Housed Hours							
G&A	Total Cost Less Subcontract & Material							

*CFY (Contractor Fiscal Year)= October to September .
(month) (month)

b. The limitations may be adjusted at the discretion of the Contracting Officer to the extent that increases to the Contractor's indirect costs are caused by:

(i) New or revised statutes and court decisions and/or written ruling or regulation by the Internal Revenue Service or any other taxing authority.

(ii) Wage determinations and/or regulations issued by the Department of Labor pursuant to the Service Contract Act of 1965, as amended.

c. A proposal for any adjustment under paragraph (b) must be in sufficient detail to establish that the cause of the amount of adjustment requested was solely due to the permitted conditions stated in the paragraph. It must be submitted no later than 60 days after the condition(s) become(s) known, or should have become known, to the Contractor. The amount of adjustment, if any, is at the discretion of the Contracting Officer and shall not be subject to the Disputes clause.

(End of clause)

**SECTION B OF NNG07CA21C
SUPPLIES OR SERVICES AND PRICE/COST**

B.4 ESTIMATED COST INCREASES

(a) The parties estimate that performance of this contract, exclusive of any fee, will not cost the Government more than the estimated cost specified in any individual task order.

(b) The Contractor shall notify the Contracting Officer in writing when the Contractor has reason to believe that -

(1) The costs the Contractor expects to incur under any individual task order, exclusive of fee, when added to all costs previously incurred, will exceed 75 percent of the estimated cost specified in any individual task order; or

(2) The total estimated cost for the performance of any individual task order, exclusive of any fee, will be substantially less than had been previously estimated.

(c) Notification shall not be delayed pending preparation of a proposal. A proposal is required to support a request for an increase in the estimated cost of a task order. The proposal should be submitted as soon as possible after the above notification but no later than **30** days before the incurred costs are expected to exceed the estimated cost. This will allow adequate time for the Government to evaluate the proposal and to mutually establish any increase in estimated cost with the Contractor.

(d) (1) The proposal shall be submitted in the following format unless some other format is directed or approved by the Contracting Officer:

Incurred costs to date
Projected cost to completion
Total cost at completion
Current negotiated estimated cost
Requested increase in estimated cost

(2) The "projected cost to completion" shall consist of the following "other than cost or pricing data" unless the Contracting Officer requests or approves the submittal of a greater or lesser amount of information:

(i) Elements of cost with supporting detail for estimated direct labor hours, direct and indirect rates, materials and subcontracts, and other elements.

(ii) Supporting explanation for the increases and projections, sufficient for the Government to understand the reasons for the increased estimated cost.

(End of text)

**SECTION B OF NNG07CA21C
SUPPLIES OR SERVICES AND PRICE/COST**

B. 5 ORDERING (52.216-18) (OCT 1995)

(a) Any supplies and services to be furnished under this contract shall be ordered by issuance of delivery orders or task orders by the individuals or activities designated in the Schedule. Such orders may be issued from the award date of this contract through a five (5) year period afterwards (effective ordering period).

(b) All delivery orders or task orders are subject to the terms and conditions of this contract. In the event of conflict between a delivery order or task order and this contract, the contract shall control.

(c) If mailed, a delivery order or task order is considered "issued" when the Government deposits the order in the mail. Orders may be issued orally, by facsimile, or by electronic commerce methods only if authorized in the Schedule.

(End of clause)

B. 6 ORDER LIMITATIONS (52.216-19) (OCT 1995)

(a) Minimum order. When the Government requires supplies or services covered by this contract in an amount of less than \$1,000, the Government is not obligated to purchase, nor is the Contractor obligated to furnish, those supplies or services under the contract.

(b) Maximum order. The Contractor is not obligated to honor--

(1) Any order for a single item in excess of \$50,000,000

(2) Any order for a combination of items in excess of \$50,000,000; or

(3) A series of orders from the same ordering office within 30 days that together call for quantities exceeding the limitation in subparagraph (1) or (2) above.

(c) If this is a requirements contract (i.e., includes the Requirements clause at subsection 52.216-21 of the Federal Acquisition Regulation (FAR)), the Government is not required to order a part of any one requirement from the Contractor if that requirement exceeds the maximum-order limitations in paragraph (b) above.

(d) Notwithstanding paragraphs (b) and (c) above, the Contractor shall honor any order exceeding the maximum order limitations in paragraph (b), unless that order (or orders) is returned to the

**SECTION B OF NNG07CA21C
SUPPLIES OR SERVICES AND PRICE/COST**

ordering office within 5 days after issuance, with written notice stating the Contractor's intent not to ship the item (or items) called for and the reasons. Upon receiving this notice, the Government may acquire the supplies or services from another source.

(End of clause)

B. 7 INDEFINITE QUANTITY (52.216-22) (OCT 1995)

(a) This is an indefinite-quantity contract for the supplies or services specified, and effective for the period stated, in the Schedule. The quantities of supplies and services specified in the Schedule are estimates only and are not purchased by this contract.

(b) Delivery or performance shall be made only as authorized by orders issued in accordance with the Ordering clause. The Contractor shall furnish to the Government, when and if ordered, the supplies or services specified in the Schedule up to and including the quantity designated in the Schedule as the "maximum. The Government shall order at least the quantity of supplies or services designated in the Schedule as the "minimum."

(c) Except for any limitations on quantities in the Order Limitations clause or in the Schedule, there is no limit on the number of orders that may be issued. The Government may issue orders requiring delivery to multiple destinations or performance at multiple locations.

(d) Any order issued during the effective period of this contract and not completed within that period shall be completed by the Contractor within the time specified in the order. The contract shall govern the Contractor's and Government's rights and obligations with respect to that order to the same extent as if the order were completed during the contract's effective period; provided, that the Contractor shall not be required to make any deliveries under this contract after one (1) year from the end of the contract's effective ordering period.

(End of clause)

B. 8 PAYMENT FOR OVERTIME PREMIUMS (52.222-2) (JUL 1990)

(a) The use of overtime is authorized under this contract if the overtime premium cost does not exceed \$0 or the overtime premium is paid for work--

**SECTION B OF NNG07CA21C
SUPPLIES OR SERVICES AND PRICE/COST**

(1) Necessary to cope with emergencies such as those resulting from accidents, natural disasters, breakdowns of production equipment, or occasional production bottlenecks of a sporadic nature:

(2) By indirect-labor employees such as those performing duties in connection with administration, protection, transportation, maintenance, standby plant protection, operation of utilities, or accounting:

(3) To perform tests, industrial processes, laboratory procedures, loading or unloading of transportation conveyances' and operations in flight or afloat that are continuous in nature and cannot reasonably be interrupted or completed otherwise, or

(4) That will result in lower overall costs to the Government.

(b) Any request for estimated overtime premiums that exceeds the amount specified above shall include all estimated overtime for contract completion and shall--

(1) Identify the work unit: e.g., department or section in which the requested overtime will be used, together with present workload, staffing, and other data of the affected unit sufficient to permit the Contracting Officer to evaluate the necessity for the overtime;

(2) Demonstrate the effect that denial of the request will have on the contract delivery or performance schedule;

(3) Identify the extent to which approval of overtime would affect the performance or payments in connection with other Government contracts, together with identification of each affected contract; and

(4) Provide reasons why the required work cannot be performed by using multishift operations or by employing additional personnel.

(End of clause)

B.9 ESTIMATED COST AND AWARD FEE (1852.216-85) (SEPTEMBER 1993)

The estimated cost of this contract is **\$(to be negotiated by task order)**. The maximum available award fee, excluding base fee, if any, is **\$(to be negotiated by task order)**. The base fee is \$0. Total estimated cost, base fee, and maximum award fee are **\$(to be negotiated by task order, in accordance with Attachment B.)**

(End of clause)

**SECTION B OF NNG07CA21C
SUPPLIES OR SERVICES AND PRICE/COST**

B.10 CONTRACT FUNDING (1852.232-81) (JUN 1990)

(a) For purposes of payment of cost, exclusive of fee, in accordance with the Limitation of Funds clause, the total amount allotted by the Government to this contract is \$0. This allotment is for cost and covers the following estimated period of performance: None.

(b) An additional amount of \$0 is obligated under this contract for payment of fee.

(End of clause)

B.11 SUPPLEMENTAL TASK ORDERING PROCEDURES

(a) When the Government issues a request for a "task plan" to the Contractor in accordance with the Clause entitled "Task Ordering Procedure" of this contract, the Contractor shall prepare its estimate of the labor hours, labor categories, indirect costs, and other direct costs required to perform the task order requirements. The Contractor shall use the labor categories and labor and indirect rates that shall not exceed the rates listed in Attachment B to calculate the proposed estimated cost to perform the task order requirements.

(b) The Contractor agrees that only those appropriate labor and indirect cost rates, which may be less than but shall not exceed the rates found in the applicable Attachment B, shall be used to calculate the proposed estimated costs for all task orders issued in accordance with the "Task Ordering Procedure" clause of this contract. The Contractor's proposed approach/pricing of the representative tasks set forth in its proposal for award of this contract shall be used as reference by the Contracting Officer in negotiating tasks with the Contractor which are issued under this contract, but only to the extent portions of a representative task are relevant to portions of a task actually issued.

(c) The Government and Contractor agree that the maximum available award fee percentage specified in Attachment B shall be used to calculate the maximum award fee dollars on all task orders issued in accordance with the "Task Ordering Procedure" clause of this contract. The Government shall solely determine the earned award fee under the contract.

(d) Upon initiation, the Government will designate each task order as a "Services" or "End Item(s)" task order. The following clauses shall

SECTION B OF NNG07CA21C
SUPPLIES OR SERVICES AND PRICE/COST

apply specifically to the appropriately designated task orders:

- *Services*: Clauses E.4, G.5 and Clause I.1-52.246-25 shall apply to task orders issued for services.
- *End Item(s)*: Clauses D.1, E.5, G.6, and Clause I.1-52.246-24 shall apply to task orders issued for end items.

(e) Task Orders will be issued using a Web-based Task Order Management System (TOMS) method.

(End of Text)

[END OF SECTION]

SECTION C OF NNG07CA21C
DESCRIPTION/SPECIFICATIONS/WORK STATEMENT

C.1 SCOPE OF WORK (GSFC 52.211-91) (FEB 1991)

The Contractor shall provide the personnel, materials, and facilities, except as otherwise specified in this contract, necessary to perform the work and to furnish the items specified in Section B of this contract in accordance with the Statement of Work (Section J, Attachment A) and task orders issued hereunder.

(End of clause)

C.2 REPORTS OF WORK

(a) Monthly progress reports. The Contractor shall submit monthly progress reports of all work accomplished covering all tasks active during each month of contract performance. Reports shall be in narrative form and brief and informal in content. They shall include a quantitative description of overall progress, an indication of any current problems, which may impede performance and proposed corrective action, discussions of the work to be performed and any CONUS/OCONUS trips planned and/or completed during the next monthly reporting period. Trip discussions shall include a description of the following: (1) date(s) of travel; (2) destination; (3) purpose; and (4) costs of travel (i.e. airfare, per diem (hotels/meals), rental vehicles, etc.)

(b) Final Task Report. The Contractor shall submit a final task report that summarizes the results of the entire task work, including recommendations and conclusions based on the experience and results obtained. The final task report should include tables, graphs, diagrams, curves, sketches, photographs, and drawings in sufficient detail to explain comprehensively the results achieved under the contract.

(c) The last page of the final report shall be a completed Standard Form (SF) 298, Report Documentation Page.

(d) Submission. The Contractor shall submit the report required by this clause as follows:

[M=Monthly, F=Final]

Copies	Report Type	Addressee	Mail Code
1	M, F	Contracting Officer	210.3
1	M, F	Contracting Officer's Technical Representative (COTR)	540

**SECTION C OF NNG07CA21C
DESCRIPTION/SPECIFICATIONS/WORK STATEMENT**

Copies	Report Type	Addressee	Mail Code
1	M,F	Task Monitor	See Task Order
1	F	Center for AeroSpace Information (CASI) Attn: Acquisitions Collections Development Specialist, 7121 Standard Drive, Hanover, Maryland 21076-1320	

(e) Submission dates. Monthly reports shall be submitted by the 15th day of the month following the month being reported. If the contract is awarded beyond the middle of a month, the first monthly report shall cover the period from award until the end of the following month. The final report for each task order shall be due 5 days prior to task order end date.

(End of Text)

C.3 COMPUTER SOFTWARE AND DATA RIGHTS

Computer software and data related to the computer software such as its documentation and training materials are to be delivered with unlimited rights. No limited rights data or restricted computer software will be accepted for delivery, except for the following COTS computer software products: **None**

(End of Text)

[END OF SECTION]

**SECTION D OF NNG07CA21C
PACKAGING AND MARKING**

D. 1 PACKAGING, HANDLING, AND TRANSPORTATION (1852.211-70) (SEPT 2005)

NOTE: This clause applies to all CPAF Task orders for End-Items.

(a) The Contractor shall comply with NPR 6000.1, "Requirements for Packaging, Handling, and Transportation for Aeronautical and Space Systems, Equipment, and Associated Components" as may be supplemented by the statement of work or specifications of this contract, for all items designated as Class I, II, or III.

(b) The Contractor's packaging, handling, and transportation procedures may be used, in whole or in part, subject to the written approval of the Contracting Officer, provided--

(1) The Contractor's procedures are not in conflict with any requirements of this contract, and

(2) The requirements of this contract shall take precedence in the event of any conflict with the Contractor's procedures.

(c) The Contractor must place the requirements of this clause in all subcontracts for items that will become components of deliverable Class I, II, or III items.

(End of clause)

[END OF SECTION]

**SECTION E OF NNG07CA21C
INSPECTION AND ACCEPTANCE**

**E. 1 MATERIAL INSPECTION AND RECEIVING REPORT NOT REQUIRED
(GSFC 52.246-94) (APR 1989)**

NASA FAR Supplement clause 1852.246-72 of this contract requires the furnishing of a Material Inspection and Receiving Report (MIRR) (DD Form 250 series) at the time of each delivery under this contract. However, a MIRR is not required for paper/electronic deliverables (i.e. reports).

(End of clause)

E. 2 INSPECTION SYSTEM (SUBCONTRACTS) (GSFC 52.246-100) (JULY 2000)

In performance of this contract, the Contractor shall impose inspection system requirements on subcontractors and suppliers to ensure the required quality of supplies or services. Monitoring of the Contractor's system for inspecting subcontractors will be accomplished through the combined efforts of NASA/GSFC personnel and the delegated Government agency. The authority and responsibility of the delegated agency will be defined in a letter of contract administration delegation.

(End of clause)

E. 3 INSPECTION SYSTEM RECORDS (GSFC 52.246-102) (OCT 1988)

The Contractor shall maintain records evidencing inspections in accordance with the Inspection clause of this contract for five years after delivery of all items and/or completion of all services called for by the contract.

(End of clause)

E. 4 INSPECTION OF SERVICES--COST-REIMBURSEMENT (52.246-5) (APR 1984)

NOTE: This clause applies to all CPAF Task Orders for Services.

(a) Definition. "Services," as used in this clause, includes services performed, workmanship, and material furnished or used in performing services.

**SECTION E OF NNG07CA21C
INSPECTION AND ACCEPTANCE**

(b) The Contractor shall provide and maintain an inspection system acceptable to the Government covering the services under this contract. Complete records of all inspection work performed by the Contractor shall be maintained and made available to the Government during contract performance and for as long afterwards as the contract requires.

(c) The Government has the right to inspect and test all services called for by the contract, to the extent practicable at all places and times during the term of the contract. The Government shall perform inspections and tests in a manner that will not unduly delay the work.

(d) If any of the services performed do not conform with contract requirements, the Government may require the Contractor to perform the services again in conformity with contract requirements, for no additional fee. When the defects in services cannot be corrected by reperformance, the Government may

- (1) require the Contractor to take necessary action to ensure that future performance conforms to contract requirements and
- (2) reduce any fee payable under the contract to reflect the reduced value of the services performed.

(e) If the Contractor fails to promptly perform the services again or take the action necessary to ensure future performance in conformity with contract requirements, the Government may (1) by contract or otherwise, perform the services and reduce any fee payable by an amount that is equitable under the circumstances or (2) terminate the contract for default.

(End of clause)

**E.5 INSPECTION OF RESEARCH AND DEVELOPMENT-COST-REIMBURSEMENT
(52.246-8) (MAY 2001)**

NOTE: This clause applies to all CPAF Task Orders for End-Items.

(a) *Definitions.* As used in this clause—
“Contractor’s managerial personnel” means the Contractor’s directors, officers, managers, superintendents, or equivalent representatives who have supervision or direction of—

- (1) All or substantially all of the Contractor’s business;

**SECTION E OF NNG07CA21C
INSPECTION AND ACCEPTANCE**

(2) All or substantially all of the Contractor's operation at any one plant or separate location where the contract is being performed; or

(3) A separate and complete major industrial operation connected with performing this contract.

"Work" includes data when the contract does not include the Warranty of Data clause.

(b) The Contractor shall provide and maintain an inspection system acceptable to the Government covering the work under this contract. Complete records of all inspection work performed by the Contractor shall be maintained and made available to the Government during contract performance and for as long afterwards as the contract requires.

(c) The Government has the right to inspect and test all work called for by the contract, to the extent practicable at all places and times, including the period of performance, and in any event before acceptance. The Government may also inspect the plant or plants of the Contractor or its subcontractors engaged in the contract performance. The Government shall perform inspections and tests in a manner that will not unduly delay the work.

(d) If the Government performs any inspection or test on the premises of the Contractor or a subcontractor, the Contractor shall furnish and shall require subcontractors to furnish all reasonable facilities and assistance for the safe and convenient performance of these duties.

(e) Unless otherwise provided in the contract, the Government shall accept work as promptly as practicable after delivery, and work shall be deemed accepted 90 days after delivery, unless accepted earlier.

(f) At any time during contract performance, but no later than 6 months (or such other time as may be specified in the contract) after acceptance of all of the end items (other than designs, drawings, or reports) to be delivered under the contract, the Government may require the Contractor to replace or correct work not meeting contract requirements. Time devoted to the replacement or correction of such work shall not be included in the computation of the above time period. Except as otherwise provided in paragraph (h) of this clause, the cost of replacement or correction shall be determined as specified in the Allowable Cost and Payment clause, but

**SECTION E OF NNG07CA21C
INSPECTION AND ACCEPTANCE**

no additional fee shall be paid. The Contractor shall not tender for acceptance work required to be replaced or corrected without disclosing the former requirement for replacement or correction, and, when required, shall disclose the corrective action taken.

(g) (1) If the Contractor fails to proceed with reasonable promptness to perform required replacement or correction, the Government may—

(i) By contract or otherwise, perform the replacement or correction, charge to the Contractor any increased cost, or make an equitable reduction in any fixed fee paid or payable under the contract;

(ii) Require delivery of any undelivered articles and shall have the right to make an equitable reduction in any fixed fee paid or payable under the contract; or

(iii) Terminate the contract for default.

(2) Failure to agree on the amount of increased cost to be charged the Contractor or to the reduction in fixed fee shall be a dispute.

(h) Notwithstanding paragraphs (f) and (g) of this clause, the Government may at any time require the Contractor to remedy by correction or replacement, without cost to the Government, any failure by the Contractor to comply with the requirements of this contract, if the failure is due to—

(1) Fraud, lack of good faith, or willful misconduct on the part of the Contractor's managerial personnel; or

(2) The conduct of one or more of the Contractor's employees selected or retained by the Contractor after any of the Contractor's managerial personnel has reasonable grounds to believe that the employee is habitually careless or unqualified.

(i) This clause shall apply in the same manner to a corrected or replacement end item or components as to work originally delivered.

(j) The Contractor has no obligation or liability under the contract to correct or replace articles not meeting contract requirements at time of delivery, except as provided in this clause or as may otherwise be specified in the contract.

(k) Unless otherwise provided in the contract, the Contractor's obligations to correct or replace Government-furnished property shall be governed by the clause pertaining to Government property.

(End of clause)

**SECTION E OF NNG07CA21C
INSPECTION AND ACCEPTANCE**

E. 6 HIGHER-LEVEL CONTRACT QUALITY REQUIREMENT (52.246-11) (FEB 1999)

The Contractor shall comply with the higher-level quality standard selected below.

(a) When conducting services at GSFC the contractor shall follow GSFC ANSI/ISO/ASQ Q9001-2000 quality management system (QMS) requirements as documented on-line in the GSFC QMS system. In addition, the contractor's quality system shall be compliant with ISO 9001. Additional quality requirements may also be specified in individual task order authorizations.

"Compliant" means that the contractor has defined, documented, and will continually implement during the term of the contract management-approved methods of operation that conform to the requirements given in the above-cited International Standard.

(b) Attachment F - Mission Assurance Plan (MAP)

(End of clause)

E. 7 MATERIAL INSPECTION AND RECEIVING REPORT (1852.246-72) (AUG 2003)

(a) At the time of each delivery to the Government under this contract, the Contractor shall furnish a Material Inspection and Receiving Report (DD Form 250 series) prepared in an original copy and sufficient other copies to accomplish the following distribution:

(1) Via mail and marked "Advance Copy", one copy each to the Contracting Officer, the Contracting Officer's Technical Representative (if designated in the contract), and to the cognizant Administrative Contracting Officer, if any.

(2) Via mail, the original and 1 copy (unfolded) to the shipment address (delivery point) specified in Section F of this contract. Mark the exterior of the envelope "CONTAINS DD FORM 250". This must arrive prior to the shipment.

(3) With shipment in waterproof envelope (one copy) for the consignee.

(4) If the shipment address is not directly to the Goddard Space Flight Center (Greenbelt) or Goddard Space Flight Center (Wallops) central receiving areas, then one copy of the DD Form 250 must be provided (via mail) to one on the following addresses depending upon whether this contract is with GSFC Greenbelt or GSFC Wallops:

**SECTION E OF NNG07CA21C
INSPECTION AND ACCEPTANCE**

Receiving and Inspection (Code 279), Goddard Space Flight Center, Greenbelt, MD 20771.

Receiving and Inspection (Bldg. F16), Wallops Flight Facility, Wallops Island VA 23337.

(b) The Contractor shall prepare the DD Form 250 in accordance with NASA FAR Supplement 18-46.6. The Contractor shall enclose the copies of the DD Form 250 in the package or seal them in a waterproof envelope, which shall be securely attached to the exterior of the package in the most protected location.

(c) When more than one package is involved in a shipment, the Contractor shall list on the DD Form 250, as additional information, the quantity of packages and the package numbers. The Contractor shall forward the DD Form 250 with the lowest numbered package of the shipment and print the words "CONTAINS DD FORM 250" on the package.

(End of clause)

E.8 ACCEPTANCE--SINGLE LOCATION (GSFC 52.246-92) (SEPT 1989)

The Contracting Officer or authorized representative will accomplish acceptance at Goddard Space Flight Center. For the purpose of this clause, the Contracting Officer's Technical Representative named in this contract is the authorized representative. The Contracting Officer reserves the right to unilaterally designate a different Government agent as the authorized representative. The Contractor will be notified by a written notice or by a copy of the delegation of authority if different representative is designated.

(End of clause)

[END OF SECTION]

**SECTION F OF NNG07CA21C
DELIVERIES OR PERFORMANCE**

F.1 PLACE OF PERFORMANCE--SERVICES (GSFC 52.237-92) (OCT 1988)

The services specified by this contact shall be performed at the following location(s): NASA/Goddard Space Flight Center, Other NASA Centers (subject to on-site availability, if required), and **Contractor's facilities in Lanham/Seabrook, MD and subcontractor manufacturing facilities for Northrop Grumman Corporation (Lanham, MD and Linthicum, MD) Ball Aerospace & Technology Corporation (Boulder, CO) and Sigma Space Corporation (Lanham, MD).**

(End of clause)

F.2 EFFECTIVE ORDERING PERIOD

The Government may issue tasks for a period of five (5) years from the effective date of the contract. New Task Orders shall not be issued after the expiration of the effective ordering period. The Contracting Officer may extend existing Task Orders up to twelve (12) months past the expiration of the effective ordering period.

(End of Text)

F.3 SHIPPING INSTRUCTIONS--CENTRAL RECEIVING (GSFC 52.247-94) (JUL 1993)

Shipments of the items required under this contract shall be to:

Receiving Officer
Building 16W
Code 279
Goddard Space Flight Center
Greenbelt, Maryland 20771

Marked for: NNG07CA21C

Technical Monitor (Name):	Code:
Building:	Room:
Contract No.	Task Order No.
Item(s) No.	

The above to be specified in each task order.

Compliance with this clause is necessary to assure verification of delivery and acceptance and prompt payment.

(End of clause)

**SECTION F OF NNG07CA21C
DELIVERIES OR PERFORMANCE**

F.4 STOP-WORK ORDER (52.242-15) (AUG 1989)--ALTERNATE I (APR 1984)

(a) The Contracting Officer may, at any time, by written order to the Contractor, require the Contractor to stop all, or any part, of the work called for by this contract for a period of 90 days after the order is delivered to the Contractor, and for any further period to which the parties may agree. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Within a period of 90 days after a stop-work order is delivered to the Contractor, or within any extension of that period to which the parties shall have agreed, the Contracting Officer shall either--

(1) Cancel the stop-work order; or

(2) Terminate the work covered by the order as provided in the Termination clause of this contract.

(b) If a stop-work order issued under this clause is canceled or the period of the order or any extension thereof expires, the Contractor shall resume work. The Contracting Officer shall make an equitable adjustment in the delivery schedule, the estimated cost, the fee, or a combination thereof, and in any other terms of the contract that may be affected.

(1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract; and

(2) The Contractor asserts its right to the adjustment within 30 days after the end of the period of work stoppage; provided, that, if the Contracting Officer decides the facts justify the action, the Contracting Officer may receive and act upon the claim submitted at any time before final payment under this contract.

(c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.

**SECTION F OF NNG07CA21C
DELIVERIES OR PERFORMANCE**

(d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.

(End of clause)

F.5 F.O.B. DESTINATION (52.247-34) (NOV 1991)

(a) The term "f.o.b. destination," as used in this clause, means--

(1) Free of expense to the Government, on board the carrier's conveyance, at a specified delivery point where the consignee's facility (plant, warehouse, store, lot, or other location to which shipment can be made) is located, and

(2) Supplies shall be delivered to the destination consignee's wharf (if destination is a port city and supplies are for export), warehouse unloading platform, or receiving dock, at the expense of the Contractor. The Government shall not be liable for any delivery, storage, demurrage, accessorial, or other charges involved before the actual delivery (or "constructive placement" as defined in carrier tariffs) of the supplies to the destination, unless such charges are caused by an act or order of the Government acting in its contractual capacity. If rail carrier is used, supplies shall be delivered to the specified unloading platform of the consignee. If motor carrier (including "piggyback") is used, supplies shall be delivered to truck tailgate at the unloading platform of the consignee, except when the supplies delivered meet the requirements of Item 568 of the National Motor Freight Classification for "heavy or bulky freight". When supplies meeting the requirements of the referenced Item 568 are delivered, unloading (including movement to the tailgate) shall be performed by the consignee, with assistance from the truck driver, if requested. If the Contractor uses rail carrier or freight forwarder for less than carload shipments, the Contractor shall ensure that the carrier will furnish tailgate delivery, when required, if transfer to truck is required to complete delivery to consignee.

(b) The Contractor shall--

(1) (i) Pack and mark the shipment to comply with contract specifications; or

(ii) In the absence of specifications, prepare the shipment in conformance with carrier requirements;

**SECTION F OF NNG07CA21C
DELIVERIES OR PERFORMANCE**

- (2) Prepare and distribute commercial bills of lading;
- (3) Deliver the shipment in good order and condition to the point of delivery specified in the contract;
- (4) Be responsible for any loss of and/or damage to the goods occurring before receipt of the shipment by the consignee at the delivery point specified in the contract;
- (5) Furnish a delivery schedule and designate the mode of delivering carrier; and
- (6) Pay and bear all charges to the specified point of delivery.

(End of clause)

[END OF SECTION]

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

G.1 FINANCIAL MANAGEMENT REPORTING (GSFC 52.242-90) (FEB 2004)

(a) Requirements. This clause provides the supplemental instructions referred to in NASA FAR Supplement (NFS) clause 1852.242-73. The NFS clause and NASA Procedural Requirements (NPR) 9501.2D, "NASA Contractor Financial Management Reporting", establish report due dates and other financial management reporting requirements. NPR 9501.2D permits withholding of payment for noncompliance.

(b) Supplemental instructions. (1) Monthly (NF 533M) reports are required. Quarterly (NF 533Q) reports are also required. The reporting structure shall be in accordance with Attachment C of this contract.

(2) As stated in NPR 9501.2D, NASA strongly encourages electronic contractor cost reporting. The preferred formats are Excel and Adobe. Contact the Contracting Officer for any E-Mail addresses that are not provided or which become noncurrent.

Distribution shall be as follows:

Contracting Officer, Code 210.3
Email: Kathleen.M.Pierson@nasa.gov

Contracting Officer's Technical Representative, Code 540
Email: Lyle.G.Knight@nasa.gov

Resources Analyst, Code 540 (Electronic Format via CD
and Hardcopy for The Summary Sheets)
Email: Wilma.M.Warren@nasa.gov

Regional Finance Office Cost Team, Code 155
E-Mail: rfocateam@listserv.gsfc.nasa.gov

Administrative Contracting Officer (if delegated)

(c) Web sites. (1) NPR 9501.2D, "NASA Contractor Financial Management Reporting":

[http://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal ID=N PR 9501 002D
&page name=main](http://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal%20ID=N%20PR%209501%20002D&page%20name=main)

(2) NF 533 Tutorial: (for training purposes only)

<http://genesis.gsfc.nasa.gov/nf533/nf533.htm>

(End of clause)

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

G.2 CONTRACTOR USE OF GSFC LIBRARY (GSFC 52.245-90) (AUG 1993)

The Contractor's professional employees performing work under this contract are granted borrowing privileges at the Goddard Space Flight Center (GSFC) Library.

(a) The Contractor shall establish procedures to account for borrowed materials and to ensure their timely return. "Timely return" means prior to the expiration of the borrowing period, prior to the termination of employment of the particular employee, or prior to the expiration of this contract, whichever comes first.

(b) The Contractor shall initiate borrowing privileges for its employees by contacting the GSFC Librarian. The Librarian will require the Contractor to provide the name and title of the company official responsible for ensuring compliance with (a) above. The responsible official will be required to indicate the level of control for the issuance of Library charge plates and whether the countersignature of the responsible company official will be required on Goddard Library Card Applications. The GSFC Librarian may impose additional information requirements if Library privileges are requested for employees that do not have permanent GSFC badges.

(c) The Contractor shall be responsible for all items lost, destroyed or not returned. Such items shall be immediately replaced by the Contractor at no cost to the Government. The GSFC Librarian may revoke library privileges at any time during the performance of the contract if the Contractor fails to comply with this clause or is experiencing an inordinate amount of loss or destruction of library materials. Discontinuance of library privileges shall not entitle the Contractor to an increase in the cost or price for contract performance or to any other adjustment to the contract.

(End of clause)

**G.3 PROPERTY CLAUSE APPLICABILITY--ON-SITE AND OFF-SITE (GSFC 52.245-96)
(JULY 2004)**

(a) Performance of this contract requires that contractor personnel and any furnished and/or acquired government property be located at both Government controlled and managed premises (on-site) and at contractor controlled and managed premises (off-site). The requirements for control and accountability of government property differ depending upon the location of the property. The applicability of the clauses in this contract to on-site and to off-site locations is indicated below.

(b) Clauses applicable to both on-site and off-site locations.

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

FAR clause 52.245-5, "Government Property (Cost Reimbursement, Time-and-Material, or Labor-Hour Contracts" except that paragraph (e) does not apply to on-site locations.

NASA FAR Supplement clause 1852.245-70, "Contractor Requests for Government-Owned Equipment".

GSFC clause 52.245-92, "Repair or Replacement of Government Property--Special Conditions", if included.

GSFC clause 52.245-97, "Contractor Acquired Property--NASA Conditions".

(c) Clauses applicable only to off-site locations.

NASA FAR Supplement clause 1852.245-73, "Financial Reporting of NASA Property in the Custody of Contractors"

NASA FAR Supplement clause 1852.245-76, "List of Government-Furnished Property", if included.

(d) Clauses applicable only to on-site locations.

NASA FAR Supplement clause 1852.245-71, "Installation-Accountable Government Property (Alternate I)".

NASA FAR Supplement clause 1852.245-77, "List of Installation-Accountable Property and Services".

GSFC clause 52.245-93, "Reports of Contractor Acquired Government Property"

(End of clause)

**G.4 CONTRACTOR ACQUIRED PROPERTY--NASA CONDITIONS (GSFC 52.245-97)
(SEP 1998)**

NASA FAR Supplement 1845.502-70 establishes general and specific conditions that apply to this contract for various categories of contractor acquired property.

(End of clause)

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

G.5 AWARD FEE FOR SERVICE CONTRACTS (1852.216-76) (JUNE 2000)

NOTE: This clause applies to all Task Orders for Services.

(a) The contractor can earn award fee from a minimum of zero dollars to the maximum stated in NASA FAR Supplement clause 1852.216-85, "Estimated Cost and Award Fee" in this contract.

(b) Beginning 6 months after the effective date of this contract, the Government shall evaluate the Contractor's performance every 6 months to determine the amount of award fee earned by the contractor during the period. The Contractor may submit a self-evaluation of performance for each evaluation period under consideration. These self-evaluations will be considered by the Government in its evaluation. The Government's Fee Determination Official (FDO) will determine the award fee amounts based on the Contractor's performance in accordance with the MSES II/A Performance Evaluation Plan. The plan may be revised unilaterally by the Government prior to the beginning of any rating period to redirect emphasis.

(c) The Government will advise the Contractor in writing of the evaluation results. The Cost and Commercial Accounts Department, Code 155, will make payment based on issuance of a unilateral modification by Contracting Officer.

(d) After 85% of the potential award fee has been paid, the Contracting Officer may direct the withholding of further payment of award fee until a reserve is set aside in an amount that the Contracting Officer considers necessary to protect the Government's interest. This reserve shall not exceed 15 percent of the total potential award fee.

(e) The amount of award fee which can be awarded in each evaluation period is limited to the amounts set forth in the Performance Evaluation Plan. Award fee which is not earned in an evaluation period cannot be reallocated to future evaluation periods.

(f)(1) Provisional award fee payments will be made under this contract pending the determination of the amount of fee earned for an evaluation period. If applicable, provisional award fee payments will be made to the Contractor on a monthly basis. The total amount of award fee available in an evaluation period that will be provisionally paid is the lesser of 80% or the prior period's evaluation score.

(2) Provisional award fee payments will be superseded by the final award fee evaluation for that period. If provisional payments exceed the final evaluation score, the Contractor will either credit the

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

next payment voucher for the amount of such overpayment or refund the difference to the Government, as directed by the Contracting Officer.

(3) If the Contracting Officer determines that the Contractor will not achieve a level of performance commensurate with the provisional rate, payment of provisional award fee will be discontinued or reduced in such amounts as the Contracting Officer deems appropriate. The Contracting Officer will notify the Contractor in writing if it is determined that such discontinuance or reduction is appropriate.

(4) Provisional award fee payments will be made prior to the first award fee determination by the Government.

(g) Award fee determinations are unilateral decisions made solely at the discretion of the Government.

(End of clause)

G.6 AWARD FEE FOR END ITEM CONTRACTS (1852.216-77) (JUN 2000)

NOTE: This clause applies to all CPAF Task Orders for End-Items.

(a) The contractor can earn award fee, or base fee, if any, from a minimum of zero dollars to the maximum stated in NASA FAR Supplement clause 1852.216-85, "Estimated Cost and Award Fee" in this contract. All award fee evaluations, with the exception of the last evaluation, will be interim evaluations. At the last evaluation, which is final, the Contractor's performance for each End-Item Task Order will be evaluated to determine total earned award fee. No award fee or base fee will be paid to the Contractor if the final award fee evaluation is "poor/unsatisfactory."

(b) Beginning 6 months after the effective date of this contract, the Government will evaluate the Contractor's interim performance every 6 months to monitor Contractor performance prior to contract completion and to provide feedback to the Contractor. The evaluation will be performed in accordance with MSES II/A Performance Evaluation Plan to this contract. The Contractor may submit a self-evaluation of performance for each period under consideration. These self-evaluations will be considered by the Government in its evaluation. The Government will advise the Contractor in writing of the evaluation results. The plan may be revised unilaterally by the Government prior to the beginning of any rating period to redirect emphasis.

(c) (1) Base fee, if applicable, will be paid in monthly installments based on the percent of completion of the work as determined by the Contracting Officer.

(2) Interim award fee payments will be made to the Contractor based on each interim evaluation. The amount of the interim award fee payment is limited to the lesser of the interim evaluation score

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

or 80% of the fee allocated to that period less any provisional payments made during the period. All interim award fee payments will be superseded by the final award fee determination.

(3) Provisional award fee payments will be made under this contract pending each interim evaluation. If applicable, provisional award fee payments will be made to the Contractor on a monthly basis. The amount of award fee which will be provisionally paid in each evaluation period is limited to 80% of the prior interim evaluation score. Provisional award fee payments made each evaluation period will be superseded by the interim award fee evaluation for that period. If provisional payments made exceed the interim evaluation score, the Contractor will either credit the next payment voucher for the amount of such overpayment or refund the difference to the Government, as directed by the Contracting Officer. If the Government determines that (i) the total amount of provisional fee payments will apparently substantially exceed the anticipated final evaluation score, or (ii) the prior interim evaluation is "poor/unsatisfactory," the Contracting Officer will direct the suspension or reduction of the future payments and/or request a prompt refund of excess payments as appropriate. Written notification of the determination will be provided to the Contractor with a copy to the Deputy Chief Financial Officer (Finance).

(4) All interim (and provisional, if applicable) fee payments will be superseded by the fee determination made in the final award fee evaluation. The Government will then pay the Contractor, or the Contractor will refund to the Government the difference between the final award fee determination and the cumulative interim (and provisional, if applicable) fee payments. If the final award fee evaluation is "poor/unsatisfactory", any base fee paid will be refunded to the Government.

(5) Payment of base fee, if applicable, will be made based on submission of an invoice by the Contractor. Payment of award fee will be made by the Cost and Commercial Accounts Department, Code 155, will make payment based on issuance of a unilateral modification by Contracting Officer.

(d) Award fee determinations are unilateral decisions made solely at the discretion of the Government.

(End of clause)

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

G.7 SUBMISSION OF VOUCHERS FOR PAYMENT (1852.216-87) (MAR 1998)

(a) The designated billing office for cost vouchers for purposes of the Prompt Payment clause of this contract is indicated below. Public vouchers for payment of costs shall include a reference to the number of this contract.

(b)(1) If the contractor is authorized to submit interim cost vouchers directly to the NASA paying office, the original voucher and one copy should be submitted to:

Cost and Commercial Accounts Department
Code 155
Goddard Space Flight Center
Greenbelt, Maryland 20771

(2) For any period that the Defense Contract Audit Agency has authorized the Contractor to submit interim cost vouchers directly to the Government paying office, interim vouchers are not required to be sent to the Auditor, and are considered to be provisionally approved for payment subject to final audit.

(3) Copies of vouchers should be submitted as may be directed by the Contracting Officer.

(c) If the contractor is not authorized to submit interim cost vouchers directly to the paying office as described in paragraph (b), the contractor shall prepare and submit vouchers as follows:

(1) One original and one copy Standard Form (SF)1034, SF 1035, or equivalent Contractor's attachment to the Auditor. **DCAA, Columbia Branch Office, One Mall North, 10025 Governor Warfield Parkway Suite 200, Columbia, MD 21033, Attn: Ms. Jacqueline, Hlavin, Branch Manager 410-964-2060**

(2) One "**Courtesy**" copy to the Contracting Officer submitted electronically.

(3) The Contracting Officer may designate other recipients as required.

(d) Public vouchers for payment of fee shall be prepared similarly to the procedures in paragraphs (b) or (c) of this clause, whichever is applicable, and be forwarded to the Contracting Officer.

This is the designated billing office for fee vouchers for purposes of the Prompt Payment clause of this contract.

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

(e) In the event that amounts are withheld from payment in accordance with provisions of this contract, a separate voucher for the amount withheld will be required before payment for that amount may be made.

(End of clause)

G. 8 DESIGNATION OF NEW TECHNOLOGY REPRESENTATIVE AND PATENT REPRESENTATIVE (1852.227-72) (JULY 1997)

(a) For purposes of administration of the clause of this contract entitled "New Technology" or "Patent Rights -- Retention by the Contractor (Short Form)", whichever is included, the following named representatives are hereby designated by the Contracting Officer to administer such clause:

Title	Office Code	Address (including zip code)
New Technology Representative	504	Goddard Space Flight Center Greenbelt, MD 20771
Patent Representative	140.1	Goddard Space Flight Center Greenbelt, MD 20771

(b) Reports of reportable items, and disclosure of subject inventions, interim reports, final reports, utilization reports, and other reports required by the clause, as well as any correspondence with respect to such matters, should be directed to the New Technology Representative unless transmitted in response to correspondence or request from the Patent Representative. Inquiries or requests regarding disposition of rights, election of rights, or related matters should be directed to the Patent Representative. This clause shall be included in any subcontract hereunder requiring a "New Technology" clause or "Patent Rights--Retention by the Contractor (Short Form)" clause, unless otherwise authorized or directed by the Contracting Officer. The respective responsibilities and authorities of the above-named representatives are set forth in 1827.305-370 of the NASA FAR Supplement.

(End of clause)

G. 9 NASA CONTRACTOR FINANCIAL MANAGEMENT REPORTING (1852.242-73) (NOV 2004)

a) The Contractor shall submit NASA Contractor Financial Management Reports on NASA Forms 533 in accordance with the instructions in NASA Procedural Requirements (NPR) 9501.2, NASA Contractor Financial Management Reporting, and on the reverse side of the forms, as

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

supplemented in the Schedule of this contract. The detailed reporting categories to be used, which shall correlate with technical and schedule reporting, shall be set forth in the Schedule. Contractor implementation of reporting requirements under this clause shall include NASA approval of the definitions of the content of each reporting category and give due regard to the Contractor's established financial management information system.

(b) Lower level detail used by the Contractor for its own management purposes to validate information provided to NASA shall be compatible with NASA requirements.

(c) Reports shall be submitted in the number of copies, at the time, and in the manner set forth in the Schedule or as designated in writing by the Contractor Officer. Upon completion and acceptance by NASA of all contract line items, the Contracting Officer may direct the Contractor to submit Form 533 reports on a quarterly basis only, report only when changes in actual cost incur, or suspend reporting altogether.

(d) The Contractor shall ensure that its Form 533 reports include accurate subcontractor cost data, in the proper reporting categories, for the reporting period.

(e) If during the performance of this contract NASA requires a change in the information or reporting requirements specified in the Schedule, or as provided for in paragraph (a) or (c) of this clause, the Contracting Officer shall effect that change in accordance with the Changes clause of this contract.

(End of clause)

**G. 10 CONTRACTOR REQUESTS FOR GOVERNMENT-OWNED EQUIPMENT
(1852.245-70) (JUL 1997)**

(a) "Equipment," as used in this clause, means commercially available items capable of stand-alone use, including those to be acquired for incorporation into special test equipment or special tooling.

(b) (1) Upon determination of need for any Government-owned equipment item for performance of this contract, the contractor shall provide to the contracting officer a written request justifying the need for the equipment and the reasons why contractor-owned property cannot be used, citing the applicable FAR or contract authority for use of Government-owned equipment. Equipment being acquired as a deliverable end item listed in the contract or as a component for

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

incorporation into a deliverable end item listed in the contract is exempt from this requirement.

(2) The contractor's request shall include a description of the item in sufficient detail to enable the Government to screen its inventories for available equipment or to purchase equipment. For this purpose, the contractor shall (i) prepare a separate DD Form 1419, DOD Industrial Plant Equipment Requisition, or equivalent format, for each item requested and (ii) forward it through the contracting officer to the Industrial Property Officer at the cognizant NASA installation at least 30 days in advance of the date the contractor intends to acquire the item. Multiple units of identical items may be requested on a single form. Instructions for preparing the DD Form 1419 are contained in NASA FAR Supplement 1845.7102. If a certificate of nonavailability is not received within that period, the contractor may proceed to acquire the item, subject to having obtained contracting officer consent, if required, and having complied with any other applicable provisions of this contract.

(c) Contractors who are authorized to conduct their own screening using the NASA Equipment Management System (NEMS) and other Government sources of excess property shall provide the evidence of screening results with their request for contracting officer consent. Requests to purchase based on unsuitability of items found shall include rationale for the determined unsuitability.

(End of clause)

**G. 11 INSTALLATION-ACCOUNTABLE GOVERNMENT PROPERTY (1852.245-71)
(NOV 2004)**

(a) The Government property described in the clause at 1852.245-77, List of Installation-Accountable Property and Services, shall be made available to the Contractor on a no-charge basis for use in performance of this contract. This property shall be utilized only within the physical confines of the NASA installation that provided the property. Under this clause, the Government retains accountability for, and title to, the property, and the contractor assumes the following user responsibilities:

(1) Notify the cognizant property custodian, COTR, and the Installation Security Officer immediately if theft of Government property is suspected or property cannot be located

(2) Identify Government property equipment that is no longer considered necessary for performance of the contract.

(3) Ensure that equipment is turned in to the Property

SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA

Disposal Officer through the cognizant property custodian when no longer needed. This is the only acceptable procedure for disposal of Government property.

(4) Do not relocate Government property within Government premises or remove Government property from Government premises without written approval.

(5) Ensure that Government property, including property leased to the Government, is used only for the purposes of performing the contract.

(6) Ensure that Government property is protected and conserved.

The Contractor shall establish and adhere to a system of written procedures for compliance with the user responsibilities. Such procedures must include holding employees liable, when appropriate, for loss, damage, or destruction of Government property.

(b)(1) The official accountable record keeping, physical inventory, financial control, and reporting of the property subject to this clause shall be retained by the Government and accomplished by the installation Supply and Equipment Management Officer (SEMO) and Financial Management Officer. If this contract provides for the contractor to acquire property, title to which will vest in the Government, the following additional procedures apply:

(i) The contractor's purchase order shall require the vendor to deliver the property to the installation central receiving area;

(ii) The contractor shall furnish a copy of each purchase order, prior to delivery by the vendor, to the installation central receiving area;

(iii) The contractor shall establish a record of the property as required by FAR 45.5 and 1845.5 and furnish to the Industrial Property Officer a DD Form 1149 Requisition and Invoice/Shipping Document (or installation equivalent) to transfer accountability to the Government within 5 working days after receipt of the property by the contractor. The contractor is accountable for all contractor-acquired property until the property is transferred to the Government's accountability.

(iv) Contractor use of Government property at an off-site location and off-site subcontractor use require advance approval of the contracting officer and notification of the SEMO. The contractor shall assume accountability and financial reporting responsibility for such property. The contractor shall establish records and property control procedures and maintain the property in accordance with the requirements of FAR Part 45.5 until its return to the installation.

(2) After transfer of accountability to the Government, the contractor shall continue to maintain such internal records as are

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

necessary to execute the user responsibilities identified in paragraph (a) and document the acquisition, billing, and disposition of the property. These records and supporting documentation shall be made available, upon request, to the SEMO and any other authorized representatives of the contracting officer.

(End of clause)

G. 12 FINANCIAL REPORTING OF NASA PROPERTY IN THE CUSTODY OF CONTRACTORS (1845.245-73) (OCT 2003)

(a) The Contractor shall submit annually a NASA Form (NF) 1018, NASA Property in the Custody of Contractors, in accordance with the provisions of 1845.505-14, the instructions on the form, subpart 1845.71, and any supplemental instructions for the current reporting period issued by NASA.

(b)(1) Subcontractor use of NF 1018 is not required by this clause; however, the Contractor shall include data on property in the possession of subcontractors in the annual NF 1018.

(2) The Contractor shall mail the original signed NF 1018 directly to the Goddard Space Flight Center (GSFC), General Accounting Department, General Ledger Section, Code 157, Greenbelt, MD 20771, unless the Contractor uses the NF 1018 Electronic Submission System (NESS) for report preparation and submission.

(3) One copy shall be submitted (through the Department of Defense (DOD) Property Administrator if contract administration has been delegated to DOD) to the following address:

Goddard Space Flight Center, Supply and Equipment Management Branch, Code 273, Greenbelt, MD 20771--unless the Contractor uses the NF 1018 Electronic Submission System (NESS) for report preparation and submission.

(c)(1) The annual reporting period shall be from October 1 of each year through September 30 of the following year. The report shall be submitted in time to be received by October 15. The information contained in these reports is entered into the NASA accounting system to reflect current asset values for agency financial statement purposes. Therefore, it is essential that required reports be received no later than October 15. Some activity may be estimated for the month of September, if necessary, to ensure the NF 1018 is received when due. However, contractors' procedures must document the process for developing these estimates based on planned activity such as planned purchases or NASA Form 533 (NF 533 Contractor Financial Management Report) cost estimates. It should be supported

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

and documented by historical experience or other corroborating evidence, and be retained in accordance with FAR Subpart 4.7, Contractor Records Retention. Contractors shall validate the reasonableness of the estimates and associated methodology by comparing them to actual activity once that data is available, and adjust them accordingly. In addition, differences between the estimated cost and the actual cost must be adjusted during the reporting period. Contractors shall have formal policies and procedures, which address the validation of NF 1018 data, including data from subcontractors, and the identification and timely reporting of errors. The objective of this validation is to ensure that information reported is accurate and in compliance with the NASA FAR Supplement. If errors are discovered on NF 1018 after submission, the contractor shall immediately contact the cognizant NASA Center Industrial Property Officer (IPO) to discuss corrective action.

(2) The Contracting Officer may, in NASA's interest, withhold payment until a reserve not exceeding \$25,000 or 5 percent of the amount of the contract, whichever is less, has been set aside, if the Contractor fails to submit annual NF 1018 reports in accordance with 1845.505-14 and any supplemental instructions for the current reporting period issued by NASA. Such reserve shall be withheld until the Contracting Officer has determined that NASA has received the required reports. The withholding of any amount or the subsequent payment thereof shall not be construed as a waiver of any Government right.

(d) A final report shall be submitted within 30 days after disposition of all property subject to reporting when the contract performance period is complete in accordance with (b)(1) through (3) of this clause.

(End of clause)

G.13 LIST OF GOVERNMENT-FURNISHED PROPERTY (1852.245-76) (OCT 1988)

For performance of work under this contract, the Government will make available Government property identified in each individual task order, if applicable, of this contract on a no-charge-for-use basis. The Contractor shall use this property in the performance of this contract at applicable site (s) identified in each individual task order and at other location(s) as may be approved by the Contracting Officer. Under the FAR 52.245 Government property clause of this contract, the Contractor is accountable for the identified property.

(End of clause)

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

**G.14 LIST OF INSTALLATION-ACCOUNTABLE PROPERTY AND SERVICES
(1852.245-77) (JUL 1997)**

In accordance with the clause at 1852.245-71, Installation-Accountable Government Property, the Contractor is authorized use of the types of property and services listed below, to the extent they are available, in the performance of this contract within the physical borders of the installation which may include buildings and space owned or directly leased by NASA in close proximity to the installation, if so designated by the Contracting Officer.

(a) Office space, work area space, and utilities. Government telephones are available for official purposes only; pay telephones are available for contractor employees for unofficial calls.

(b) General- and special-purpose equipment, including office furniture.

(1) Equipment to be made available is listed in each individual task order, if applicable. The Government retains accountability for this property under the clause at 1852.245-71, Installation-Accountable Government Property, regardless of its authorized location.

(2) If the Contractor acquires property, title to which vests in the Government pursuant to other provisions of this contract, this property also shall become accountable to the Government upon its entry into Government records as required by the clause at 1852.245-71, Installation-Accountable Government Property.

(3) The Contractor shall not bring to the installation for use under this contract any property owned or leased by the Contractor, or other property that the Contractor is accountable for under any other Government contract, without the Contracting Officer's prior written approval.

(c) Supplies from stores stock.

(d) Publications and blank forms stocked by the installation.

(e) Safety and fire protection for Contractor personnel and facilities.

(f) Installation service facilities: Goddard Library

(g) Medical treatment of a first-aid nature for Contractor personnel injuries or illnesses sustained during on-site duty.

(h) Cafeteria privileges for Contractor employees during normal operating hours.

**SECTION G OF NNG07CA21C
CONTRACT ADMINISTRATION DATA**

(i) Building maintenance for facilities occupied by Contractor personnel.

(j) Moving and hauling for office moves, movement of large equipment, and delivery of supplies. Moving services shall be provided on-site, as approved by the Contracting Officer.

(k) The user responsibilities of the Contractor are defined in paragraph (a) of the clause at 1852.245-71, Installation-Accountable Government Property.

(End of clause)

G. 15 ACCOUNTABILITY OF COSTS/SEGRATION OF TASK ORDERS

(a) All costs incurred by the Contractor, under this contract, shall be segregated by each Task Order (TO). The Contractor shall therefore establish separate "Job Order Accounts and Numbers" for each Task Order issued and shall record all incurred costs in the appropriate job order account assigned each Task Order.

(b) The Contractor shall submit invoice(s) reflecting the costs incurred and segregated by each Task Order.

(c) There shall be no commingling of or transferring of costs between Task Orders.

(End of text)

[END OF SECTION]

**SECTION H OF NNG07CA21C
CONTRACT CLAUSES**

H.1 SECTION H CLAUSES INCORPORATED BY REFERENCE

- (1852.208-81) RESTRICTIONS ON PRINTING AND DUPLICATING (NOV 2004)
- (1852.223-70) SAFETY AND HEALTH (APR 2002)
- (1852.223-75) MAJOR BREACH OF SAFETY OR SECURITY (FEB 2002)
- (1852.228-72) CROSS WAIVER OF LIABILITY FOR SPACE SHUTTLE SERVICES (SEPT 1993)
- (1852.228-76) CROSS WAIVER OF LIABILITY FOR SPACE STATION ACTIVITIES (DEC 1994)
- (1852.242-72) OBSERVANCE OF LEGAL HOLIDAYS (AUG 1992)--ALTERNATE II (OCT 2000)
- (1852.244-70) GEOGRAPHIC PARTICIPATION IN THE AEROSPACE PROGRAM (APRIL 1985)

(End of By Reference Section)

H.2 CONTRACTOR PERSONNEL—IDENTIFICATION, ONSITE REPORTING, AND CHECKOUT PROCEDURES (GSFC 52.204-99) (SEPT 2006)

(a) In accordance with FAR 52.204-9, Personal Identity Verification of Contractor Personnel, the Contractor shall follow Steps 1 through 6 described in Attachment J, Personal Identity Verification (PIV) Card Issuance Procedures, for each contract employee (prime and subcontractor) who will have physical access to a NASA-controlled facility (also referred to as "onsite"). The Contractor must apply for permanent NASA/GSFC PIV cards (badges) for those contract employees who will be employed by the Contractor onsite for at least six months. The GSFC Security Division will consider permanent PIV cards for other employees of the Contractor on a case by case basis, such as employees that are not resident onsite, but must frequently visit. In the future, upon written notice from the Contracting Officer, the Contractor shall proceed with Step 7 of Attachment J for PIV credentials for all onsite contract personnel with PIV cards. In addition, upon future written notice from the Contracting Officer, the Contractor shall follow Steps 1 through 7 in Attachment J for each offsite contract employee (prime and subcontractor) who require remote access to a NASA information system for contract performance.

(b) The Contractor shall notify the GSFC Security Division, Code 240, Attention: Locator and Information Tracking System (LISTS) Manager, and the Contracting Officer's Technical Representative (COTR) of the contractor's designated LIST representative within 15 calendar days after award of this contract. The GSFC maintained LISTS contains work and home location and contact information for personnel that have permanent NASA/GSFC PIV cards. The Contractor may contact the LISTS Manager, Tel 301-286-2306 for assistance regarding LISTS.

**SECTION H OF NNG07CA21C
CONTRACT CLAUSES**

(c) For each contract employee, the Contractor must complete and submit a GSFC Form 24-27, "LISTS Form. The form is available from GSFC Stores Stock or online via NASA and GSFC systems <<http://gdms.gsfc.nasa.gov/gdmsnew/home.jsp>>. The GSFC Form 24-27 must be signed by the COTR or the Contracting Officer. The COTR will resolve any housing or access issues, review the forms for accuracy and completeness, and return the signed forms to the Contractor. The Contractor shall forward the form(s) to the GSFC Security Division, Code 240, for subsequent data entry into the LISTS.

(d) The Contractor shall submit an annotated LISTS Report each month. The GSFC LISTS Manager will furnish a LISTS print-out to the Contractor no later than the end of each month. The Contractor shall annotate this provided report monthly to correct and update the information as follows:

(1) Draw a line through the names of employees who are no longer employed by the contractor or that no longer work onsite under the contract, and;

(2) Make handwritten changes to any other incorrect data.

The annotated LISTS Report shall be separately submitted to the GSFC Security Division, Code 240, Attention: LISTS Manager, and to the COTR by the 10th calendar day of the month.

(e) The Contractor shall ensure that all personnel who have NASA/GSFC issued PIV cards, keys or other property who leave its employ or that no longer work onsite, process out through the GSFC Security Division, Code 240. Employees must return all GSFC issued identification and any Government property no later than the last day of their employment. The Contractor shall establish appropriate procedures and controls to ensure this is accomplished. Failure to comply may result in the exercise of Government rights to limit and control access to Government premises, including denial of access and invalidation of NASA issued PIV cards and identification.

(End of clause)

H.3 GOVERNMENT PREMISES—PHYSICAL ACCESS AND COMPLIANCE WITH PROCEDURES (GSFC 52.211-95) (SEPT 2006)

(a)(1) The Contractor must apply for permanent NASA/GSFC Personal Identity Verification (PIV) cards (badges) for those employees that will be employed by the Contractor and subcontractors and that will be resident for at least six months at GSFC or at locations controlled by GSFC, such as GSFC leased space. Other personnel may be issued a temporary badge. All personnel must conspicuously display the GSFC PIV card at, or above, the waistline. Refer to GSFC clause

**SECTION H OF NNG07CA21C
CONTRACT CLAUSES**

52.204-99, "Contractor Personnel-Identification, Onsite Reporting, and Checkout Procedures" for permanent PIV card issuance procedures.

(2) Visits by foreign nationals are restricted and must be necessary for the performance of the contract and concurred with by the Contracting Officer or by the Contracting Officer's Technical Representative. Approval of such visits must be approved in advance in accordance with GPR 1600.1.

(3) Access to the GSFC may be changed or adjusted in response to threat conditions or special situations.

(b) While on Government premises, the Contractor shall comply with requirements governing the conduct of personnel and the operation of the facility. These requirements are set forth in NASA-wide or installation directives, procedures, handbooks and announcements. The following cover many of the requirements:

- (1) Coordinated Harassment/Discrimination Inquiry Guidelines
<<http://internal.gsfc.nasa.gov/directives/security.html>>
- (2) GMI 1152.9, Facilities Coordination Committee
- (3) GPR 1600.1, GSFC Security Manual
- (4) GPR 1700.1, Occupational Safety Program
- (5) GPR 1700.2, Chemical Hygiene Plan
- (6) GPR 1800.1, GSFC Smoking Guidelines
- (7) GPR 1800.2, Occupational Health Program
- (8) GPR 1860.1, Ionizing Radiation Protection
- (9) GPR 1860.2, Laser Radiation Protection
- (10) GPR 1860.3, Radio Frequency Radiation Safety
- (11) GPR 1860.4, Ultraviolet and High Intensity Light Radiation Protection
- (12) GPR 2570.1, Radio Frequency Equipment Licensing
- (13) GPD 8500.1, Environmental Program Management
- (14) GPR 8710.2, Emergency Preparedness Program for Greenbelt
- (15) GPD 8715.1, GSFC Safety Policy
- (16) GPR 8715.1, Processing of NASA Safety Reporting System (NSRS) Incident Reports

Copies of the current issuances may be obtained at <<http://gdms.gsfc.nasa.gov>> or from the Contracting Officer. The above list may be modified by the Contracting Officer to include additional issuances pertaining to the conduct of personnel and the operation of the facility.

(c) The Contractor may not use official Government mail (indicia or "eagle" mail). Contractors found in violation could be liable for a fine of \$300 per piece of indicia mail used. However, the Contractor is allowed to use internal GSFC mail to the extent necessary for purposes of the contract.

(End of clause)

**SECTION H OF NNG07CA21C
CONTRACT CLAUSES**

H. 4 REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFEROR (GSFC 52.215-90) (NOV 1999)

In accordance with FAR 15.204-1(b), the completed and submitted "Representations, Certifications, and Other Statements of Offeror", are incorporated by reference in this resulting contract.

(End of clause)

H. 5 SAFETY AND HEALTH--ADDITIONAL REQUIREMENTS (GSFC 52.223-91) (OCT 2002)

(a) Other safety and health requirements. In addition to compliance with all Federal, state, and local laws as required by paragraph (b) of NFS clause 18-52.223-70, the Contractor shall comply with the following:

Quarterly health and safety report specifying incidents, disabling injuries, lost work days incident rate, days lost, property damage cost, manhours worked/month, and total employees. Template available at <http://safety1st.gsfc.nasa.gov> under Contractor Safety.

(b) Reporting. The immediate notification and prompt reporting required by paragraph (d) of NFS clause 1852.223-70 shall be to the to the Goddard Space Flight Center Safety and Environmental Branch, Code 205.2, Tel 301-286-2281 and to the Contracting Officer. This should be a verbal notification and confirmed by FAX or E-Mail. This notification is also required for any unsafe or environmentally hazardous condition associated with Government-owned property that is provided or made available for the performance of the contract.

(End of clause)

H. 6 LIMITATION OF FUTURE CONTRACTING (1852.209-71) (DEC 1988)

(a) The Contracting Officer has determined that this acquisition may give rise to a potential organizational conflict of interest. Accordingly, the attention of prospective offerors is invited to FAR Subpart 9.5-Organizational Conflicts of Interest.

(b) The nature of this conflict, in general terms, is that:

1. The contractor may be tasked to develop statements of work and/or specifications, which may be used in subsequent, competitive acquisitions, and
2. The contractor may require access to other NASA contractor data, and

**SECTION H OF NNG07CA21C
CONTRACT CLAUSES**

3. The contractor may be tasked to develop and/or maintain NASA program/project financial systems.

(c) The restrictions upon future contracting are as follows:

(1) If the Contractor, under the terms of this contract, or through the performance of tasks pursuant to this contract, is required to develop specifications or statements of work and such specifications or statements of work are to be incorporated into a solicitation, the Contractor shall be ineligible to perform the work described in that solicitation as a prime or first-tier subcontractor under an ensuing NASA contract. This restriction shall remain in effect for a reasonable time as agreed to by the Contracting Officer and the Contractor sufficient to avoid unfair competitive advantage or potential bias (this time shall in no case be less than the duration of the initial production contract). NASA shall not unilaterally require the Contractor to prepare such specifications or statements of work under this contract.

(2) To the extent that the work under this contract requires access to proprietary, business confidential, or financial data of other companies, and as long as these data remain proprietary or confidential, the Contractor shall protect these data from unauthorized use and disclosure and agrees not use them to compete with those other companies.

(End of clause)

H. 7 TASK ORDERING PROCEDURE (1852.216-80) (OCTOBER 1996)

(a) Only the Contracting Officer may issue task orders to the Contractor, providing specific authorization or direction to perform work within the scope of the contract and as specified in the schedule. The Contractor may incur costs under this contract in performance of task orders and task order modifications issued in accordance with this clause. No other costs are authorized unless otherwise specified in the contract or expressly authorized by the Contracting Officer.

(b) Prior to issuing a task order, the Contracting Officer shall provide the Contractor with the following data:

- (1) A functional description of the work identifying the objectives or results desired from the contemplated task order.
- (2) Proposed performance standards to be used as criteria for determining whether the work requirements have been met.
- (3) A request for a task plan from the Contractor to include the technical approach, period of performance, appropriate cost

SECTION H OF NNG07CA21C
CONTRACT CLAUSES

information, and any other information required to determine the reasonableness of the Contractor's proposal.

(c) Within **14** calendar days after receipt of the Contracting Officer's request; however, less time may be specified on individual tasks. The Contractor shall submit a task plan conforming to the request.

(d) After review and any necessary discussions, the Contracting Officer may issue a task order to the Contractor containing, as a minimum, the following:

- (1) Date of the order.
- (2) Contract number and order number.
- (3) Functional description of the work identifying the objectives or results desired from the task order, including special instructions or other information necessary for performance of the task.
- (4) Performance standards, and where appropriate, quality assurance standards.
- (5) Maximum dollar amount authorized (cost and fee or price). This includes allocation of award fee among award fee periods, if applicable.
- (6) Any other resources (travel, materials, equipment, facilities, etc.) authorized.
- (7) Delivery/performance schedule including start and end dates.
- (8) If contract funding is by individual task order, accounting and appropriation data.

(e) The Contractor shall provide acknowledgment of receipt to the Contracting Officer within **5** calendar days after receipt of the task order.

(f) If time constraints do not permit issuance of a fully defined task order in accordance with the procedures described in paragraphs (a) through (d), a task order which includes a ceiling price may be issued.

(g) The Contracting Officer may amend tasks in the same manner in which they were issued.

(h) In the event of a conflict between the requirements of the task order and the Contractor's approved task plan, the task order shall prevail.

(End of clause)

**SECTION H OF NNG07CA21C
CONTRACT CLAUSES**

H. 8 EXPORT LICENSES (1852.225-70) (FEB 2000)

(a) The Contractor shall comply with all U.S. export control laws and regulations, including the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120 through 130, and the Export Administration Regulations (EAR), 15 CFR Parts 730 through 799, in the performance of this contract. In the absence of available license exemptions/exceptions, the Contractor shall be responsible for obtaining the appropriate licenses or other approvals, if required, for exports of hardware, technical data, and software, or for the provision of technical assistance.

(b) The Contractor shall be responsible for obtaining export licenses, if required, before utilizing foreign persons in the performance of this contract, including instances where the work is to be performed on-site at any Government installation, where the foreign person will have access to export-controlled technical data or software.

(c) The Contractor shall be responsible for all regulatory record keeping requirements associated with the use of licenses and license exemptions/exceptions.

(d) The Contractor shall be responsible for ensuring that the provisions of this clause apply to its subcontractors.

(End of clause)

H. 9 ACCESS TO SENSITIVE INFORMATION (1852.237-72) (JUNE 2005)

(a) As used in this clause, "sensitive information" refers to information that a contractor has developed at private expense, or that the Government has generated that qualifies for an exception to the Freedom of Information Act, which is not currently in the public domain, and which may embody trade secrets or commercial or financial information, and which may be sensitive or privileged.

(b) To assist NASA in accomplishing management activities and administrative functions, the Contractor shall provide the services specified elsewhere in this contract.

(c) If performing this contract entails access to sensitive information, as defined above, the Contractor agrees to--

(1) Utilize any sensitive information coming into its possession only for the purposes of performing the services specified in this contract, and not to improve its own competitive position in another procurement.

**SECTION H OF NNG07CA21C
CONTRACT CLAUSES**

(2) Safeguard sensitive information coming into its possession from unauthorized use and disclosure.

(3) Allow access to sensitive information only to those employees that need it to perform services under this contract.

(4) Preclude access and disclosure of sensitive information to persons and entities outside of the Contractor's organization.

(5) Train employees who may require access to sensitive information about their obligations to utilize it only to perform the services specified in this contract and to safeguard it from unauthorized use and disclosure.

(6) Obtain a written affirmation from each employee that he/she has received and will comply with training on the authorized uses and mandatory protections of sensitive information needed in performing this contract.

(7) Administer a monitoring process to ensure that employees comply with all reasonable security procedures, report any breaches to the Contracting Officer, and implement any necessary corrective actions.

(d) The Contractor will comply with all procedures and obligations specified in its Organizational Conflicts of Interest Avoidance Plan, which this contract incorporates as a compliance document.

(e) The nature of the work on this contract may subject the Contractor and its employees to a variety of laws and regulations relating to ethics, conflicts of interest, corruption, and other criminal or civil matters relating to the award and administration of government contracts. Recognizing that this contract establishes a high standard of accountability and trust, the Government will carefully review the Contractor's performance in relation to the mandates and restrictions found in these laws and regulations. Unauthorized uses or disclosures of sensitive information may result in termination of this contract for default, or in debarment of the Contractor for serious misconduct affecting present responsibility as a government contractor.

(f) The Contractor shall include the substance of this clause, including this paragraph (f), suitably modified to reflect the relationship of the parties, in all subcontracts that may involve access to sensitive information.

(End of clause)

H.10 RELEASE OF SENSITIVE INFORMATION (1852.237-73) (JUNE 2005)

(a) As used in this clause, "sensitive information" refers to information, not currently in the public domain, that the Contractor has developed at private expense, that may embody trade secrets or

**SECTION H OF NNG07CA21C
CONTRACT CLAUSES**

commercial or financial information, and that may be sensitive or privileged.

(b) In accomplishing management activities and administrative functions, NASA relies heavily on the support of various service providers. To support NASA activities and functions, these service providers, as well as their subcontractors and their individual employees, may need access to sensitive information submitted by the Contractor under this contract. By submitting this proposal or performing this contract, the Contractor agrees that NASA may release to its service providers, their subcontractors, and their individual employees, sensitive information submitted during the course of this procurement, subject to the enumerated protections mandated by the clause at 1852.237-72, Access to Sensitive Information.

(c)(1) The Contractor shall identify any sensitive information submitted in support of this proposal or in performing this contract. For purposes of identifying sensitive information, the Contractor may, in addition to any other notice or legend otherwise required, use a notice similar to the following:

Mark the title page with the following legend:

This proposal or document includes sensitive information that NASA shall not disclose outside the Agency and its service providers that support management activities and administrative functions. To gain access to this sensitive information, a service provider's contract must contain the clause at NFS 1852.237-72, Access to Sensitive Information. Consistent with this clause, the service provider shall not duplicate, use, or disclose the information in whole or in part for any purpose other than to perform the services specified in its contract. This restriction does not limit the Government's right to use this information if it is obtained from another source without restriction. The information subject to this restriction is contained in pages [insert page numbers or other identification of pages].

Mark each page of sensitive information the Contractor wishes to restrict with the following legend:

Use or disclosure of sensitive information contained on this page is subject to the restriction on the title page of this proposal or document.

(2) The Contracting Officer shall evaluate the facts supporting any claim that particular information is "sensitive." This evaluation shall consider the time and resources necessary to protect the information in accordance with the detailed safeguards mandated by the clause at 1852.237-72, Access to Sensitive

SECTION H OF NNG07CA21C
CONTRACT CLAUSES

Information. However, unless the Contracting Officer decides, with the advice of Center counsel, that reasonable grounds exist to challenge the Contractor's claim that particular information is sensitive, NASA and its service providers and their employees shall comply with all of the safeguards contained in paragraph (d) of this clause.

(d) To receive access to sensitive information needed to assist NASA in accomplishing management activities and administrative functions, the service provider must be operating under a contract that contains the clause at 1852.237-72, Access to Sensitive Information. This clause obligates the service provider to do the following:

(1) Comply with all specified procedures and obligations, including the Organizational Conflicts of Interest Avoidance Plan, which the contract has incorporated as a compliance document.

(2) Utilize any sensitive information coming into its possession only for the purpose of performing the services specified in its contract.

(3) Safeguard sensitive information coming into its possession from unauthorized use and disclosure.

(4) Allow access to sensitive information only to those employees that need it to perform services under its contract.

(5) Preclude access and disclosure of sensitive information to persons and entities outside of the service provider's organization.

(6) Train employees who may require access to sensitive information about their obligations to utilize it only to perform the services specified in its contract and to safeguard it from unauthorized use and disclosure.

(7) Obtain a written affirmation from each employee that he/she has received and will comply with training on the authorized uses and mandatory protections of sensitive information needed in performing this contract.

(8) Administer a monitoring process to ensure that employees comply with all reasonable security procedures, report any breaches to the Contracting Officer, and implement any necessary corrective actions.

(e) When the service provider will have primary responsibility for operating an information technology system for NASA that contains sensitive information, the service provider's contract shall include the clause at 1852.204-76, Security Requirements for Unclassified Information Technology Resources. The Security Requirements clause requires the service provider to implement an Information Technology Security Plan to protect information processed, stored, or transmitted from unauthorized access, alteration, disclosure, or use. Service provider personnel requiring privileged access or limited privileged access to these information technology systems are subject to screening using the standard National Agency Check (NAC) forms

**SECTION H OF NNG07CA21C
CONTRACT CLAUSES**

appropriate to the level of risk for adverse impact to NASA missions. The Contracting Officer may allow the service provider to conduct its own screening, provided the service provider employs substantially equivalent screening procedures.

(f) This clause does not affect NASA's responsibilities under the Freedom of Information Act.

(g) The Contractor shall insert this clause, including this paragraph (g), suitably modified to reflect the relationship of the parties, in all subcontracts that may require the furnishing of sensitive information.

(End of clause)

H.11 NON-PERSONAL SERVICES

(a) No personal services shall be performed under this contract. No Contractor employee will be directly supervised by the Government. All individual employee assignments, and daily work direction, shall be given by the applicable employee supervisor. If the Contractor believes any Government action or communication has been given that would create a personal services relationship between the Government and any Contractor employee, the Contractor shall promptly notify the Contracting Officer of this communication or action.

(b) The Contractor shall not perform any inherently governmental actions under this contract. No contractor employees shall hold him or herself out to be a Government employee, agent, or representative. No contractor employee shall state orally, or in writing at any time that he or she is acting on behalf of the government. In all communications with third parties in connection with this contract, contractor employees shall identify themselves as Contractor employees and specify the name of the company for which they work. In all communications with other government contractors in connection with this contract, the Contractor employee shall state that they have no authority to in any way change the contract.

(c) The Contractor shall insure that all of its employees working on this contract are informed of the substance of this clause. Nothing in this clause shall limit the Government's rights in any way under other provisions of the contract, including those related to the Government's right to inspect and accept services to be performed under this contract. The substance of this text shall be included in all subcontracts at any tier.

(End of text)

**SECTION H OF NNG07CA21C
CONTRACT CLAUSES**

H. 12 TRAVEL, SUBSISTENCE, CONUS AND OCONUS PRICING

The Government will reimburse travel required in the performance of this contract, identified by individual task orders. Travel will be in accordance with the Federal Travel Regulations (FTR) and the NASA Supplemental Travel Regulations, as applicable. Established Federal Government Per Diem rates will apply to contractor travel. The Contractor shall provide a detailed description in the monthly report of all anticipated and/or completed travel in response to each task order.

(End of text)

[END OF SECTION]

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

I.1 SECTION I CLAUSES INCORPORATED BY REFERENCE

- (52.202-1) DEFINITIONS (JUL 2004)
- (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 (SEPT 2006)
- (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 (SEPT 2005)
- (52.204-2) SECURITY REQUIREMENTS (AUG 1996)
- (52.204-4) PRINTED OR COPIED DOUBLE-SIDED ON RECYCLED PAPER (AUG 2000)
- (52.204-7) CENTRAL CONTRACTOR REGISTRATION (JULY 2006)
- (52.204-9) PERSONAL IDENTITY VERIFICATION OF CONTRACTOR PERSONNEL (OCT 2005)
- (52.209-6) PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (SEPT 2006)
- (52.211-5) MATERIAL REQUIREMENTS (AUG 2000)
- (52.211-15) DEFENSE PRIORITY AND ALLOCATION REQUIREMENTS (SEPT 1990)
- (52.215-2) AUDIT AND RECORDS--NEGOTIATION (JUNE 1999)
- (52.215-8) ORDER OF PRECEDENCE--UNIFORM CONTRACT FORMAT (OCT 1997)
- (52.215-11) PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA--MODIFICATION (OCT 1997)
- (52.215-13) SUBCONTRACTOR COST OR PRICING DATA--MODIFICATIONS (OCT 1997)
- (52.215-14) INTEGRITY OF UNIT PRICES (OCT 1997)
- (52.215-15) PENSION ADJUSTMENTS AND ASSET REVERSIONS (OCT 2004)
- (52.215-18) REVERSION OR ADJUSTMENT OF PLANS FOR POSTRETIREMENT BENEFITS (PRB) OTHER THAN PENSIONS (JUL 2005)
- (52.215-19) NOTIFICATION OF OWNERSHIP CHANGES (OCT 1997)
- (52.215-21) REQUIREMENTS FOR COST OR PRICING DATA OR INFORMATION OTHER THAN COST OR PRICING DATA--MODIFICATIONS (OCT 1997)
- (52.216-7) ALLOWABLE COST AND PAYMENT (DEC 2002)
- (52.219-6) NOTICE OF TOTAL SMALL BUSINESS SET-ASIDE (JUNE 2003)
- (52.219-8) UTILIZATION OF SMALL BUSINESS CONCERNS (MAY 2004)
- (52.222-1) NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (FEB 1997)
- (52.222-19) CHILD LABOR--COOPERATION WITH AUTHORITIES AND REMEDIES (JAN 2006)
- (52.222-20) WALSH-HEALEY PUBLIC CONTRACTS ACT (DEC 1996)

SECTION I OF NNG07CA21C
CONTRACT CLAUSES

- (52.222-21) PROHIBITION OF SEGREGATED FACILITIES (FEB 1999)
- (52.222-26) EQUAL OPPORTUNITY (APR 2002)
- (52.222-35) EQUAL OPPORTUNITY FOR SPECIAL DISABLED VETERANS, VETERANS OF THE VIETNAM ERA, AND OTHER ELIGIBLE VETERANS (SEPT 2006)
- (52.222-36) AFFIRMATIVE ACTION FOR WORKERS WITH DISABILITIES (JUN 1998)
- (52.222-37) EMPLOYMENT REPORTS ON SPECIAL DISABLED VETERANS, VETERANS OF THE VIETNAM ERA, AND OTHER ELIGIBLE VETERANS (SEPT 2006)
- (52.222-50) COMBATING TRAFFICKING IN PERSONS (APR 2006)
- (52.223-5) POLLUTION PREVENTION AND RIGHT-TO-KNOW INFORMATION (AUG 2003)
- (52.223-6) DRUG FREE WORK PLACE (MAY 2001)
- (52.223-14) TOXIC CHEMICAL RELEASE REPORTING (AUG 2003)
- (52.225-1) BUY AMERICAN ACT--SUPPLIES (JUNE 2003)
- (52.225-8) DUTY FREE ENTRY (FEB 2000)
- (52.225-13) RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (FEB 2006)
- (52.227-1) AUTHORIZATION AND CONSENT (JUL 1995)--ALTERNATE I (APR 1984)
- (52.227-2) NOTICE AND ASSISTANCE REGARDING PATENT AND COPY-RIGHT INFRINGEMENT (AUG 1996)
- (52.227-11) PATENT RIGHTS--RETENTION BY CONTRACTOR (SHORT FORM) (JUN 1997) as modified by NASA FAR Supplement 1852.227-11
- (52.227-14) RIGHTS IN DATA--GENERAL (JUN 1987) as modified by NASA FAR Supplement 1852.227-14
- (52.228-7) INSURANCE--LIABILITY TO THIRD PERSONS (MAR 1996)
- (52.232-17) INTEREST (JUN 1996)
- (52.232-22) LIMITATION OF FUNDS (APR 1984)
- (52.232-23) ASSIGNMENT OF CLAIMS (JAN 1986)
- (52.232-25) PROMPT PAYMENT (OCT 2003)--ALTERNATE I (FEB 2002)
- (52.232-34) PAYMENT BY ELECTRONIC FUNDS TRANSFER--OTHER THAN CENTRAL CONTRACTOR REGISTRATION (MAY 1999) [para (b) (1) fill-in hereafter: "designated office"--Cost and Commercial Accounts Department, Code 155, NASA/Goddard Space Flight Center, Greenbelt, MD 20771, FAX 301-286-1748, no later than concurrent with the first request for payment.]
- (52.233-1) DISPUTES (JULY 2002)
- (52.233-3) PROTEST AFTER AWARD (AUG 1996)--ALTERNATE I (JUN 1985)
- (52.233-4) APPLICABLE LAW FOR BREACH OF CONTRACT CLAIM (OCT 2004)
- (52.237-2) PROTECTION OF GOVERNMENT BUILDINGS, EQUIPMENT, AND VEGETATION (APR 1984)
- (52.237-3) CONTINUITY OF SERVICES (JAN 1991)
- (52.239-1) PRIVACY OR SECURITY SAFEGUARDS (AUG 1996)
- (52.242-1) NOTICE OF INTENT TO DISALLOW COSTS (APR 1984)
- (52.242-3) PENALTIES FOR UNALLOWABLE COSTS (MAY 2001)

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

(52.242-4) CERTIFICATION OF FINAL INDIRECT COSTS (JAN 1997)
(52.242-13) BANKRUPTCY (JUL 1995)
(52.243-2) CHANGES--COST-REIMBURSEMENT (AUG 1987)-- ALTERNATE II
(APR 1984)
(52.244-2) SUBCONTRACTS (AUG 1998) [paragraph (e) is
"Professional and consultant Services as defined at
FAR 31.205-33" and paragraph (k) is None.
(52.244-5) COMPETITION IN SUBCONTRACTING (DEC 1996)
(52.245-1) PROPERTY RECORDS (APR 1984)
(52.245-5) GOVERNMENT PROPERTY (COST-REIMBURSEMENT, TIME-AND-
MATERIAL, OR LABOR-HOUR CONTRACTS) (MAY 2004)
(DEVIATION) (SEP 1999)--(g)(5) of the clause shall
read as follows: "The contractor shall notify the
contracting officer upon loss or destruction of, or
damage to, Government property provided under this
contract, with the exception of low value property for
which loss, damage, or destruction is reported at
contract termination, completion, or when needed for
continued performance. The Contractor shall take all
reasonable action to protect the Government property
from further damage, separate the damaged and
undamaged Government property, put all the affected
Government property in the best possible order, and
furnish to the Contracting Officer a statement of--"
the balance of (g)(5) is unchanged.
(52.245-19) GOVERNMENT PROPERTY FURNISHED "AS IS" (APR 1984)
(52.246-24) LIMITATION OF LIABILITY-HIGH-VALUE ITEMS (Feb 1997)
(52.246-25) LIMITATION OF LIABILITY--SERVICES (FEB 1997)
(52.247-1) COMMERCIAL BILL OF LADING NOTATIONS (FEB 2006)
(52.247-63) PREFERENCE FOR U.S.-FLAG AIR CARRIERS (JUNE 2003)
(52.247-67) SUBMISSION OF COMMERCIAL TRANSPORTATION BILLS TO THE
GENERAL SERVICES ADMINISTRATION FOR AUDIT (FEB 2006)
(52.249-6) TERMINATION (COST-REIMBURSEMENT) (MAY 2004)
(52.249-14) EXCUSABLE DELAYS (APR 1984)
(52.251-1) GOVERNMENT SUPPLY SOURCES (APR 1984)
(1852.203-70) DISPLAY OF INSPECTOR GENERAL HOTLINE POSTERS
(JUNE 2001)
(1852.204-76) SECURITY REQUIREMENTS FOR UNCLASSIFIED INFORMATION
TECHNOLOGY RESOURCES (NOV 2004) [DEVIATION] Para(c)
Within "30 days"
(1852.215-84) OMBUDSMAN (OCT 2003)--ALTERNATE I (JUNE 2000) The
installation Ombudsman is Dorothy C. Perkins, Goddard
Space Flight Center, Mailstop 100, Greenbelt, MD
20771, Business Phone: 301 286-5066, Fax 301 286-1714,
E-mail address: Dorothy.C.Perkins@nasa.gov
(1852.216-89) ASSIGNMENT AND RELEASE FORMS (JUL 1997)

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

(1852.223-74) DRUG-AND ALCOHOL-FREE WORKPLACE (MAR 1996)
(1852.242-78) EMERGENCY MEDICAL SERVICES AND EVACUATION (APR 2001)
(1852.243-71) SHARED SAVINGS (MAR 1997)

(End of By Reference Section)

I.2 LIMITATIONS ON SUBCONTRACTING (52.219-14) (DEC 1996)

(a) This clause does not apply to the unrestricted portion of a partial set-aside.

(b) By submission of an offer and execution of a contract, the Offeror/Contractor agrees that in performance of the contract in the case of a contract for--

(1) Services (except construction). At least 50 percent of the cost of contract performance incurred for personnel shall be expended for employees for the concern.

(2) Supplies (other than procurement from a nonmanufacturer of such supplies). The concern shall perform work for at least 50 percent of the cost of manufacturing the supplies, not including the cost of materials.

(3) General construction. The concern will perform at least 15 percent of the cost of the contract, not including the cost of materials, with its own employees.

(4) Construction by special trade contractors. The concern will perform at least 25 percent of the cost of the contract, not including the cost of materials, with its own employees.

(End of clause)

I.3 NOTIFICATION OF EMPLOYEE RIGHTS CONCERNING PAYMENT OF UNION DUES OR FEES (52.222-39) (DEC 2004)

(a) Definition. As used in this clause--

"United States" means the 50 States, the District of Columbia, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, the U.S. Virgin Islands, and Wake Island.

(b) Except as provided in paragraph (e) of this clause, during the term of this contract, the Contractor shall post a notice, in the form of a poster, informing employees of their rights concerning union

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

membership and payment of union dues and fees, in conspicuous places in and about all its plants and offices, including all places where notices to employees are customarily posted. The notice shall include the following information (except that the information pertaining to National Labor Relations Board shall not be included in notices posted in the plants or offices of carriers subject to the Railway Labor Act, as amended (45 U.S.C. 151-188)).

Notice to Employees

Under Federal law, employees cannot be required to join a union or maintain membership in a union in order to retain their jobs. Under certain conditions, the law permits a union and an employer to enter into a union-security agreement requiring employees to pay uniform periodic dues and initiation fees. However, employees who are not union members can object to the use of their payments for certain purposes and can only be required to pay their share of union costs relating to collective bargaining, contract administration, and grievance adjustment.

If you do not want to pay that portion of dues or fees used to support activities not related to collective bargaining, contract administration, or grievance adjustment, you are entitled to an appropriate reduction in your payment. If you believe that you have been required to pay dues or fees used in part to support activities not related to collective bargaining, contract administration, or grievance adjustment, you may be entitled to a refund and to an appropriate reduction in future payments.

For further information concerning your rights, you may wish to contact the National Labor Relations Board (NLRB) either at one of its Regional offices or at the following address or toll free number:

National Labor Relations Board
Division of Information
1099 14th Street, N.W.
Washington, DC 20570
1-866-667-6572
1-866-316-6572 (TTY)

To locate the nearest NLRB office, see NLRB's website at <http://www.nlr.gov>.

END OF NOTICE

SECTION I OF NNG07CA21C
CONTRACT CLAUSES

(c) The Contractor shall comply with all provisions of Executive Order 13201 of February 17, 2001, and related implementing regulations at 29 CFR Part 470, and orders of the Secretary of Labor.

(d) In the event that the Contractor does not comply with any of the requirements set forth in paragraphs (b), (c), or (g), the Secretary may direct that this contract be cancelled, terminated, or suspended in whole or in part, and declare the Contractor ineligible for further Government contracts in accordance with procedures at 29 CFR Part 470, Subpart B—Compliance Evaluations, Complaint Investigations and Enforcement Procedures. Such other sanctions or remedies may be imposed as are provided by 29 CFR Part 470, which implements Executive Order 13201, or as are otherwise provided by law.

(e) The requirement to post the employee notice in paragraph (b) does not apply to—

(1) Contractors and subcontractors that employ fewer than 15 persons;

(2) Contractor establishments or construction work sites where no union has been formally recognized by the Contractor or certified as the exclusive bargaining representative of the Contractor's employees;

(3) Contractor establishments or construction work sites located in a jurisdiction named in the definition of the United States in which the law of that jurisdiction forbids enforcement of union-security agreements;

(4) Contractor facilities where upon the written request of the Contractor, the Department of Labor Deputy Assistant Secretary for Labor-Management Programs has waived the posting requirements with respect to any of the Contractor's facilities if the Deputy Assistant Secretary finds that the Contractor has demonstrated that—

(i) The facility is in all respects separate and distinct from activities of the Contractor related to the performance of a contract; and

(ii) Such a waiver will not interfere with or impede the effectuation of the Executive order; or

(5) Work outside the United States that does not involve the recruitment or employment of workers within the United States.

(f) The Department of Labor publishes the official employee notice in two variations; one for contractors covered by the Railway Labor Act and a second for all other contractors. The Contractor shall—

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

(1) Obtain the required employee notice poster from the Division of Interpretations and Standards, Office of Labor-Management Standards, U.S. Department of Labor, 200 Constitution Avenue, NW, Room N-5605, Washington, DC 20210, or from any field office of the Department's Office of Labor-Management Standards or Office of Federal Contract Compliance Programs;

(2) Download a copy of the poster from the Office of Labor-Management Standards website at <http://www.olms.dol.gov>; or

(3) Reproduce and use exact duplicate copies of the Department of Labor's official poster.

(g) The Contractor shall include the substance of this clause in every subcontract or purchase order that exceeds the simplified acquisition threshold, entered into in connection with this contract, unless exempted by the Department of Labor Deputy Assistant Secretary for Labor-Management Programs on account of special circumstances in the national interest under authority of 29 CFR 470.3(c). For indefinite quantity subcontracts, the Contractor shall include the substance of this clause if the value of orders in any calendar year of the subcontract is expected to exceed the simplified acquisition threshold. Pursuant to 29 CFR Part 470, Subpart B-Compliance Evaluations, Complaint Investigations and Enforcement Procedures, the Secretary of Labor may direct the Contractor to take such action in the enforcement of these regulations, including the imposition of sanctions for noncompliance with respect to any such subcontract or purchase order. If the Contractor becomes involved in litigation with a subcontractor or vendor, or is threatened with such involvement, as a result of such direction, the Contractor may request the United States, through the Secretary of Labor, to enter into such litigation to protect the interests of the United States.

(End of clause)

**I. 4 HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA
(52.223-3) (JAN 1997)--ALTERNATE I (JUL 1995)**

(a) "Hazardous material," as used in this clause, includes any material defined as hazardous under the latest version of Federal Standard No. 313 (including revisions adopted during the term of the contract).

(b) The offeror must list any hazardous material, as defined by paragraph (a) of this clause, to be delivered under this contract. The hazardous material shall be properly identified and include any

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

applicable identification number, such as National Stock Number or Special Item Number.

This information shall also be included on the Material Safety Data Sheet submitted under this contract.

Material (If none, insert NONE)

None

.....

Identification No.

.....

(c) This list must be updated during performance of the contract whenever the Contractor determines that any other material to be delivered under this contract is hazardous.

(d) The apparently successful offeror agrees to submit, for each item as required prior to award, a Material Safety Data Sheet, meeting the requirements of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous material identified in paragraph (b) of this clause. Data shall be submitted in accordance with Federal Standard No. 313, whether or not the apparently successful offeror is the actual manufacturer of these items. Failure to submit the Material Safety Data Sheet prior to award may result in the apparently successful offeror being considered nonresponsible and ineligible for award.

(e) If, after award, there is a change in the composition of the item(s) or a revision to Federal Standard No. 313, which renders incomplete or inaccurate the data submitted under paragraph (d) of this clause, the Contractor shall promptly notify the Contracting Officer and resubmit the data.

(f) Neither the requirements of this clause nor any act or failure to act by the Government shall relieve the Contractor of any responsibility or liability for the safety of Government, Contractor, or subcontractor personnel or property.

(g) Nothing contained in this clause shall relieve the Contractor from complying with applicable Federal, State, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.

(h) The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

(1) To use, duplicate, and disclose any data to which this clause is applicable. The purposes of this right are to--

(i) Apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials;

(ii) Obtain medical treatment for those affected by the material; and

(iii) Have others use, duplicate, and disclose the data for the Government for these purposes.

(2) To use, duplicate, and disclose data furnished under this clause, in accordance with subparagraph (h)(1) of this clause, in precedence over any other clause of this contract providing for rights in data.

(3) The Government is not precluded from using similar or identical data acquired from other sources.

(i) Except as provided in paragraph (i)(2), the Contractor shall prepare and submit a sufficient number of Material Safety Data Sheets (MSDS's), meeting the requirements of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous material identified in paragraph (b) of this clause.

(1) For items shipped to consignees, the Contractor shall include a copy of the MSDS's with the packing list or other suitable shipping document which accompanies each shipment. Alternatively, the Contractor is permitted to transmit MSDS's to consignees in advance of receipt of shipments by consignees, if authorized by the Contracting Officer.

(2) For items shipped to consignees identified by mailing address as agency depots, distribution centers or customer supply centers, the Contractor shall provide one copy of the MSDS's in or on each shipping container. If affixed to the outside of each container, the MSDS must be placed in a weather resistant envelope.

(End of clause)

I.5 NOTICE OF RADIOACTIVE MATERIALS (52.223-7) (JAN 1997)

(a) The Contractor shall notify the Contracting Officer or designee, in writing, thirty (30) days prior to the delivery of, or prior to the completion of any servicing required by this contract, of items

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

containing either (1) radioactive material requiring specific licensing under the regulations issued pursuant to the Atomic Energy Act of 1954, as amended, as set forth in title 10 of the Code of Federal Regulations, in effect on the date of this contract, or (2) other radioactive material not requiring specific licensing in which the specific activity is greater than 0.002 microcuries per gram or the activity per item equals or exceeds 0.01 microcuries. Such notice shall specify the part or parts of the items which contain radioactive materials, a description of the materials, the name and activity of the isotope, the manufacturer of the materials, and any other information known to the Contractor which will put users of the items on notice as to the hazards involved (OMB No. 9000-0107).

(b) If there has been no change affecting the quantity of activity, or the characteristics and composition of the radioactive material from deliveries under this contract or prior contracts, the Contractor may request that the Contracting Officer or designee waive the notice requirement in paragraph (a) of this clause. Any such request shall--

(1) Be submitted in writing;

(2) State that the quantity of activity, characteristics, and composition of the radioactive material have not changed; and

(3) Cite the contract number on which the prior notification was submitted and the contracting office to which it was submitted.

(c) All items, parts, or subassemblies which contain radioactive materials in which the specific activity is greater than 0.002 microcuries per gram or activity per item equals or exceeds 0.01 microcuries, and all containers in which such items, parts or subassemblies are delivered to the Government shall be clearly marked and labeled as required by the latest revision of MIL-STD 129 in effect on the date of the contract.

(d) This clause, including this paragraph (d), shall be inserted in all subcontracts for radioactive materials meeting the criteria in paragraph (a) of this clause.

(End of clause)

I.6 LIMITATION ON WITHHOLDING OF PAYMENTS (52.232-9) (APR 1984)

If more than one clause or Schedule term of this contract authorizes the temporary withholding of amounts otherwise payable to the Contractor for supplies delivered or services performed, the total of

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

the amounts withheld at any one time shall not exceed the greatest amount that may be withheld under any one clause or Schedule term at that time; provided, that this limitation shall not apply to--

- (a) Withholdings pursuant to any clause relating to wages or hours of employees;
- (b) Withholdings not specifically provided for by this contract;
- (c) The recovery of overpayments; and
- (d) Any other withholding for which the Contracting Officer determines that this limitation is inappropriate.

(End of clause)

I. 7 NOTIFICATION OF CHANGES (52.243-7) (APR 1984)

(a) Definitions. "Contracting Officer," as used in this clause, does not include any representative of the Contracting Officer. "Specifically authorized representative (SAR)," as used in this clause, means any person the Contracting Officer has so designated by written notice (a copy of which shall be provided to the Contractor) which shall refer to this subparagraph and shall be issued to the designated representative before the SAR exercises such authority.

(b) Notice. The primary purpose of this clause is to obtain prompt reporting of Government conduct that the Contractor considers to constitute a change to this contract. Except for changes identified as such in writing and signed by the Contracting Officer, the Contractor shall notify the Administrative Contracting Officer in writing promptly, within **seven** calendar days from the date that the Contractor identifies any Government conduct (including actions, inactions, and written or oral communications) that the Contractor regards as a change to the contract terms and conditions. On the basis of the most accurate information available to the Contractor, the notice shall state--

(1) The date, nature, and circumstances of the conduct regarded as a change;

(2) The name, function, and activity of each Government individual and Contractor official or employee involved in or knowledgeable about such conduct;

(3) The identification of any documents and the substance of any oral communication involved in such conduct;

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

(4) In the instance of alleged acceleration of scheduled performance or delivery, the basis upon which it arose;

(5) The particular elements of contract performance for which the Contractor may seek an equitable adjustment under this clause, including--

(i) What contract line items have been or may be affected by the alleged change,

(ii) What labor or materials or both have been or may be added, deleted, or wasted by the alleged change;

(iii) To the extent practicable, what delay and disruption in the manner and sequence of performance and effect on continued performance have been or may be caused by the alleged change;

(iv) What adjustments to contract price, delivery schedule, and other provisions affected by the alleged change are estimated; and

(6) The Contractor's estimate of the time by which the Government must respond to the Contractor's notice to minimize cost, delay or disruption of performance.

(c) Continued performance. Following submission of the notice required by (b) above, the Contractor shall diligently continue performance of this contract to the maximum extent possible in accordance with its terms and conditions as construed by the Contractor, unless the notice reports a direction of the Contracting Officer or a communication from a SAR of the Contracting Officer, in either of which events the Contractor shall continue performance; provided, however, that if the Contractor regards the direction or communication as a change as described in (b) above, notice shall be given in the manner provided. All directions, communications, interpretations, orders and similar actions of the SAR shall be reduced to writing promptly and copies furnished to the Contractor and to the Contracting Officer. The Contracting Officer shall promptly countermand any action which exceeds the authority of the SAR.

(d) Government response. The Contracting Officer shall promptly, within **21** calendar days after receipt of notice, respond to the notice in writing. In responding, the Contracting Officer shall either--

(1) Confirm that the conduct of which the Contractor gave notice constitutes a change and when necessary direct the mode of further performance;

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

(2) Countermand any communication regarded as a change;

(3) Deny that the conduct of which the Contractor gave notice constitutes a change and when necessary direct the mode of further performance; or

(4) In the event the Contractor's notice information is inadequate to make a decision under (1), (2), or (3) above, advise the Contractor what additional information is required, and establish the date by which it should be furnished and the date thereafter by which the Government will respond.

(e) Equitable adjustments. (1) If the Contracting Officer confirms that Government conduct effected a change as alleged by the Contractor, and the conduct causes an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, whether changed or not changed by such conduct, an equitable adjustment shall be made--

(i) In the contract price or delivery schedule or both; and

(ii) In such other provisions of the contract as may be affected.

(2) The contract shall be modified in writing accordingly. In the case of drawings, designs or specifications which are defective and for which the Government is responsible, the equitable adjustment shall include the cost and time extension for delay reasonably incurred by the Contractor in attempting to comply with the defective drawings, designs or specifications before the Contractor identified, or reasonably should have identified, such defect. When the cost of property made obsolete or excess as a result of a change confirmed by the Contracting Officer under this clause is included in the equitable adjustment, the Contracting Officer shall have the right to prescribe the manner of disposition of the property. The equitable adjustment shall not include increased costs or time extensions for delay resulting from the Contractor's failure to provide notice or to continue performance as provided, respectively, in (b) and (c) above.

NOTE: The phrases "contract price" and "cost" wherever they appear in the clause, may be appropriately modified to apply to cost-reimbursement or incentive contracts, or to combinations thereof.

(End of clause)

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

I.8 SUBCONTRACTS FOR COMMERCIAL ITEMS (52.244-6) (SEPT 2006)

(a) *Definitions.* As used in this clause-

"Commercial item" has the meaning contained in Federal Acquisition Regulation 2.101, Definitions.

"Subcontract" includes a transfer of commercial items between divisions, subsidiaries, or affiliates of the Contractor or subcontractor at any tier.

(b) To the maximum extent practicable, the Contractor shall incorporate, and require its subcontractors at all tiers to incorporate, commercial items or nondevelopmental items as components of items to be supplied under this contract.

(c) (1) The Contractor shall insert the following clauses in subcontracts for commercial items:

(i) 52.219-8, Utilization of Small Business Concerns (May 2004) (15 U.S.C. 637(d)(2) and (3)), in all subcontracts that offer further subcontracting opportunities. If the subcontract (except subcontracts to small business concerns) exceeds \$550,000 (\$1,000,000 for construction of any public facility), the subcontractor must include 52.219-8 in lower tier subcontracts that offer subcontracting opportunities.

(ii) 52.222-26, Equal Opportunity (Apr 2002) (E.O. 11246).

(iii) 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans (Sept 2006) (38 U.S.C. 4212(a));

(iv) 52.222-36, Affirmative Action for Workers with Disabilities (June 1998) (29 U.S.C. 793).

(v) 52.222-39, Notification of Employee Rights Concerning Payment of Union Dues or Fees (Dec 2004) (E.O. 13201). Flow down as required in accordance with paragraph (g) of FAR clause 52.222-39).

(vi) 52.247-64, Preference for Privately Owned U.S.-Flag Commercial Vessels (Feb 2006) (46 U.S.C. App. 1241 and 10 U.S.C. 2631) (flow down required in accordance with paragraph (d) of FAR clause 52.247-64).

(2) While not required, the Contractor may flow down to subcontracts for commercial items a minimal number of additional clauses necessary to satisfy its contractual obligations.

(d) The Contractor shall include the terms of this clause, including this paragraph (d), in subcontracts awarded under this contract.

(End of clause)

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

I. 9 CLAUSES INCORPORATED BY REFERENCE (52.252-2) (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):

Federal Acquisition Regulation (FAR) clauses:

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

NASA FAR Supplement (NFS) clauses:

<http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm>

(End of clause)

I. 10 COMPUTER GENERATED FORMS (52.253-1) (JAN 1991)

(a) Any data required to be submitted on a Standard or Optional Form prescribed by the Federal Acquisition Regulation (FAR) may be submitted on a computer generated version of the form, provided there is no change to the name, content, or sequence of the data elements on the form, and provided the form carries the Standard or Optional Form number and edition date.

(b) Unless prohibited by agency regulations, any data required to be submitted on an agency unique form prescribed by an agency supplement to the FAR may be submitted on a computer generated version of the form provided there is no change to the name, content, or sequence of the data elements on the form and provided the form carries the agency form number and edition date.

(c) If the Contractor submits a computer generated version of a form that is different than the required form, then the rights and obligations of the parties will be determined based on the content of the required form.

(End of clause)

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

I. 11 SECURITY CLASSIFICATION REQUIREMENTS (1852.204-75) (SEPT 1989)

Performance under this contract will involve access to and/or generation of classified information, work in a security area, or both, up to the level of secret. See Federal Acquisition Regulation clause 52.204-2 in this contract and DD Form 254, Contract Security Classification Specification, Attachment D.

(End of clause)

I. 12 USE OF RURAL AREA SMALL BUSINESSES (1852.219-74) (SEP 1990)

(a) Definitions.

"Rural area" means any county with a population of fewer than twenty thousand individuals.

"Small business concern," as used in this clause, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding under this contract, and qualified as a small business under the criteria and size standards in 13 CFR 121.

(b) NASA prime and subcontractors are encouraged to use their best efforts to award subcontracts to small business concerns located in rural areas.

(c) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as small business concerns located in rural areas.

(d) The Contractor agrees to insert the provisions of this clause, including this paragraph (d), in all subcontracts hereunder that offer subcontracting possibilities.

(End of clause)

I. 13 NASA 8 PERCENT GOAL (1852.219-76) (JUL 1997)

(a) Definitions.

"Historically Black Colleges or University", as used in this clause means an institution determined by the Secretary of Education to meet the requirements of 34 CFR Section 608.2. The term also includes any nonprofit research institution that was an integral part of such a college or university before November 14, 1986.

"Minority institutions", as used in this clause, means an institution of higher education meeting the requirements of section 1046(3) of

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

the Higher Education Act of 1965 (20 U.S.C. 1135d-5(3)) which for the purposes of this clause includes a Hispanic-serving institution of higher education as defined in section 316(b)(1) of the Act (20 U.S.C. 1059c(b)(1)).

"Small disadvantaged business concern", as used in this clause, means a small business concern that (1) is at least 51 percent unconditionally owned by one or more individuals who are both socially and economically disadvantaged, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more socially and economically disadvantaged individuals, and (2) has its management and daily business controlled by one or more such individuals. This term also means a small business concern that is at least 51 percent unconditionally owned by an economically disadvantaged Indian tribe or Native Hawaiian Organization, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more of these entities, which has its management and daily business controlled by members of an economically disadvantaged Indian tribe or Native Hawaiian Organization, and which meets the requirements of 13 CFR 124.

"Women-owned small business concern", as used in this clause, means a small business concern (1) which is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women, and (2) whose management and daily business operations are controlled by one or more women.

(b) The NASA Administrator is required by statute to establish annually a goal to make available to small disadvantaged business concerns, Historically Black Colleges and Universities, minority institutions, and women-owned small business concerns, at least 8 percent of NASA's procurement dollars under prime contracts or subcontracts awarded in support of authorized programs, including the space station by the time operational status is obtained.

(c) The contractor hereby agrees to assist NASA in achieving this goal by using its best efforts to award subcontracts to such entities to the fullest extent consistent with efficient contract performance.

(d) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as small disadvantaged business concerns, Historically Black Colleges and Universities, minority institutions, and women-owned small business concerns.

(End of clause)

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

I. 14 MINIMUM INSURANCE COVERAGE (1852.228-75) (OCT 1988)

The Contractor shall obtain and maintain insurance coverage as follows for the performance of this contract:

(a) Worker's compensation and employer's liability insurance as required by applicable Federal and state workers' compensation and occupational disease statutes. If occupational diseases are not compensable under those statutes, they shall be covered under the employer's liability section of the insurance policy, except when contract operations are so commingled with the Contractor's commercial operations that it would not be practical. The employer's liability coverage shall be at least \$100,000, except in States with exclusive or monopolistic funds that do not permit workers' compensation to be written by private carriers.

(b) Comprehensive general (bodily injury) liability insurance of at least \$500,000 per occurrence.

(c) Motor vehicle liability insurance written on the comprehensive form of policy which provides for bodily injury and property damage liability covering the operation of all motor vehicles used in connection with performing the contract. Policies covering motor vehicles operated in the United States shall provide coverage of at least \$200,000 per person and \$500,000 per occurrence for bodily injury liability and \$20,000 per occurrence for property damage. The amount of liability coverage on other policies shall be commensurate with any legal requirements of the locality and sufficient to meet normal and customary claims.

(d) Comprehensive general and motor vehicle liability policies shall contain a provision worded as follows:

"The insurance company waives any right of subrogation against the United States of America which may arise by reason of any payment under the policy."

(e) When aircraft are used in connection with performing the contract, aircraft public and passenger liability insurance of at least \$200,000 per person and \$500,000 per occurrence for bodily injury, other than passenger liability, and \$200,000 per occurrence for property damage. Coverage for passenger liability bodily injury shall be at least \$200,000 multiplied by the number of seats or passengers, whichever is greater.

(End of clause)

**SECTION I OF NNG07CA21C
CONTRACT CLAUSES**

I. 15 CENTER FOR AEROSPACE INFORMATION (1852.235-70) (FEB 2003)

(a) The Contractor should register with and avail itself of the services provided by the NASA Center for AeroSpace Information (CASI) (<http://www.sti.nasa.gov>) for the conduct of research or research and development required under this contract. CASI provides a variety of services and products as a NASA repository and database of research information, which may enhance contract performance.

(b) Should the CASI information or service requested by the Contractor be unavailable or not in the exact form necessary by the Contractor, neither CASI nor NASA is obligated to search for or change the format of the information. A failure to furnish information shall not entitle the Contractor to an equitable adjustment under the terms and conditions of this contract.

(c) Information regarding CASI and the services available can be obtained at the Internet address contained in paragraph (a) of this clause or at the following address:

Center for AeroSpace Information (CASI)
7121 Standard Drive
Hanover, Maryland 21076-1320
Email: help@sti.nasa.gov
Phone: 301-621-0390
FAX: 301-621-0134

(End of clause)

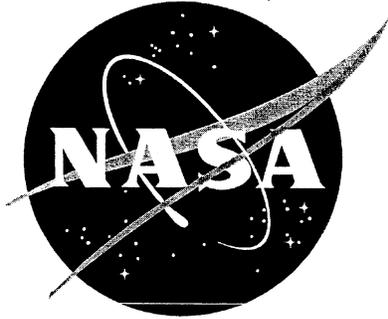
I. 16 EMERGENCY EVACUATION PROCEDURES (1852.237-70) (DEC 1988)

The Contractor shall assure that its personnel at Government facilities are familiar with the functions of the Government's emergency evacuation procedures. If requested by the Contracting Officer, the Contractor shall designate an individual or individuals as contact points to provide for efficient and rapid evacuation of the facility if and when required.

(End of clause)

[END OF SECTION]

ATTACHMENT A
NNG07CA21C
January 2006



**NASA
GODDARD SPACE FLIGHT CENTER**

**STATEMENT OF WORK
FOR
MECHANICAL SYSTEMS
ENGINEERING SERVICES (MSES II/A)
FOR THE
APPLIED ENGINEERING AND
TECHNOLOGY DIRECTORATE (AETD)**

Contents

	<u>Page</u>
INTRODUCTION	1
SCOPE OF WORK	2
I. GENERAL RESPONSIBILITIES	3
II. PERFORMANCE MEASUREMENT	4
III. TASKS	5
FUNCTION 1 –Pre-Formulation and Formulation Services: Candidate, Feasibility and Systems Definition Studies	5
A. Candidate Study Services	6
B. Preliminary Analysis Study Services	6
C. System Definition Study Services	7
FUNCTION 2 -- Implementation Phase Services – Mechanical Systems Disciplines	9
A. Materials Engineering.....	9
B. Structural Analysis and Loads Engineering	12
C. Mechanical Engineering	14
D. Electro-Mechanical Engineering	15
E. Thermal Engineering	17
F. Contamination and Coatings Engineering	18
G. Manufacturing Engineering	20
H. Integration and Test Engineering.....	22
FUNCTION 3 -- Implementation Phase Services – Related Discipline Engineering	25
A. Project Management	25
B. Mission Systems Engineering.....	25
C. Instrument Systems Engineering.....	28
D. Optical Design and Analysis Engineering	31
E. Detector Engineering	33
F. Flight Dynamics Engineering	34
G. Power Systems Engineering.....	34
H. Propulsion Systems Engineering	35
I. Guidance, Navigation and Control Engineering	36
J. Communications, Command and Data Handling Engineering.....	37
K. Software Engineering.....	39
L. Electrical and Electronics Engineering.....	39
M. Launch and Post-Launch Operations Engineering	40
N. Mission Assurance Engineering	41
O. System Safety Engineering	45
P. Radiation Engineering	46
Q. Cryogenics and Fluids Engineering	47
R. Ground Systems Engineering.....	47

Contents

	<u>Page</u>
S. Parts and Materials.....	48
T. ISS and STS Mission Management	48
U. Configuration Management Services.....	49
V. Hardware Refurbishment and Reuse	50
W. Training.....	50
X. CAD/CAE Facility Support	51
Y. Hardware Storage.....	51
FUNCTION 4 – Research and Technology Services	52
A. Advanced Thermal Control Systems	52
B. Optics and Opto-mechanical Systems.....	52
C. Cryogenic and Fluid Systems	52
D. Advanced Coatings and Film Technologies	52
FUNCTION 5 – Support Services	53
A. Documentation Services	53
B. Computer Technology Support Services	54
C. Maintenance Services	56
D. Sustaining Engineering Services.....	57
E. Education Services.....	58
F. Standards and Process.....	59
IV. APPLICABLE DOCUMENTS AND SPECIFICATIONS.....	60
V. REFERENCE DOCUMENTS AND SPECIFICATIONS	61
VI. ACRONYMS LIST	62

INTRODUCTION

The National Aeronautics and Space Administration (NASA) was established to plan, direct, and conduct aeronautical and space activities for peaceful purposes for the benefit of all mankind. The operational aspects of NASA's work are divided among field installations around the country and involve research and development activities under the responsibility of four technical program offices at NASA Headquarters.

The Goddard Space Flight Center (GSFC) is located in Greenbelt, Maryland and reports to the Office of Science. The GSFC is chartered to expand the knowledge of the earth and its environment, the solar system, and the universe through observations from space. To this end, the GSFC's primary emphasis is in scientific investigation, in the development and operation of space systems, and in the advancement of essential technologies. In accomplishing this responsibility, the GSFC has undertaken a broad program of scientific research, both theoretical and experimental, in the study of space phenomena and earth sciences. The program ranges from basic research to flight experiment developments and from mission operations to data analysis.

Within the GSFC, the Applied Engineering Technology Directorate (AETD) plans, organizes, and conducts a broad range of technical research and development activities in support of science applications. The AETD is responsible for providing engineering expertise and support in the formulation, design, development, fabrication, integration, test, verification, and operation of components, subsystems, systems, science instruments, and complete spacecraft for multiple projects. The specific components, subsystems, systems, and science instruments are ultimately integrated into the spacecraft to form a science observatory. It is these observatories that are launched to fulfill the mission of the GSFC. The AETD comprises five engineering divisions: the Mechanical Systems Division (MSD), the Information Systems Division (ISD), the Instrument Systems and Technology Division (ISTD), the Electrical Engineering Division (EED), and the Mission Engineering and Systems Analysis Division (MESA).

To fulfill these responsibilities and ultimately achieve their missions, GSFC must acquire a wide range of engineering services in support of its divisions to implement the GSFC mission.

SCOPE OF WORK

The purpose of this contract is to acquire engineering services and related services to MSD and related organizations throughout GSFC, as required, for the formulation, design, development, fabrication, integration, testing, verification, and operations of space flight and ground system hardware and software, including development and validation of new technologies to enable future space and science missions. **The engineering areas of emphasis are multidisciplinary with concentration in the mechanical engineering areas of materials, structural analysis and loads, mechanical design, electromechanical design, thermal, contamination and coatings, manufacturing and integration and test.**

To this end, the contractor shall provide on/off-site multidisciplinary engineering services, pursuant to task assignments issued by the Contracting Officer. These services shall include the personnel, facilities, and materials (unless otherwise provided by the Government) to accomplish the tasks.

Current engineering services provided rely on frequent face-to-face communication between the Government and its contractors. This includes meetings with the task manager and with various organizations throughout GSFC. The amount and form of communication varies from task to task. It will be necessary for the contractor's project managers and technical task managers to have the capability to attend frequent face-to-face meetings with Government personnel at the GSFC for a vast majority of the task orders to be issued in the future. The contractor shall have the capability to conduct these communications without being unproductive and inefficient.

Tasks orders will be issued to perform services in all aspects of mission and instrument development and implementation for components, subsystems, systems, science instruments, observatories, launch, ground system, spacecraft, and suborbital craft (e.g., aircraft, sounding rockets, UAVs, balloons), including attached shuttle or Space Station payloads, free-flying spacecraft, suborbital craft payloads, as well as ground support equipment, simulators, non-flight models, and prototypes; candidate, feasibility, and systems definition studies; project management; systems engineering; analysis; preliminary design; detailed design; non-flight and flight fabrication; assembly; integration; test and verification; test instrumentation; data systems management; launch, on-orbit and post-launch operations; research and technology unique to system development; parts and materials, technical facilities support, logistics, documentation; maintenance; sustaining engineering; configuration management; mission assurance; architectural trades, performance, cost, risk assessment, and systems safety.

I. GENERAL RESPONSIBILITIES

The Contractor's responsibilities shall include the management of personnel, timely and effective implementation of task assignments, control and monitoring of contract and subcontract performance, management of scheduled deliveries, and timely and effective reporting to the Government. These responsibilities shall also include efficient cost management methods as well as procedures to ensure that the Government is aware of task assignment status and progress achieved.

The administration of the task assignments under this contract shall be handled via the Task Order Management Systems (TOMS) web-based software tool, to be provided by NASA's Goddard Space Flight Center. The contractor shall ensure computer system compatibility with the TOMS software compatibility requirements at all times. TOMS shall be the primary tool for administration of tasks under this contract.

II. PERFORMANCE MEASUREMENT

Performance-based statements of work/specifications will be used for establishing contract requirements. Therefore, each task assignment issued by the Contracting Officer will include, as a minimum, the following:

1. Statement of Work, including the requirements to be met, the standard(s) of performance/quality of work, and required deliverables (or other output)
2. Performance Specification (if applicable)
3. Applicable Documents (if required)
4. Period of Performance
5. Incentive Structure
6. Surveillance Plan
7. Contractor response evaluation criteria for purposes of technical recommendation for contractor selection

The Contractor shall be required to adhere to the performance measurements detailed in each task assignment.

III. TASKS

Services shall be required in one or more of the areas described in the scope above for any given task assignment. Services within the scope of this Statement of Work and specified in task assignments shall include, but not be limited to, the specific services delineated in the following sections.

FUNCTION 1 – Pre-Formulation and Formulation Services: Candidate, Preliminary Analysis, and Systems Definition Studies

The Contractor shall provide engineering services for mission concept development that integrate the aspects of flight systems, ground systems, instrument systems, and launch systems.

In general, the Contractor shall:

1. Produce pre-formulation and formulation phase study inputs for spacecraft, suborbital craft, instruments, and ground systems
2. Develop mission needs (mission objectives, measurement concept, and instrument concept) and mission design (mission requirements, architectural design, and operations concept).
3. Develop preliminary, relative cost and schedule estimates based on design alternatives, and identify and assess high-risk elements in designs
4. Document the history of design, qualification, flight experience, and modifications where existing components or subsystems are to be utilized
5. Identify interface requirements for pre-launch, launch, on-orbit servicing, or retrieval of flight hardware
6. Define interface engineering and management requirements
7. Prepare mission systems and operations documentation
8. Prepare requirements and specification packages that conform to applicable standards defined within task statement
9. Identify interfaces and prepare interface control documents
10. Provide technical inputs for problem-solving and/or design inputs in selected spacecraft, instruments, suborbital craft, ground system, and data disciplines

11. Analyze various reports (i.e., progress reports) delivered by the GSFC mission contractor(s) and provide recommendations to the project
12. Provide liaison and coordination services for project activities
13. Provide design services that include performance of preliminary design (leading to a Preliminary Design Review) of the subsystems, components, and assemblies that comprise the instrument/spacecraft/platform/launch system/ground system.

A. Candidate Study Services

The Contractor shall provide study services for the conceptual design and development of subsystems and systems, thereby participating in the identification of scientific objectives, mission requirements and technical concepts. Study products produced during this phase shall include, but are not limited to:

1. Strategic technology planning
2. Integration of joint missions, partnerships, and other collaborative efforts
3. Research/science/technology/cost trade studies
4. Candidate operations concepts
5. Candidate system architectures
6. Cost, schedule, and risk estimates
7. Research and technology unique to system development
8. Customer development support and outreach

B. Preliminary Analysis Study Services

The Contractor shall provide preliminary analysis study services focusing on analyzing mission requirements and establishing mission architectures in order to demonstrate that a credible, feasible design(s) exist(s). The Contractor shall develop top-level requirements and evaluation criteria, identify alternative operations/logistics concepts, and identify project constraints and system boundaries. Study products produced during this phase shall include, but are not limited to:

1.0 Analysis Services Specific Tasks – The Contractor shall perform analysis services tasks, including but not limited to:

- a. Preliminary system design of a feasible, but not necessarily optimum configuration.
- b. Assessment of technical risks, including identification of technical problems and the criticality of their solution to follow-on efforts, identification of those problems currently being addressed, and a judgment of effort and time likely to be necessary to find a practical solution.

- c. Identification of all recommended systems characteristics, including launch and control capability, tracking and data acquisition, facility considerations, and institutional base activities.
- d. Implementation plans, which include the identification of all major systems and subsystems.
- e. Preparation of the system design that forms the basis for implementing system development (hardware or software).
- f. Provide alternative design concepts including feasibility and risk studies, cost and schedule estimates, and advanced technology requirements.
- g. Prepare for and support the appropriate Phase A project and technical reviews and prepare Phase A project documentation as appropriate (see the NASA Systems Engineering Handbook, SP-6105, June 1995).

2.0 Documentation Specific Tasks – The Contractor shall document all results from the study in a Feasibility Study Report.

C. System Definition Study Services

The Contractor shall provide system definition and preliminary design study services to establish (and evolve) the project baseline(s). These shall include:

1.0 Analysis Services Specific Tasks – The Contractor shall perform system definition analysis services specific tasks, which may include but are not limited to the following:

- a. Define system requirements, system budgets (e.g., mass, power, memory), error budgets, system/subsystem requirements, software requirements, ground support equipment requirements, and integration and test requirements
- b. Identify all recommended system characteristics, defining the subsystem components and assemblies, identifying the required complement of flight and ground support equipment, specifying internal and external interfaces, and verifying that the recommended design approach's critical subsystems and components are within the state-of-the-art
- c. Provide a formal flow down of project-level performance requirements to a complete set of system and subsystem design specifications for both flight and ground elements. Phase B baseline information shall be developed including system requirements and verification requirements matrices, system architecture and work breakdown structures, operations concepts, "design-to" specifications at all levels, and project plans including schedule, resources, and acquisition strategies
- d. Perform risk assessments of all critical elements, describe the risks and control methods. The knowledge and use of Probability Risk Assessment (PRA), Failure Modes and Effects Analysis (FMEA) and Fault Tree Analysis (FTA) is required.

- e. Prepare the system design that shall form the basis for implementing/developing the system (hardware or software); define the tasks and sequence of tasks that shall be performed to provide orderly technical development, design, review, interface, test, and integration of the system; and provide the required plans (modeling, analysis, and simulation; configuration; logistics; information; software; verification; integration and test, etc.) for the effort
- f. Describe and document integrated mission architecture
- g. Prepare for and support the appropriate Phase B project and technical reviews and prepare Phase B project documentation as appropriate (see the NASA Systems Engineering Handbook, SP-6105, June 1995).

2.0 Documentation Specific Tasks – The Contractor shall document all results from the study effort in a Definition Study Report.

FUNCTION 2 – Implementation Phase Services – Mechanical Systems

The Contractor shall provide services to design, analyze, develop, fabricate, assemble, unit test, system integrate, verify, mission integrate, deploy, and operate hardware and software on spacecraft, platform, and/or payload as defined by this Statement of Work. The implementation phase services shall include:

A. Materials Engineering

The contractor shall provide materials engineering support in the two major areas of Materials Assurance Engineering and Materials Laboratory Support.

1.0 Materials Assurance Engineering

The contractor shall provide materials engineering support for the development and implementation of materials assurance programs for GSFC managed flight projects. Contractor materials engineers shall assist GSFC project engineers with the selection and application of materials and processes, plan and supervise investigations or evaluations, provide general materials program management and access the flight worthiness of all materials usage. This includes providing materials engineering expertise to projects and designers in the form of consultation, guidance and review. This support will address reliability, product assurance, and quality assurance.

a. Document Reviews

The contractor shall review all material usage lists and documentation associated with material applications. The contractor shall prepare reports that identify differences between contractor documentation and NASA requirements and recommend required changes. When needed, the contractor shall provide all materials support required for the success of the project.

b. Material Usage Lists

The contractor shall review and recommend flight usage for material lists for GSFC managed flight projects in accordance with project requirements. The review process shall identify materials and their usage as standard or nonstandard and as compliant or noncompliant. Materials Usage Agreements shall be reviewed and approved or disapproved. The maintenance and distribution of material lists shall address requirements such as revision tracking and approval status.

c. Facility Evaluations

The contractor shall evaluate GSFC and NASA contractor Materials Engineering, processing and quality facilities for required equipment, processes personnel, training and capability for producing flight quality hardware. The contractor shall prepare reports of findings and recommendations for bringing facilities into compliance with requirements.

d. Hardware Evaluation

The contractor shall support the audit of NASA and NASA contractor manufacturing of flight hardware, including in-process and end item inspections for compliance with agency and project requirements.

2.0 Laboratory Support

The contractor shall provide engineering support for laboratory operations associated with the testing and analysis of organic, ceramic, composite and metallic materials typically used in space flight projects. The contractor shall be responsible for maintaining laboratory facilities and equipment and maintaining equipment calibration in any laboratories where they are assigned the position of Laboratory Manager.

a. Organic Materials

The contractor shall perform failure analysis, material investigations, process development, and analyses of organic materials.

i. Organic Contamination Analyses

The contractor shall perform analyses of contaminants collected via cold fingers, witness mirrors or swab wipes.

ii. Outgassing Tests

The contractor shall perform material outgassing tests in accordance with ASTM E-595, Test Method for Total Mass Loss (TML) and Collected Volatile Condensable Materials (CVCM). The contractor shall support a computer database containing percent TML, percent CVCM, and percent Water Vapor Regained (WVR) for all materials tested.

iii. Polymeric Application

The contractor shall perform polymeric applications for flight hardware. The contractor should be capable of applying all of the Materials Engineering Branch documented procedures for polymers.

b. Ceramic and Composite Materials Engineering

The contractor shall perform physical, chemical and mechanical testing of composite and ceramic materials as well as providing engineering support for failure analyses for these materials.

i. Mechanical Testing

The contractor shall provide engineering support for mechanical testing of composite materials to verify lamina and laminate design allowables and to verify composite joint designs. Tests include tension, compression, shear, and fatigue at both room and cryogenic temperatures. The contractor shall also provide support for the mechanical characterization of ceramic materials.

ii. Physical Property Testing

The contractor shall provide engineering support for testing of ceramic and composite materials to measure or verify physical properties such as coefficient of thermal expansion, thermal conductivity, and moisture absorption.

c. Metallurgical Engineering

The contractor shall perform material characterizations and failure analyses using procedures derived by the contractor, various standards or, ISO standards.

i. Fastener Screening

The contractor shall perform screening of fasteners by strength testing, hardness testing, and visual inspection in accordance with NASA and GSFC requirements.

ii. Printed Circuit Board Coupon Analysis

The contractor shall perform analyses of printed circuit board coupons for GSFC and GSFC contractors in accordance with Materials Engineering Branch procedures and IPC standards 6011/6012B Performance Specification Sheet for Space and Military Avionics. The analyses shall be reported in accordance with project requirements for traceability, certification and schedule.

iii. Nondestructive Evaluation

The contractor shall support nondestructive evaluation (NDE) operations including digital microfocus radiography, immersion and contact ultrasonics, thermography, dye penetrant and eddy current. These NDE inspections are performed on flight hardware and associated parts to detect flaws and failures to insure component reliability.

d. Materials Identification and Certification

The contractor shall perform identification and certification of materials. This includes metallic, nonmetallic and composite materials.

e. Life Testing

The contractor shall develop, design and provide equipment, write procedures and reports, conduct life tests on lamps, lubricated space mechanisms and other flight hardware items. The support should also include thermal cycling, performance testing, data collection and data analysis.

f. Cryo-lab Support

The contractor shall provide support to the Materials Engineering Branch in stocking the tanks, maintenance and operation of equipment such as storage tanks, cryogenic chambers, supply piping and related safety equipment.

g. Electrical Testing of Materials

The contractor shall provide support in testing electrical properties of materials such as ESD and resistivity.

h. Reports and Publications

The contractor shall prepare reports of test and analysis results. Analyses shall be documented in a report format using photographs and diagrams as necessary and addressing objectives, techniques, results, conclusions and recommendations. Inspections and test results shall be documented according to project requirements for traceability and certification. Reports shall be suitable for distribution to center, agency and material discipline community. When appropriate or required, the contractor shall prepare GIDEP ALERTS for submission through the COTR and appropriate center channels.

B. Structural Analysis and Loads Engineering**1.0 Finite Element Model Analysis**

Generate finite element models (FEM's) of space flight and related structures with primary emphasis given to the use of the NASTRAN structural analysis program. The contractor shall utilize FEM pre- and post-processor software to aid in the development and modification, checkout and visualization of the NASTRAN models themselves as well as the FEM analysis results. FEM visualization processes shall include modern techniques for viewing static and dynamic deformations, forces, stresses, and applied loads (including temperature) that aid in the understanding of the model and analysis results. Model checkout processes shall include checks that test the mathematical accuracy of NASTRAN models prior to their use in analyses. In addition, capabilities must exist for the checkout, modification, and visualization of models for use in analyses that require combining FEM's from several diverse sources into an overall system model. This latter capability must address the possibility that some of the models may be delivered as FEM's in codes other than NASTRAN and must be converted to NASTRAN prior to performing the overall systems analyses in NASTRAN.

While the majority of associated tasks will utilize only the linear analysis capability of NASTRAN, from time to time some analyses can only be addressed with non-linear techniques. Such tasks might include, but are not limited to, generating FEM's to analyze structures with material or geometric non-linearities, thin-film wrinkling, and MEMS. Capability to use the non-linear capability of NASTRAN or other solvers shall be present. Capability to use the optimization routines of NASTRAN must also exist.

2.0 STS and ELV Flight Loads Analysis

Perform coupled launch vehicle/payload flight loads analyses on task specified payload configurations. Flight loads analyses include lift-off, ascent, descent, and landing for the Space Transportation System (STS) and launch and ascent for Expendable Launch Vehicles (ELV). These analyses may be directed toward determining envelope, preliminary design loads, or toward the determination of payload specific time-history transient flight loads. Load parameters required may be acceleration, displacement, force, or stress.

3.0 On-orbit Loads Analyses

Perform coupled on-orbit loads analyses on task specified payloads configurations for STS/payload, ELV/payload and ISS/payload combinations. Load parameters required shall include acceleration, displacement, force and stress.

Determine loads resulting from grappling of payloads using the STS Remote Manipulator System (RMS), from berthing of payloads to carrier structures in the Orbiter cargo bay, from re-positioning of payloads using motorized devices (such as pivoting mechanisms, rotators, etc.), from firings of the Orbiter Maneuvering System (OMS) and Reaction Control System (RCS) while the payload is grappled or berthed, from Extra-Vehicular Activities (EVAs), from Orbiter-induced venting or jet-plumes, from tip-off at the time of deployment, and from any other loading events that may occur during on-orbit operations. Loads from all ISS operations shall be included in on-orbit analyses for ISS/payload combinations.

4.0 Stress Analysis

Perform hardware related stress and margin of safety analyses of spacecraft structures, electromechanical devices, and mechanisms using both classical "hand" stress analysis and computerized stress analysis techniques. These analyses will be directed toward sizing the required structural members to obtain the required strength and stiffness characteristics and toward demonstrating required stress margins of safety. This activity is a necessary prerequisite for fracture control implementation using safe-life (fracture mechanics analysis) and fail-safe approaches.

5.0 Dynamic Analysis

Perform selected random vibration, frequency response, shock and vibroacoustic analyses to simulate spacecraft test and flight events. Analyses shall determine the acceleration, velocity, displacement, and force response of the hardware due to random, transient, sinusoidal vibration, acoustic, and transportation and handling environments. Derive equivalent test specifications, including force-limited or otherwise notched, which properly simulate dynamic flight environments and envelope transportation and handling loads.

6.0 Fracture Control

Develop fracture control plans for task specified STS payloads. Implement approved fracture control procedures. Perform fracture mechanics analyses in accordance with GSFC standards to ensure that the maximum crack size which can exist in structural elements, as determined by NDI test procedures, will not propagate to failure as a result of intended service usage. Perform fail-safe and containment analyses where appropriate to satisfy fracture control requirements. Support STS safety reviews for specific payloads as specified in task orders.

C. Mechanical Engineering

1.0 Mechanical Systems Development

Provide mechanical design and engineering services, including consultation services, for the support of GSFC spacecrafts and instruments being developed both in and out-of-house. Provide engineering services and/or consultation on mechanical requirements definition, review and optimization. Provide engineering services and/or consultation and/or review of structural loads, conceptual designs, detailed designs, integration plans, performance test plans, environmental qualification test plans, mass budgets, static and dynamic analyses for concurrence with GSFC defined standards and practices. Develop risk and cost reduction plans. Provide support at task specified flight project meetings and reviews, which may require travel both within and outside the United States of America. Engineering services, consultation and/or review findings are to be documented in technical memorandums. Trip reports shall be submitted to the ATR for all travel, and shall include a summary of activities, all assigned action items, and necessary schedule information.

2.0 Mechanical Design and Drawing Production

Perform detailed mechanical design studies, and provide designs and drawings of spacecraft structures, flight support and carrier structures, instrument structures, electromechanical devices, Ground Support Equipment (GSE), and mechanisms.

Produce configuration layout and accommodation drawings and iterate these arrangement drawings, as necessary, to satisfy mission objectives and specific science requirements such as instrument fields-of-view, access and other packaging needs.

Provide conceptual designs and drawings of spacecraft structures, balloon structures, flight support and carrier structures, instrument structures, GSE, and mechanisms (i.e. deployable booms, choppers, shutter mechanisms, aperture doors, etc.). The contractor shall be capable of designing precision mechanical structures using both conventional metallic materials and advanced composite material systems, with detailed knowledge of composite laminate and sandwich design for dimensional stability.

Produce layout and detail fabrication drawings of all hardware mentioned above in Computer Aided Design (CAD) format fully compatible, at a minimum, with current releases of the following CAD tools: I-DEAS and Pro-Engineer. In some instances, the use of Auto-Cad and/or SolidWorks shall be required under a task order.

3.0 Mechanical Drawing Checking

Provide detailed mechanical drawing checking in accordance with ANSI Y14.5M, Dimensioning and Tolerancing and the GSFC Engineering Drawing Standards Manual, Doc # 500-PG-8700.2.5. Checking 'redlines', detailing necessary changes to make a drawing compliant with the above standard, shall be provided for each drawing or model checked. Alternative forms of documenting the necessary drawing corrections may be used if there is a benefit to the government, upon concurrence by the ATR.

D. Electro-Mechanical Engineering

Electromechanical systems comprises mechanisms and their associated electronics, typically requiring precision motion, accomplished utilizing electromagnetic or other means for actuation, sensors for detecting velocity, position, or other physical parameters, along with a closed-loop or open-loop feedback controller. Design and analysis services shall be provided to perform concept trades, concept design, and detailed design of electromechanical systems and their components. Fabrication, assembly, and testing services, including life testing, shall be provided so that the capability exists to develop prototype, ETU, and flight electromechanical systems. Types of electromechanical systems requiring expertise include magnetic bearings, active/smart structures, vibration isolation, and large aperture, lightweight systems. Severe environments that electromechanical systems are subjected to include, but are not limited to acoustic, EMI/EMC, magnetic, cryogenic, vacuum, 0-g, and launch vibration. Special handling and clean-room environments are to be utilized for assembly of mechanisms as appropriate.

The contractor shall provide analyses using CAD and simulation tools utilizing hardware and software compatible with those used by the Mechanical Systems Division. The contractor shall have expertise to set-up and operate electronic design and test equipment compatible with equipment used by the Mechanical Systems Division, and other equipment typically found in flight hardware development electrical and mechanical labs.

Mechanical related electromechanical tasks have mostly been covered in the mechanical section of this document. Tasks in addition, but not limited to, include design, analysis, selection, implementation, and testing of bearings, flex-pivots, and flexures. This requires expertise in bearing tribology as well as aerospace materials.

1.0 Robotics

Robotic systems are electromechanical systems that specifically are used for providing autonomous or remote manipulation. Robotic systems typically possess multiple joints such that multiple solutions exist for a manipulator to move from one location to another. For this reason, support services shall include analysis to solve statics and dynamics of serial and parallel kinematic systems, and controller software development to implement the appropriate solutions for those systems. Expertise will be required in the area of Orbital Replacement Units (ORUs), other robotically serviceable assemblies, and robotic manipulators and end-effectors, as necessary, to provide engineering support services.

2.0 Micro Electromechanical Systems (MEMS)

Micro Electromechanical Systems (MEMS) techniques will be applied to those applications requiring micro-miniaturization of mechanisms, or sub-assemblies of conventional mechanisms. Expertise in analysis and implementation of MEMS is required. This includes, but is not limited to, FEM analysis of small scale structures, materials, fabrication techniques, packaging, photolithography, lithography electroforming and molding (LIGA in German), interfacing with macro-components, micro-actuators, focused ion-beam milling and welding, and coatings and tribology issues.

3.0 Systems Design and Analysis

System level electromechanical tasks include, but are not limited to system identification and modeling, both linear and non-linear as appropriate using MATLAB/Simulink or a similar modeling software. These models are used as a tool for design optimization, design verification, etc. Expertise in SISO and MIMO controllers is necessary.

4.0 Electronics and Electromagnetics

Electronics and electromagnetics related tasks shall include, but are not limited to, the design, analysis, fabrication, implementation and testing of: power electronic circuits for the drive and commutation of motors; precision, low noise signal conditioning and interface electronics for sensors, optical encoders, and thermistors; digital and microprocessor based controllers for the implementation of command and telemetry functions, embedded software for microprocessor based systems to implement digital filtering and control algorithms in sampled data systems, perform worst case, failure mode and performance sensitivity analysis of electronic systems to verify the suitability of the design for the range of operational and survival temperatures and the cosmic radiation environments; analysis, design, and troubleshooting of grounding, shielding, Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC) problems; the layout, fabrication, and population of printed circuit boards (PCB's); design and fabrication of the interconnecting harness for electronic assemblies; and the determination of the electromagnetic fields and the electromagnetically generated forces in electrical machinery. Expertise to provide design, analysis, fabrication, selection, implementation, and testing of electrical machines, actuators, and sensors is required.

E. Thermal Engineering

1.0 Thermal Design

Conceive and develop thermal and cryogenic designs for spacecraft and instrument systems and balloon payloads. Determine thermal interfaces between instruments and their support structure. Develop plans and/or procedures for thermal analyses and verification testing. Review, evaluate, analyze, and report on thermal design, implementation and development.

2.0 Thermal Analyses

Perform thermal analyses for spacecraft bus, and STS, ISS, ELV and balloon payloads. Develop analytical mathematical models, including thermal mathematical models and geometric mathematical models, representing conductive and radiative heat transfer both internal and external to the spacecraft and payload, and including convection effects for balloon payloads. Determine heat fluxes, temperature distributions, and temperature gradients for all specified spacecraft and payload components and locations for all flight and on-orbit conditions and launch and landing sites if required. Perform thermal analyses and design studies for cryogenically cooled instruments, subsystems, and components. Develop new thermal analysis software and improve existing software. All thermal analysis software utilized must be compatible with Systems Improved Numerical Differencing Analyzer (SINDA), Thermal Radiation Analyzer System (TRASYS), Thermal Synthesizer Systems (TSS), Finite Element Modeling and Post-processing (FEMAP/TCON), Simplified Space Payload Thermal Analyzer (SSPTA), Thermal Desktop, or Thermal Model Generator (TMG) software packages.

3.0 Thermal Device Design

Provide design of thermal subsystem components including thermal blankets of all types, heat pipes, Capillary Pumped Loops (CPL), Loop Heat Pipes (LHP), heaters, coatings, radiators, thermoelectric coolers and other thermal control systems and devices.

4.0 Cryogenic GSE

Perform thermal analysis and design for cryogenic GSE, including dewar systems; dewar subsystems and components; and optical, opto-mechanical, electrical, and electro-mechanical GSE required to operate at cryogenic temperatures.

5.0 Thermal Laboratory Support

Provide electrical, mechanical, and software engineering; and mechanical and electrical technician support for the fabrication and test of various thermal and contamination control devices for both flight and ground systems. Design, assembly, instrumentation, insulation, data processing and display, tests and reports of various systems, including two-phase thermal test beds is required. Support for the preparation, data processing, and testing of flight and ground systems in the thermal vacuum facilities is also included. Facility repair, upgrades to laboratory equipment, and maintenance of data processing systems is included.

6.0 Thermal Vacuum Test Support

Provide support in the area of thermal vacuum test and thermal balance test for spacecraft and instrument systems and balloon payloads. Prepare or review test plans, test procedures, and test reports. Perform pre-test temperature predictions and post-test thermal correlations.

F. Contamination and Coatings Engineering

1.0 Contamination Engineering Management

Develop contamination control plans for spacecraft, instruments, ground support equipment, and flight experiments. Determine contamination control requirements, and develop appropriate monitoring plans and procedures to assess contamination control requirements compliance. Monitor, review, evaluate, analyze, and report on overall contamination engineering management implementation and development. Support project meetings at the spacecraft and instrument level, support and present at project reviews, support technical interchange meetings, peer reviews, working group meetings, failure review boards, facility cleanliness surveys/evaluations, lessons learned, knowledge capture, and other project meetings at vendor sites (as required). Provide support for implementation of contamination control plans and requirements at vendor sites and at launch sites.

2.0 Contamination Engineering Analysis

Develop analytical transport models (molecular, thruster plume, and/or particulate) for spacecraft and instrument systems and/or other space flight hardware and generate contamination hazards predictions. Perform detailed environmental analyses of all phases of assembly, integration, test, transportation, pre-launch (i.e., payload processing facilities, launch pad), launch, on-orbit, descent, and landing and compare against requirements. Establish surface contamination limits based on allowable optical and thermal performance degradation and conduct tradeoff analyses, analyzing specifications and reviewing requirements.

Establish particulate and gaseous contamination limits for ambient temperature and cryogenic fluid systems.

Develop new, or improve existing contamination engineering analysis software.

Perform tape lift sampling and analysis according to GSFC 545-WI-8072.1.2 and provide report of all events in IEST-STD-CC1246D and percent area covered formats where requested. Provide additional particulate contamination analysis as needed.

Monitor and model outgassing tests of flight systems and their components at the systems and subsystem vacuum level tests. Perform data reduction of all contamination monitoring devices and present results in report format.

Analyze trends in clean room facilities for airborne particles and molecular depositions.

Make relevant analysis and predictions on the performance of ovens and space environmental test chambers. Determine suitability of test equipment for specific mission criteria. Develop requirements for contamination control ground support equipment and flight instruments.

3.0 Contamination Laboratory Support

Perform and record outgassing measurements in the Molecular Kinetics (MOLEKIT) facility. Provide testing according to ASTM E1559 or equivalent GSFC 545-WI-8072.1.34. Catalog and present data for model input parameters.

Perform Bidirectional Scattering Distribution Function (BSDF) measurements (i.e. reflectance and transmittance) on optical and thermal control samples for project support.

Perform testing according to GSFC 545-WI-8072.1.32.

Perform Image Analysis measurements on samples and witness plates according to GSFC 545-WI-8072.1.33.

Provide contamination flight monitor support for fabrication, testing, integration, on-orbit data review, and data reduction. Flight monitors will be project specific and independently funded.

Provide setup and operation of airborne particle counters and microscopes.

4.0 Development and Use of Contamination Standards

Provide analysis and support for the development of GSFC, NASA, national and international contamination control standards. Develop, procure and calibrate, and test new equipment for the purpose of developing new standards or monitoring flight projects contamination control.

If necessary, support these activities off site. Write and present papers documenting the development of new techniques and standards in contamination control.

Become familiar with and use new standards as they are developed and become applicable and supercede existing standards.

5.0 Cleaning Support and Technology

Provide cleaning procedures, and precision cleaning, for GSE and flight hardware.

Investigate, develop, procure and calibrate, and test new cleaning techniques and applications to enhance our ability to provide and validate cleanliness of flight hardware. Investigate, develop, and test new cleaning techniques and applications to enhance our ability to provide and validate cleanliness of flight hardware. Techniques developed need to focus on surfaces that can be physically contacted with cleaning surfaces that can be physically contacted with cleaning techniques as well as surfaces that cannot allow contact.

6.0 Space Environmental Coatings Testing and Management

Perform Flight qualification and space environment testing of coatings along with thermal radiative property measurements, thickness measurements, and coating adherence testing. Develop, operate, and maintain GSFC unique facilities to select, apply, and qualify coatings for use on spacecraft and instrument surfaces. Characterize thermal control surfaces and assess degradation from environmental effects due to UV radiation, thermal cycling, charged particles, electrostatic discharge, outgassing and humidity. Develops and maintains a database of thermal property test data and coordinates extended shelf life testing of paints. When appropriate, develop and maintain GSFC, NASA, national, and international standards for the application and testing of space environmental coatings.

7.0 Thermal and Contamination Flight Experiments

Provide services to design, develop, fabricate, assemble, test, integrate, verify, and operate thermal and contamination flight experiments to be flown on flight platforms.

8.0 Space Environmental Coatings Application

Provide support to apply spacecraft and instrument coatings that meet thermal and contamination requirements. Devise methods of surface preparation and application procedures for sprayed thermal control coatings (silicate, silicon and urethane based coatings) and thermal control films (silver teflon, etc.). Devise and implement techniques for the refurbishment and cleaning of coatings to remove particulate contamination. This work shall utilize government facilities and, as directed, the contractor's own facilities. Provide offsite support for the use of these techniques.

9.0 Thin Films

Provide support in the area of vacuum vapor deposition and sputter deposited thin films. Provide support to apply thin film coatings on space flight parts at either government facilities and/or the contractor facilities. Provide offsite support for the use of these techniques.

G. Manufacturing Engineering

Provide flight (including protoflight), and non-flight (including prototype) hardware fabrication and assembly support for spacecraft primary structure, secondary structure, instrument structures, mechanical subassemblies, components, mechanisms, electronics assemblies, electromechanical devices, thermal control devices and subsystems, and thermal flight experiments. All fabrication and assembly support shall be in accordance with the workmanship requirements of NASA-STD-8739.3 thru 8739.5 and IPC 6011, 6012, 6013, 6015, 6016, and 6018, as well as all subsequent updates to these documents. All fasteners used in assembling or installation shall conform to GPG 541-PG-8072.1.2, GSFC fastener integrity plan. Also provide support to fabricate mechanical ground support equipment, special test and evaluation equipment (including electronic equipment) necessary to support the operation of all mechanical hardware. In situations where hardware fabrication is required in a quick reaction mode and the contractor decides to perform the task under subcontract, the contractor shall minimize both the subcontract implementation and fabrication phases of the task. Subcontractors used for fabrication and/or assembly shall be ISO 9001 compliant.

1.0 Thermal Devices and Materials

The contractor shall install active thermal control devices (heaters, thermostats, thermocouples, thermistors, heat pipes, CPLs, etc.). The contractor shall have the capability to install thermal coatings and other passive thermal materials and devices on space flight hardware (paints, chemical films, platings, oxide coatings, both ambient temperature and cryogenic temperature blanketing applications, etc.).

2.0 Hardware Protective Coatings

Provide protective or specific performance coatings such as iridite , anodize , electroless nickel plating, and gold plating. Be able to provide preparatory etching for dye penetrant testing and bonding applications on various materials such as aluminum, Invar, and Titanium. Provide services required to perform close tolerance masking of substrates , prior to plating services , such as anodize.

Prime and paint surfaces, parts and assemblies as required.

3.0 Composites

The contractor shall provide fabrication of composite structures, including but not limited to, flat laminates, honeycomb sandwich structures (composite and aluminum), tubes, and trusses. The contractor shall also provide unique tooling for composites manufacturing of custom shapes, including dimensionally stable, low distortion tooling. The contractor shall provide machining of composites, fixturing and facilities for bonding composite elements to form completed assemblies. The contractor shall provide for the co-cure and post cure of inserts into substrates of varying composition, located to a high degree of positional accuracy.

4.0 Electronics Fabrication and Assembly

a. Ground Support Equipment

The contractor shall design, build, test, and deliver ground support equipment to commercial standards and including applicable NASA standards as specified in the task orders. Where ground support equipment (GSE) interfaces with flight equipment an analysis shall be performed to assure the compatibility between the GSE equipment and the flight equipment. The contractor shall design the GSE such that no single failure can result in damage to the flight unit. If specified in the task, this shall be shown formally in a FMEA.

All GSE interfaces that connect to flight equipment shall be electrically tested before connection to flight hardware. If a modification is made to a GSE which affects a flight interface, the interface shall be re-tested prior to reconnection to flight hardware. GSE connectors which interface with flight hardware shall be maintained as flight connectors.

Formal quality assurance procedures shall be limited to flight interface circuitry and cables which contact flight hardware. Formal quality assurance shall be limited to a final inspection only. The contractor shall generate and accept without modification GSE drawings meeting commercial standards.

b. Harness

The contractor shall fabricate and test flight harnesses from drawings either GFE'd or developed by the contractor from GFE'd interface documentation such as connector definition

drawings and Interface Control Drawings (ICD's). The contractor shall develop mechanical mockups of the payload as required. Flight harnesses shall be fabricated by flight solder and crimp certified technicians using standard space flight harnessing techniques except where new and unique methods are required for particular payloads and are developed in concert with the task technical monitor. Potting shall be performed by appropriately certified technicians. Proper assembly procedures shall be followed for all connector types.

H. Integration and Test Engineering

Integration and test services may need to be supported at various locations, including vendor sites, NASA Centers, and Military sites.

1.0 Integration

The contractor shall be required to assemble and integrate thermal, mechanical, electromechanical, and electronic flight systems and subsystems. This requires the design, fabrication, and operation of ground support equipment such as cryogenic dewars, command and telemetry simulators and computerized data acquisition systems.

2.0 Testing

The contractor shall be required to design test sequences, establish pass/fail criteria and write test procedures to characterize or verify the performance of the system under test; based on the performance requirements and the specified operational environment, choose the proper transducers, instrumentation and test equipment required for the test, conduct the test and subsequently, analyze the test data and prepare reports summarizing the test results. The contractor shall provide test and instrumentation capabilities to support these activities. The contractor shall be capable of operating Mechanical Systems Division compatible equipment such as a dynamic signal analyzers, spectrum analyzers, analog and digitizing oscilloscopes, multi-channel data acquisition hardware, tunable frequency discriminators, logic analyzers, voltage and current meters and strip chart recorders. Transducers typically used include accelerometers, force transducers, displacement sensors, thermistors, and gauss meters. Typical tasks in the area of test shall include, but are not limited to, the measurement of bearing torque, residual momentum, modal surveys of structures and mechanisms, measurement of transfer functions and transient behavior of thermal, structural, mechanical, electromechanical, and electronic components and systems; life testing of electromechanical assemblies; measurement of disturbance rejection and jitter performance; reduce and display test data, automate test sequences and data acquisition, implement signal processing algorithms to identify trends, extract modal parameters, calculate transfer functions and power spectral densities.

The Contractor shall test and/or participate in the GSFC's testing and qualification of hardware and software, including re-testing/re-qualification of spare units and breadboards previously developed for flight projects. These tests shall be conducted in accordance with Government-approved procedures and shall include both functional and environmental tests. Functional tests shall be designed and performed to demonstrate compliance with the operating requirements of the system. Environmental tests shall be designed and performed

using environmental conditions that meet the launch, safety, and operations requirements of the assigned task. The Contractor shall perform the following:

- a. In-process testing during the fabrication process to demonstrate that the design meets the requirements specified.
 - i. X-ray, dye penetrant, and eddy current inspections, as well as other forms of nondestructive analysis
 - ii. Tests to develop/validate models for structural, mechanical, thermal, optical, power, and electronic components and assemblies

- b. Functional testing, including:
 - i. Verification of operational characteristics of components and equipment
 - ii. Testing at Government facilities
 - iii. Testing and documentation to verify accuracy, repeatability, and stability while operating under simulated flight conditions

- c. Flight qualification testing on units that have successfully completed functional tests and have been prepared for space flight. These tests may be conducted at any of the levels of assembly specified in this Statement of Work, including on the spacecraft. The qualification tests shall be carried out in a test environment specified by the task order. The Government may provide test facilities and/or test equipment to the contractor, as specified in the task order. Flight qualification testing shall include:
 - i. Vibration/Shock
 - ii. Magnetic
 - iii. Thermal vacuum
 - iv. Thermal balance
 - v. Static loads
 - vi. Acoustics
 - vii. Mass properties
 - viii. Alignment

- ix. Electromagnetic interference (EMI)
- x. Electromagnetic compatibility (EMC)
- xi. Gravity effects
- xii. Life tests
- xiii. Modal survey
- xiv. Deployments
- xv. Mechanism Performance

3.0 De-Integration

The contractor shall be required to disassemble and de-integrate thermal, mechanical, electromechanical, and electronic flight systems and subsystems.

FUNCTION 3 – Implementation Phase Services - Related discipline engineering

A. Project Management

The Contractor shall provide management services, including establishment of a management organization that ensures that all assigned task objectives are accomplished within specified schedule and cost constraints. Management shall provide frequent and timely status to the Government via cost, schedule, progress and other reports during all phases of work.

B. Mission Systems Engineering

The Contractor shall provide systems engineering support for project development, reporting progress, and conformance to appropriate practices and specifications (see the GPG 7120.5 Systems Engineering). This shall include:

1.0 Systems Engineering Specific Tasks – The Contractor shall perform key mission and spacecraft-level systems engineering functions that include, but are not limited to the following:

a. Operations Concept Development & Support:

- i. Developing the operations concept
- ii. Preparing/reviewing mission operations concepts in regards to the intended functionality and interfaces among the flight subsystems and the ground
- iii. Generating Mission Operations Concept Documents (ConOps)
- iv. Participating in user interface meetings and joint integrated mission simulation training aimed at developing viable user operations
- v. Supporting satellite operations
- vi. Analyzing flight anomalies and recommending implementing appropriate actions
- vii. Working with principal investigator and science working group in planning operations
- viii. Supporting “lessons learned” presentations
- ix. Preparing plans for and supporting mission disposal operations

b. Architecture & Design Development:

- i. Defining systems and conducting trade-off studies/design studies for spacecraft, suborbital craft, instruments, space segments and ground segments
- ii. Reviewing software development and software system test activities
- iii. Generating and maintaining and/or reviewing system block diagrams

- c. Requirements Analysis, Identification and Management:**
- i. Generating and managing and/or reviewing Level 1 and 2 requirements
 - ii. Conducting requirements traceability
 - iii. Documenting specified and lower level derived requirements to demonstrate that performance requirements are met
 - iv. Reviewing/performing independent design and development requirements analyses, and submitting comments and recommendations
 - v. Reviewing technical specifications, and submitting comments and recommendations
 - vi. Providing specification of Requirements for Design, non-flight fabrication, and checkout of ground support equipment
 - vii. Reviewing contamination control requirements
 - viii. Reviewing operating plans and procedures for cryogenics, fuels, and other hazardous materials
- d. Validation and Verification:**
- i. Generating and/or reviewing Verification Plans
 - ii. Performing design, drawing, and specification reviews
 - iii. Providing comments and/or recommendations to ensure:
 - 1) that designs meet specification and interface requirements,
 - 2) that appropriate parts standards are compatible with specified mission requirements and risk levels,
 - 3) that detailed specifications are compatible with mission requirements, including margin and error budgets,
 - 4) and that proper consideration is given to cost, reliability, safety, non-flight fabrication requirements, contamination control, magnetic materials/interference, launch requirements, and space environmental requirements.
 - iv. Documentation and/or review of system qualification requirements
 - v. Preparing and/or reviewing hardware and software integration plans and procedures, and witnessing execution
 - vi. Preparing and/or reviewing detailed functional and environmental test plans and procedures, and witnessing test execution
 - vii. Ensuring that the technical aspects of shipping requirements and equipment are met
 - viii. Preparing and/or reviewing plans for launch site checkout, integration and testing of flight systems, including adequacy of the launch site facility
 - ix. Analyzing data from spacecraft telemetry data sources to ensure total system compatibility
 - x. Analyzing Flight performance from flight data

e. Interfaces and ICDs:

- i. Reviewing and analyzing design interfaces
- ii. Identifying interface control requirements for engineering and design components for launch, on-orbit servicing, or retrieval of flight hardware
- iii. Preparing, reviewing, and analyzing interface documentation for mission systems
- iv. Preparing interface control documents and verifying proper implementation for flight and ground subsystems and systems
- v. Controlling external interface documentation and requirements

f. Mission Environments:

- i. Defining and/or reviewing subsystem and hardware specifications to ensure that they meet the specific mission or spacecraft environment. Mission or spacecraft environment includes the following discipline areas:
 - Mechanical systems
 - Electrical systems
 - EMI/EMC
 - Grounding
 - Thermal
 - Radiation shielding
 - Parts engineering
 - Contamination
 - Reliability
 - Charging
 - Timing and time distribution
 - Data rates
 - Safety
 - Orbital debris assessment

g. Technical Resource Budget Tracking:

- i. Documenting and controlling and/or Review of budget plans, including power, thermal, data storage, computer processing and communication through-put, attitude control, timing, mass properties, etc., both at the flight system level and allocated to lower levels of assembly; this shall include error margins, where applicable
- ii. Documenting command and telemetry signal margin plan, including bit error rates

h. Risk Analysis, Reduction, and Management:

- i. Identifying high risk elements and developing/executing contingency plans for controlling the high risk elements
- ii. Reviewing contractor risk management plans and commenting on alternate approaches

- i. System Milestone Review Candidates:**
 - i. Conducting and documenting internal design reviews
 - ii. Supporting standards definition and review
 - iii. Attending and conducting technical meetings/design reviews, and submitting comments and recommendations
 - iv. Preparing and presenting of technical information for technical conferences/reviews/briefings

- j. Configuration Management and Documentation:**
 - i. Analyzing configuration, design, anomaly resolutions, and procedural changes submitted to change control boards. Providing the services and functions stated in Section G of this document.

- k. Systems Engineering Management Plan:**
 - i. Generating System Engineering Management Plans (SEMP)
 - ii. Documenting/reviewing system, subsystem and organizational processes in terms of ISO compliance and CMMI assessments
 - iii. Developing or reviewing existing systems engineering tools for applicability as required
 - iv. Review of Fabrication Plans

C. Instrument Systems Engineering

The Contractor shall provide instrument systems engineering support for project development, reporting progress and conformance to appropriate practices and specifications (see the GPG 7120.5 Systems Engineering). This shall include:

- 1.0 Systems Engineering Specific Tasks**– The Contractor shall perform key Instrument systems engineering functions that include, but are not limited to the following:
 - a. Instrument Data Processing Development & Support:**
 - i. Develop Instrument data processing concepts.
 - ii. Develop hardware and software designs for the Instrument Data Processing Center.
 - iii. Perform Systems analysis of Instrument Data Processing Center to verify performance.
 - iv. Develop Instrument operations concepts.
 - v. Support instrument operations.
 - vi. Analyze flight anomalies and recommending implementing appropriate actions.
 - vii. Work with principal investigator and science working group in planning operations.
 - viii. Support “lessons learned” presentations post-launch.

b. Instrument Architecture & Design Development:

- i. Define systems and conduct trade-off studies/design studies for Instruments, space segments and ground segments.
- ii. Develop Instrument Architectures
- iii. Review subsystem development and test activities.
- iv. Generate and maintain and/or review system block diagrams.

c. Requirements Analysis, Identification and Management:

- i. Generate and manage and/or review Level 1 and 2 requirements.
- ii. Conduct requirements traceability.
- iii. Document specified and lower level derived requirements to demonstrate that performance requirements are met.
- iv. Review/perform independent design and development requirements analyses, and submit comments and recommendations.
- v. Review technical specifications, and submit comments and recommendations.
- vi. Provide specification of Requirements for Design, non-flight fabrication, and checkout of ground support equipment.
- vii. Review contamination control requirements.
- viii. Review operating plans and procedures for cryogenics, and other hazardous materials.

d. Validation and Verification:

- i. Generate and/or review Verification Plans.
- ii. Perform design, drawing, and specification reviews.
- iii. Provide comments and/or recommendations to ensure:
 - 1) That designs meet specification and interface requirements,
 - 2) That appropriate parts standards are compatible with specified mission requirements and risk levels,
 - 3) That detailed specifications are compatible with mission requirements, including margin and error budgets,
 - 4) That proper consideration is given to cost, reliability, safety, non-flight fabrication requirements, contamination control, magnetic materials/interference, launch requirements, and space environmental requirements
- iv. Document and/or review system qualification requirements.
- v. Prepare and/or review hardware and software integration plans and procedures, and witness execution.
- vi. Prepare and/or review detailed functional and environmental test plans and procedures, and witness test execution.
- vii. Ensure that the technical aspects of shipping requirements and equipment are met.
- viii. Prepare and/or review plans for launch site checkout, integration and testing of flight systems, including adequacy of the launch site facility.
- ix. Analyze data from spacecraft telemetry data sources to ensure total system compatibility.
- x. Analyze flight performance from flight data.

e. Interfaces and ICDs:

- i. Review and analyze design interfaces.
- ii. Identify interface control requirements for engineering and design of hardware for launch, on-orbit servicing, or retrieval of flight hardware.
- iii. Prepare, review, and analyze interface documentation for Instrument systems.
- iv. Prepare interface control documents and verify proper implementation for flight and ground Instrument subsystems and systems.
- v. Control external interface documentation and requirements.

f. Mission Environments:

- i. Define and/or review subsystem and hardware specifications to ensure that they meet the specific mission environment. Mission environment includes the following discipline areas:
 - Mechanical systems
 - Electrical systems
 - EMI/EMC
 - Grounding
 - Thermal
 - Radiation shielding
 - Parts engineering
 - Contamination
 - Reliability
 - Charging
 - Timing and time distribution
 - Data rates
 - Safety
 - Orbital debris assessment

g. Technical Resource Budget Tracking:

- i. Document and control and/or Review of budget plans, including power, thermal, data storage, computer processing and communication through-put , attitude control, timing, mass properties, etc., both at the flight system level and allocated to lower levels of assembly; this shall include error margins, where applicable.
- ii. Document command and telemetry signal margin plan, including bit error rates.

h. Risk Analysis, Reduction, and Management:

- i. Identify high risk elements and develop/execute contingency plans for controlling the high risk elements.
- ii. Review contractor risk management plans and comment on alternate approaches

i. System Milestone Review Candidates:

- i. Conduct and document internal design reviews
- ii. Support standards definition and review
- iii. Attend and conduct technical meetings/design reviews, and submit comments and recommendations
- iv. Prepare and present technical information for technical conferences, reviews, and briefings

j. Configuration Management and Documentation:

- i. Analyze configuration, design, and procedural changes submitted to change control boards

k. Systems Engineering Management Plan:

- i. Generate System Engineering Management Plans (SEMP)
- ii. Document/review system, subsystem and organizational processes terms of ISO compliance and CMMI assessments
- iii. Develop or review existing systems engineering tools for applicability as required
- iv. Review of Fabrication Plans

D. Optical Engineering Services

Develop advanced optical, opto-mechanical, opto-electronics and laser technology for components, subsystems, and systems for space-flight and GSE optical instrumentation to support new NASA missions and applications. Such technology might include novel materials for lightweight optical components, mounts, and support structures; state-of-the art diffractive optics and characterization; novel thin film design, fabrication, and characterization processes, new optical design concepts and analysis techniques; state-of-the-art optical fabrication and test methods, high precision optical polishing manufacturing and analysis methods, etc.

1.0 Optical Design and Development

Provide optical design and analysis services to perform concept trades; concept design; detailed design; opto-mechanical component design; knowledge of lightweighting techniques; thin film/coating design; baffle and associated stray light rejection design; conceptual and detailed optical mount design, opto-mechanical layout and packaging; fabrication and alignment sensitivity analysis and tolerancing, optical system error budgeting; and development of component specifications for engineering drawings. Requires experience with optical design and analysis software, which is compatible with Code V, ZEMAX, or equivalent. Provide optical research and development involving prototype laboratory optical hardware, new optical algorithms for use in software codes, and novel optical designs and analysis techniques. Provide optical consulting with instrument teams, science principal investigators, and project managers. Experience with the design, analysis, fabrication, alignment, and test of cryogenic infrared and vacuum ultraviolet optical instrumentation is recommended.

2.0 Optical Analysis

Provide optical, opto-mechanical, electro-optical and RF analysis support at the conceptual, preliminary, and detailed stages of components, subsystems, instruments and spacecraft. This support shall include the following topics: Active and adaptive optics; geometrical and physical optics; deformable optics; diffraction; Gaussian beam propagation and interferometric modeling (fourier optics) with experience in the use of the GLAD, ASAP, FRED, or equivalent software; stray light/energy analysis requiring experience with ASAP, TracePro, or FRED software and understanding of stray light fundamentals; component tolerancing and tolerancing sensitivity; radiometry (receivers, detectors and detector arrays); image quality (geometrical and diffraction); throughput; polarization; alignment and calibration; high precision optical metrology; and guided wave optics.

The contractor shall be capable of supporting all, including optical, analysis aspects of an interdisciplinary Structural-Thermal-Optical Performance (STOP) analysis task. This support includes conceiving physical transformations, implementing coordinate transformations, and developing the interface tools (macros, etc.) to accomplish this. The contractor shall support the subsystem, instrument and spacecraft analysis of system behavior and system error budgets and tolerances. The contractor shall also establish component tolerances based on allowable tolerance sensitivities, performance degradation, and error budgets. The contractor shall also provide cost estimates of proposed optical systems, including fabrication and testing.

3.0 Optical Component Fabrication and Test

The contractor shall provide optical component and related opto-mechanical hardware fabrication, assembly, and testing services in support of space flight and non-flight optical instrumentation and components. These services shall include the fabrication (includes cutting, grinding, polishing, tooling), assembly, and test of conventional and state-of-the-art non-typical precision optical components; cryogenic optical and opto-mechanical components; single point diamond turning fabrication; machining of non-optical glass components and hardware; in-process optical testing, characterization and integration including experience with metrology equipment; and opto-mechanical fabrication consulting to engineers, scientists, and project managers. These services may require the use of the GSFC Building 5 Opto-mechanical Fabrication facility. The contractor might be expected to use any of the following types of optical equipment: WYKO and ZYGO phase measuring interferometer, Davidson interferometer, use of precision optical flats and radius test plates, diamond band and rotary saws, diamond surface grinder, cylindrical grinder, spherical generator, precision milling machine, metal lathe, bench top and standing drill press, lapping spindles, loose abrasives, diamond turning machine, and high precision optical polishing instrumentation.

4.0 Optical Integration, Alignment, and Test

The contractor shall provide optical integration services necessary to install, align, and calibrate spacecraft or flight experiment instruments and components. These services may require integration operations in the GSFC Building 7/10/15/29 integration facilities, other NASA centers or contractor sites, and preflight operations at the launch site. The contractor shall provide optical alignment verification, testing, and calibration services on flight, engineering model, and ground system optical instruments, breadboards and components; perform active alignment of systems; and perform pre- and post-environmental test distortion effects measurements. These services may require the use of the GSFC Optical Test Facility and associated optical instrumentation and equipment which includes the Calibration, Integration and Alignment (CIA) facility, the Vertical and Horizontal Flow clean rooms, the Diffraction Grating Evaluation Facility in Building 5, and additional experimental test areas in Building 7 and Building 5; use of other NASA centers or contractor sites. The contractor might be expected to operate any of the following types of optical equipment: interferometers (i.e. ZYGO), angle generators, autocollimators, alignment telescopes, collimators and telescopes, optical levels, theodolites, optical plummets, clinometers, lasers, optical metrology systems (i.e. AIMS 11), photometers, detectors, radiometers, monochrometers, and spectrometers.

E. Detector Engineering Services

The Contractor shall provide design services that include performance of detailed (leading to a Critical Design Review) design of the subsystems, components and assemblies that comprise the instrument/spacecraft/platform. This effort includes hardware and software (flight and ground) as well as ground support equipment (electrical, thermal, contamination, mechanical, and cryogenic). Documentation, including technical reports, drawings, schematics, block diagrams, layouts, parts and materials list, and equipment lists, shall be provided. Specific tasks shall include:

1.0 Detector Specific Tasks – The Contractor shall provide engineering services for state-of-the-art detection systems requiring low noise levels and calibrations traceable to physical standards including the design, development, test, and analysis of the following systems:

- a. RF
- b. Submillimeter wave
- c. Microwave
- d. Millimeter wave
- e. Infrared
- f. Visible
- g. X-ray
- h. Gamma-ray
- i. Neutral and charged particle detection
- j. MEMS
- k. Nanotechnology

F. Flight Dynamics Engineering

The Contractor shall provide GN&C engineering support for all phases of project development, monitoring and reporting progress and conformance to appropriate practices and specifications. This shall include:

- 1.0 Flight Dynamics Engineering Specific Tasks** – The Contractor shall perform specific Flight Dynamics engineering tasks that include:
- a. Attitude Design, Analysis and Simulation
 - b. Trajectory Design, Analysis and Simulation
 - c. Attitude Control Design, Analysis and Simulation
 - d. Trajectory Control Design, Analysis and Simulation
 - e. Vehicle Guidance Analysis and Algorithm Design, Analysis and Simulation
 - f. Space and Launch Vehicle Dynamics Analysis and Simulation
 - g. Control/Structure Interaction Analysis and Simulation
 - h. Mission (Attitude and Trajectory) Planning and Design
 - i. Attitude and Trajectory Estimation Design, Analysis and Simulation
 - j. Aerodynamics Design, Analysis and Simulation
 - k. Space Vehicle Autonomous Control Design, Analysis and Simulation
 - l. Formation Flying/Constellation Flight Dynamics Design, Analysis and Simulation
 - m. Flight Dynamics Technology Development
 - n. Flight Dynamics Catalog/Database Maintenance

G. Power Systems Engineering

The Contractor shall provide design services that include performance of detailed (leading to a Critical Design Review) design of the subsystems, components and assemblies that comprise the instrument/spacecraft/platform. This effort includes hardware and software (flight and ground) as well as ground support equipment. Documentation, including technical reports, drawings, schematics, block diagrams, layouts, parts and materials list, and equipment lists, shall be provided. Specific tasks shall include:

- 1.0 Power Specific Tasks** – The Contractor shall provide power system design services, including, but not limited to, the design, development, and analysis:
- a. Power system design and analysis tools for energy balance and regulation
 - b. Spacecraft power management and distribution electronics
 - c. Photovoltaic energy conversion cells, arrays, and associated ground testing
 - d. Electrochemical energy storage cells, batteries, and associated destructive physical analysis and ground testing
 - e. Payload and instrument low and high voltage power conditioning electronics (converters, filters, regulators)
 - f. Battery subsystems for use in carrier systems and experiments on the STS and ISS

Consultation on and/or delivery of the following shall also be provided:

- f. A fully qualified spacecraft/instrument power system electronics unit.
- g. Non-flight engineering test unit (ETU) power system electronics
- h. Qualified flight solar arrays and batteries
- i. Spacecraft/instrument/mission level power system test procedures
- j. Personnel to perform power system testing at spacecraft, instrument and mission level testing.
- k. Power system support as required during the launch and on-orbit operations of the spacecraft.
- l. Support for task specified project design reviews
- m. Build-to-print battery systems-In some cases the Government may direct the contractor to fabricate a battery to a preexisting design. In these cases, the contractor shall determine the minimum modifications needed to the existing design to meet the required current mission requirements.

H. Propulsion Systems Engineering

The Contractor shall provide GN&C engineering support for all phases of project development, monitoring and reporting progress and conformance to appropriate practices and specifications. This shall include:

- 1.0 Propulsion Engineering Specific Tasks** – The Contractor shall perform specific spacecraft propulsion systems engineering tasks that include:
- a. Spacecraft Propulsion Subsystem Engineering
 - b. Advanced Propulsion Technology Development, including advanced chemical propulsion, electrical propulsion (EP), MEMS, micro-propulsion components; test equipment and instrumentation to support development & testing of sub-micro N thrusters
 - c. Fluid Systems Engineering including transient flow, vapor diffusion, fluid slosh and plume impingement analyses
 - d. Power & Electric Propulsion System Engineering, including low thrust trajectory design; EP system design & trades; EMI testing, analysis and mitigation
 - e. Nanocalorimetry
 - f. Propulsion Chemical Analyses
 - g. Propulsion GSE Design and Development
 - h. Propulsion System Engineering Support to IMDC and advanced mission studies
 - i. Propulsion System Engineering Support to Flight Project, including technical consultations and engineering support for design reviews, analyses, proposal development, and anomaly resolution. Data Acquisition Engineer, including software and hardware design, development and test.
 - j. Mechanical and Thermal Engineering Support specific to propulsion system design and analysis.

2.0 Propulsion System Technician Specific Tasks - The Contractor shall perform specific spacecraft propulsion system technician tasks that include:

- a. Mechanical Technician tasks for the fabrication, assembly, integration and test of propulsion subsystems, including subsystem manifold fabrication, precision cleaning, certified welding, integration of propulsion subsystem components, and clean room operation
- b. Electrical Technician tasks for the fabrication, assembly, integration and test of propulsion subsystems, including certified soldering, crimping, staking, harness fabrication, electrical component test and integration.
- c. Advanced Propulsion Technology Development Technician tasks, including conducting micro-Newton thrust stand tests; vacuum system assembly, maintenance and operation; chemical handling; fluid system assembly and operation.

I. Guidance, Navigation and Control Engineering

The Contractor shall provide design services that include performance of detailed (leading to a Critical Design Review) design of the subsystems, components and assemblies that comprise the instrument/spacecraft/platform. This effort includes hardware and software (flight and ground) as well as ground support equipment. Documentation, including technical reports, drawings, schematics, block diagrams, layouts, parts and materials list, and equipment lists, shall be provided. Specific tasks shall include:

1.0 GN&C Component & Hardware Specific Tasks – The Contractor shall perform specific GN&C component and hardware systems engineering tasks, including:

- a. Advanced GN&C Sensor /Actuator Design, Development, and Test
- b. GN&C Hardware Systems Design, Development, and Test (Flight & Ground)
- c. GN&C Component Ground Support Equipment (GSE) Development
- d. GN&C Hardware and Software Validation
- e. Hybrid Dynamic Simulator and Systems Design, Development, and Test
- f. GN&C Component Test Facility Design and Development
- g. Advanced GN&C Component and Hardware Systems Technology Development

The Contractor shall provide GN&C engineering support for all phases of project development, monitoring and reporting progress and conformance to appropriate practices and specifications. This shall include:

2.0 GN&C Systems Engineering Specific Tasks – The Contractor shall perform specific GN&C systems engineering tasks that include:

- a. Flight Project GN&C Subsystem Engineering, including requirements development; analysis; trade studies; ICD development; verification and validation; risk management; general coordination of all GN&C elements; maintenance of mass, power, and pointing budgets; operations planning
- b. GN&C Conceptual Design, Modeling and Simulation
- c. GN&C Science and Instrument Interface Engineering
- d. Spacecraft Reentry Systems Engineering
- e. Re-entry Debris Analysis, Modeling and Simulation
- f. Advanced GN&C Systems Technology Development, including the design, analysis, non-flight fabrication, assembly, and test of hardware and/or software
- g. Balloon, UAV and Sounding Rocket GN&C Engineering
- h. Formation Flying Test Bed (FFTB) Design and Development
- i. Technical Consultation and Support (Proposals, Peer, Design, and Anomaly Reviews)

J. Communications, Command and Data Handling Engineering

The contractor shall provide support for the development of the communications and data handling system during the implementation phase, taking into account the results of formulation phase studies.

Support shall include detailed design of circuit cards and enclosures; fabrication and test of circuit cards (including bench checkout equipment), engineering test boxes, and flight boxes; hardware/software integration of test and flight software; performance of both box and subsystem level tests including environmental qualification tests; integration of the C&DH system into the spacecraft; spacecraft level tests; field support in preparation for launch; and launch on-orbit operations.

C&DH testing shall at times require the generation of new test procedures or modification of existing test procedures. Much C&DH testing shall require the use of the STOL computer testing control language. All testing shall require documentation of the procedures used, all actions taken, and the test results.

The contractor shall provide support services including the following areas:

1.0 RF Analysis

The contractor shall refine the initial link analysis.

2.0 RF Ranging & Antenna Pointing

The contractor shall coordinate the analyses and designs for handling Doppler-ranging and antenna-pointing with ACS engineering for the particular mission to determine the most reliable and most cost-efficient design and method of onboard performance of these functions.

3.0 Antennas & Feedlines

The contractor shall ensure that RF architectures can maintain digital radio link margins and pointing requirements for the entire useful life of the spacecraft. The contractor shall provide antenna design for the L-Ka bands and phased arrays.

4.0 Command Receivers and Decoders

The contractor shall ensure that spacecraft RF receivers and demodulators are protected against desensitization from powerful terrestrial or space borne emitters. The contractor shall collaborate with the antenna designers to deliver a receiving system capable of receiving, decoding, and routing to their intended elements forward-linked commands, instructions, programs, ephemerides, and where applicable, time code, ranging information and time-syncs.

5.0 Time and Frequency Distribution

The contractor shall ensure that the C&DH subsystem reliably (as prescribed in the task and/or system/mission requirements) processes and provides all onboard users with the appropriate time code and/or clock signals for (a) synchronous operation over the full useful life of the spacecraft. The contractor shall define and document the anticipated levels of temperature- and radiation-induced frequency drift in the central onboard timing source(s) for purposes of imparting knowledge of time-tagged events with accuracy as specified in the task and/or system/mission requirements.

6.0 Telemetry Encoders

The contractor shall support the design and/or specification of a telemetry encoder and/or pre-modulation processor capable of collecting, digitizing, and time-multiplexing all onboard science and housekeeping data during all operational modes, including safe hold, as prescribed in the task and/or system/mission requirements.

7.0 Spacecraft Data Recorder

The contractor shall support the design and/or specification of a spacecraft data recorder capable of storing and playing back all onboard science and housekeeping data during all operational modes, including safe hold, as prescribed in the task and/or system/mission requirements.

8.0 Onboard Communications Processor

The contractor shall support the design and/or specification of a spacecraft communications data processor capable of storing and executing ground commands as prescribed in the task and/or system/mission requirements.

9.0 Transmitter/Transponder

The contractor shall support the design and/or specification of a spacecraft transmitter or transponder capable of transmitting telemetry data at data rates with link margins as specified in the task and/or system/mission requirements. Designs may range from S to Ka bands.

10.0 Millimeter Wave System Design

The contractor shall support/provide the design of millimeter wave systems instruments and components in the 50-300GHz range.

K. Software Engineering

The Contractor shall provide software design services, including the design, development, analysis, coding, and testing:

1.0. Real-time flight system control, monitoring and data processing, command and data handling, attitude determination and control, power subsystem control and monitoring, science data collection, processing, storage, and downlink, including:

- a. Command and control
- b. Data conditioning and communication
- c. Subsystem control and status
- d. Automated system protection
- e. In-flight scientific data processing and analysis
- f. Embedded software
- g. Guidance Navigation and Control design
- h. Sensors and Actuators hardware and software development
- i. Space vehicle formation control software

2.0 Flight system simulation and modeling software

3.0 Ground and flight system software

4.0 Science support software data systems and application software

5.0 Instrument software

6.0 Information management-based system and associated application software to accomplish:

- a. Problem reporting
- b. Resource and schedule tracking
- c. Configuration management (software and hardware)
- d. System/subsystem integration and qualification status lists

L. Electrical and Electronics Engineering

The Contractor shall provide design services that include performance of detailed (leading to a Critical Design Review) design of the subsystems, components and assemblies that comprise the instrument/spacecraft/platform. This effort includes hardware and software (flight and ground) as well as ground support equipment. Documentation, including technical reports, drawings, schematics, block diagrams, layouts, parts and materials list, and equipment lists, shall be provided. Specific tasks shall include:

1.0 Electrical/Electronics Specific Tasks – The Contractor shall provide electrical/electronic design services, including the design, development and analysis of the following:

- a. Flight electronic subsystems
- b. Command and data handling systems
- c. Flight and ground data systems
- d. Low noise electronics
- e. Digital and microprocessor based designs, including FPGA and ASIC devices
- f. Analog control circuits
- g. Control systems
- h. Low voltage systems
- i. High voltage systems
- j. Power supplies with programmable voltage and current outputs
- k. Electromagnetic field analysis
- l. Electromagnetic compatibility and interference (EMC/EMI)
- m. Test circuitry and equipment, including interface to computer-based systems
- n. Bench test equipment
- o. Electrical ground support equipment
- p. High speed electronics
- q. Communication electronics
- r. Microcontroller based systems and embedded systems
- s. Flight and test harnesses (conventional wire and fiber optic)
- t. Breakout boxes
- u. Pyrotechnics
- v. Simulators
- w. FPGA-based reconfigurable computing systems
- x. Analog and mixed-signal ASIC devices
- y. Lab View based systems

M. Launch and Post-Launch Operations Support and Engineering

The Contractor shall supply launch and post-launch mission systems level, systems level, software, and ground systems support services for ELV, NSTS, sounding rocket, balloon, and aircraft-based missions, including:

1.0 Launch Site Preparation Specific Tasks – The Contractor shall provide system services at the launch site, including:

- a. Supports to payload system and its support equipment
- b. Interfaces to the mission operations control centers
- c. Technical services to facilitate interfacing with the launch site organization
- d. Development of launch site support requirements
- e. Development of launch site plans and procedures

- f. Assistance in shipment of the flight hardware and associated support equipment to and from the launch site

2.0 Launch Operations Specific Tasks – The Contractor shall provide launch and post-launch operations services for ELV, NSTS, sounding rocket, balloon, and aircraft-based missions, including:

- a. Assuring flight readiness of the payload and observatory system
- b. Pre-launch testing of the payload and observatory system
- c. Operation of associated ground support equipment
- d. Services to the launch vehicle team for payload integration to the vehicle at the launch facility

3.0 Mission Operation Support Specific Tasks – The Contractor shall provide mission operation engineering services, including services for the payload and for carrier and flight support system during mission operations.

4.0 Landing and De-Integration Specific Tasks – The Contractor shall provide landing and de-integration services, including services at the landing site for payload de-integration, post-flight testing, and payload shipment. This shall include suborbital craft and payloads recovery.

5.0 Refurbishment of Recovered Systems Specific Tasks – The Contractor shall provide refurbishment services for recovered flight systems.

6.0 Data Reduction Specific Tasks – The Contractor shall provide data reduction services, including:

- a. Compiling and analyzing systems performance data during and after the mission
- b. Reviewing and contributing to the implementation of proposed science data processing systems to ensure timely flow of accurate science data sets
- c. Reviewing the design and implementation of information data systems to identify sources of science data for investigative purposes, including existing databases and newly acquired data requirements to be scheduled
- d. Analyzing the development of data transfer systems and data status accounting systems for multiple science data processing centers

7.0 Documentation Specific Tasks – The Contractor shall provide post-flight summary reports, analyzing the performance of the system during flight.

N. Mission Assurance Engineering

The contractor's ISO 9001 quality management system and risk management processes shall extend to all flight hardware/software and critical GSE fabricated/provided under this contract.

1.0 Hardware Manufacturing Support

a. Institutional Fabrication Support

The contractor shall provide assistance for institutional fabrication efforts, including but not limited to the following:

- Performance or coordination of dye penetrant inspections per MIL-STD-6866
- Performance or coordination of fastener screening
- Performance or coordination of mechanical inspections
- Preparation of inspection reports for Material Review Board (MRB) action
- Review of work order authorizations
- Preparation of abstracts of MRB inspection results for database
- Review of subcontractor task orders
- Review of MRB, deviation, waiver, and failure report databases
- Maintenance of nonconforming materials hold areas

The contractor shall provide reports on manufacturing support activities as required in the task order. The contractor shall comply with all NASA and GSFC processes and procedures (NPRs, GPGs, PGs, WIs).

b. Integration and Test Activities

The contractor shall participate in integration and test activities, including but not limited to the following:

- Perform inspections, including documenting and stamping results
- Witness compliance with various procedures including crimping, contamination control, clean room activities, handling equipment (e.g. slings, cranes, hydrasets), hazardous operations, electrostatic discharge (ESD) control
- Ensure approved test procedures are used
- Ensure equipment calibration is in compliance with requirements
- Ensure that test anomalies and nonconformances are documented and close out resulting problem records
- Provide Quality Engineering inputs to work order authorizations

The contractor shall provide reports on review results as required by the applicable task order. The contractor shall comply with all NASA and GSFC processes and procedures (GPGs, PGs, WIs) when supporting institutional I&T activities.

c. Electrostatic Discharge (ESD) Control

The contractor shall comply with the ESD requirements of ANSI/ESD S20.20, "Protection of Electrical and Electronic Parts, Assemblies and Equipment"

2.0 Hardware Review

a. Incoming Mechanical Test and Inspection

The contractor shall conduct incoming mechanical test and inspection of flight hardware in accordance with appropriate NASA, manufacturer, contractor, and/or military drawings and specifications. These tests of physical parameters determine the compliance with the procurement specifications and engineering drawings and may involve pass/fail tests or variables data measurements. The contractor shall provide summary reports and certifications documenting the results of these tests. The contractor shall ensure that parts and materials are not released to flight stores or for kitting without appropriate certification, qualification, screening, or other required approvals or testing.

b. Problem Reporting System

The contractor shall use the GSFC problem reporting system when on site at GSFC. The contractor shall enter and track PR/PFRs received, perform trend analyses, and provide summaries in accordance with applicable procedures. The contractor's off-site procedures shall be consistent with the on-site processes.

c. Hardware Evaluations and Audits

The contractor shall support the audit of NASA and NASA contractor produced flight products, including but not limited to in-process and end-item inspections, for compliance with agency and project requirements.

3.0 Documentation Review

a. Review of Deliverables

The contractor shall review or coordinate deliverables for compliance with the applicable product assurance requirements and assurance implementation plan, including but not limited to the following:

- Waivers and deviations
- Materials and processes lists
- Limited life items lists
- Verification specifications, plans, procedures, and reports
- Hazard analyses
- Safety data packages
- Reliability analyses
- Worst case analyses
- Failure Modes, Effects, and Criticality Analyses (FMECAs)

- Risk management plans/approaches
- Application stress analyses
- Processes/procedures
- Fabrication flow charts
- Certification logs/Work Order Authorizations
- Mandatory Inspection Points (MIP)
- Nonconformance reports/Problem Reports/Problem Failure Reports
- Trend Analyses
- Risk Analyses
- Acceptance data packages

The contractor shall provide reports on review result, including conclusions regarding the adequacy of the deliverable to ensure compliance with applicable performance assurance requirements.

b. Electronics Packaging and Processes Document Reviews

The contractor shall review documentation associated with manufacture of hybrid circuits, printed circuit boards, printed wiring assemblies, and spacecraft assemblies for compliance to NASA workmanship and project requirements. The contractor shall prepare reports that identify differences between contractor documentation and NASA requirements and that recommend required changes.

c. Review of Flight Hardware Procurements

The contractor shall review procurement requests for flight hardware for inclusion of the applicable assurance provisions and provide written findings and recommendations.

4.0 Off-Site (Third-Party) Product Assurance Support

a. Manufacturing

The contractor shall review manufacturing flow plans for adequacy and review operational check points and report written results.

b. Test and Inspection

The contractor shall ensure specification compliance where verification is to be accomplished with program requirements, including disposition of CCB, MRB, and FRB actions. When appropriate or required, the contractor shall inspect hardware for conformance to PAR requirements.

c. Test Equipment Repair and Calibration

Off-site metrology and test equipment shall be repaired, calibrated and certified and in compliance with ISO/IEC 17025. On-site metrology and test equipment shall be repaired, calibrated and certified per GPG 8730.1.

O. System Safety Engineering

For all levels of flight hardware and software provided by the Contractor and specified by this Statement of Work, the Contractor shall establish and maintain a mission assurance program commensurate with mission requirements as specified by the task. The mission assurance program shall incorporate a system safety program which meets the requirements of NSTS 1700.7B, "Safety Policy and Requirements for Payloads Using the Space Transportation System" and 2.45 SPW S-100/KHB 1700.7B, "Space Shuttle Payload Ground Safety Handbook" for shuttle missions. For ELV missions at ETR or WTR, the system safety program shall meet the requirements of EWR 127-1, "Eastern and Western Range Safety Requirements."

The contractor shall establish and maintain practices, procedures, and processes that are ISO 9001 compliant.

1.0 Safety Specific Tasks – The Contractor shall provide safety services which conform to the system safety/mission assurance program, including:

- a. Establishing and documenting a systems safety plan in concert with the appropriate launch vehicle and NASA safety policy
- b. Conducting and assessing system safety analyses for flight designs and launch/retrieval operations to satisfy NASA safety and reliability requirements
- c. Analyzing design changes related to minimizing hazard levels
- d. Participating in system safety reviews
- e. Reviewing the proposed systems design to ensure that proper considerations are given to safety-critical areas, and that safety problems exposed in prior analyses, testing, and operational use of instruments and subsystems are corrected
- f. Conducting project test/validation programs for flight and critical ground systems software
- g. Preparing the Safety Data Package, including writing and editing
- h. Performing hazards analysis of flight system, shuttle interface equipment, and ground support equipment
- i. Participating in required inspection/testing to fulfill safety data requirements
- j. Coordinating with the GSFC safety officer and participating in formal safety reviews
- k. Preparing final safety data packages

P. Radiation Engineering

The Contractor shall provide design services that include performance of detailed (leading to a Critical Design Review) design of the subsystems, components and assemblies that comprise the instrument/spacecraft/platform. This effort includes hardware and software (flight and ground) as well as ground support equipment (electrical, thermal, contamination, mechanical, and cryogenic). Documentation, including technical reports, drawings, schematics, block diagrams, layouts, parts and materials list, and equipment lists, shall be provided. Specific tasks shall include:

1.0 Radiation Effects and Analysis Specific Tasks – The Contractor shall provide radiation services for the design, development, testing, and analysis of EEE components, including:

- a. Space environmental and flight analysis and specification including nuclear interaction simulations
- b. Design and development of test plans and test suite hardware and software to support research and flight project efforts
- c. Documentation of radiation test techniques and research results
- d. Determination of mission-specific system level impact of radiation test results and evaluate mission radiation risk assessment
- e. Screening of parts list for radiation vulnerable devices
- f. Dissemination of radiation effects research results via paper and presentations
- g. Curator capabilities for maintenance and upgrade of the Radiation and Analysis (REA) WEB site
- h. Database development and management of the REA radiation effects test data
- i. General REA services in the area of graphics, schedules, and reporting requirements
- j. Development of user interface software for REA-developed environment models
- k. Instrument calibration
- l. Operation and maintenance of GSFC's radiation facility
- m. Design and fabrication of radiation flight experiments and providing services to support data analysis
- n. Analysis of in-flight data on experimental and operational systems to determine system performance in radiation environment
- o. Analysis of instrument data to support space environment modeling

Q. Cryogenics and Fluids Engineering

Provide design, analysis, and design/analysis consultation on cryogenic hardware systems. Account for the effects of thermal transients and operations at cryogenic temperatures. These effects include thermal contraction; changes in material properties (mechanical, thermal, electrical, magnetic) as a function of temperature; and gaseous, liquid, and solid phase changes. Determine acceptable rates for cool-down and warm-up of the hardware as well as acceptable number of thermal cycles. For stored cryogen systems examine materials compatibility, normal and emergency venting scenarios, and effects of vacuum and pressure requirements during all phases of ground and on-orbit operations. Designs or consultation services are to be documented via drawings, models, technical memorandum or reports as appropriate.

Some electromechanical devices will be required to operate at cryogenic temperatures. The contractor shall be cognizant of mechanical, structural, thermal, electrical, and magnetic changes that occur in motors, actuators, sensors, and other electromechanical devices when cooled to cryogenic temperatures. The contractor shall also be cognizant of the effect of cryogenic temperatures on lubricants and coatings and the deleterious impact of contaminants that might freeze out when cold. The contractor shall have expertise in cryogenic flight bearing tribology and shall provide design, analysis, selection, implementation, and testing services for the selection of bearings and their lubricants.

R. Ground System Engineering

The Contractor shall provide data systems management services, including:

- a. Ensuring that all software (ground and/or flight) packages and associated interfaces are being properly managed and problems adequately identified and resolved.
- b. Developing, reviewing, and analyzing software requirements and specifications
- c. Analyzing software designs and design interfaces and making recommendations for solutions in specific problem areas.
- d. Reviewing, analyzing, evaluating, and preparing data systems documentation such as feasibility studies, automatic data processing (ADP) plans, design, design interfaces, procedure handbooks, and other documentation materials.
- e. Defining systems for end-to-end data processing
- f. Developing schedules for the data processing system in the areas of milestone development, network planning, milestone real-time tracking, and schedule impact analysis
- g. Contributing to the design, development, validation, implementation, certification, and maintenance of ground or on-board computer system simulators/emulators, including validation of flight systems software for ascent, transfer, or on-orbit phases and near real-time reprogramming and validation of modifications for recovery from anomalous situations
- h. Analyzing the design and implementation of simulators/emulators for ground crew training, systems testing and procedure validation

- i. Providing support for mechanical and electrical interface tests with the spacecraft in various stages of development, including end-to-end tests from the operations control centers through data links to the spacecraft
- j. Providing support during launch and on-orbit operations as necessary.

S. Parts and Materials Engineering

1.0 Government Furnished Parts and Equipment

The contractor shall keep a record of all Government furnished parts and equipment (GFE). Flight piece parts and equipment shall be kept in bonded storage.

All GFE parts and equipment that are intended for flight shall have any associated documentation that is furnished by the Government evaluated by the contractor for suitability for use under the applicable task quality assurance requirements; any discrepancies shall be noted and identified to the Government.

All GFE parts and equipment that are intended for flight shall be evaluated by the contractor for suitability for flight with hardware discrepancies noted and identified to the Government. The contractor shall provide for selection and kitting of government furnished parts to be utilized in the performance of task orders.

2.0 Contractor Purchased Parts

Contractor purchased, flight EEE parts shall conform to the parts program set forth in the applicable GSFC Performance Assurance Requirement.

T. ISS and STS Mission Engineering Management

The Contractor shall provide support in the development and maintenance of payload requirements and in the implementation of these requirements by the STS and ISS Programs. Support shall be provided in all phases of mission planning, including payload requirement definition, payload requirement implementation and flight execution. The contractor shall provide analytical support to ensure that the system level requirements are verified and met.

The Contractor shall provide technical support during regular payload team meetings, teleconferences, Integration and Test meetings, and quarterly reviews throughout the pre-flight support period. The Contractor shall provide operations engineering support during the flight operations reviews, including the cargo integration review, flight operations review, payload operations working group, and the pre-ship review. Additionally, the contractor will provide operational support during payload safety analysis.

Mission management support staff shall have systems engineering responsibilities. These include technical review, update, and writing of STS and ISS payload interface and integration documentation related to payload systems analysis, design, environmental testing, ground, launch, and in-flight operations, and safety and operation of thermal, mechanical, and electromechanical systems. Meetings related to the discussion, organization, and implementation of these requirements shall be attended.

Additionally, the contractor shall coordinate and provide inputs to payload design drawings, and coordinate the development of the spacecraft and carrier interface control and interface requirements documents. These documents are detailed descriptions of the hardware, software, fabrication, assembly, and integration activities to be performed by each of the participating sponsoring or experiment organizations.

Contractor shall participate in compatibility studies prior to the integration of multiple experiments into specific flights. This work shall entail the review and analysis of various operational requirements and system configurations and a recommendation towards payload designs or requirements that will enhance mission operations success.

U. Configuration Management Services

The Contractor shall provide overall management and oversight of the Configuration Management (CM), Documentation Management (DM), and Quality Control Management (QCM) disciplines throughout the life cycle of flight hardware and software provided within the scope of this Statement of Work. Each discipline shall require the development, establishment, and implementation of procedures and processes and establishment of mechanisms and tools for consistency.

The Contractor shall support the planning, identification of processes, and leading GSFC Project efforts in these disciplines. This support shall also include the necessary planning and associated process development to assist the GSFC Project in meeting conformance requirements to NASA procedures and guidelines as well as the ISO standards

The main CM/DM/QCM functions shall include:

- Configuration identification, configuration control, configuration accounting and reporting
- configuration verification and configuration auditing
- implementation and maintenance of a DM system

The Contractor shall be responsible for providing the necessary tools and databases to accomplish the above functions; developing and establishing procedures and guidelines and

training in the configuration management, documentation management, and ISO 9001 disciplines.

V. Hardware Refurbishment and Re-Use

The contractor shall provide support for refurbishment of previously flown flight hardware, in both the mechanical and electrical areas. Redesign and upgrades to the flight hardware shall be provided as required. Mechanical support shall consist of determination and tracking of maximum usable life, structural recertification as required by the particular project, inspection for defects that would prevent re-flight, and testing of mechanisms. Electrical support shall consist of reprogramming as required and functional testing at the box or subsystem level.

1.0 Mechanical

Much of the STS mechanical flight hardware is used for multiple missions. After each flight the hardware must undergo a post-flight inspection. Depending on the hardware and procedural requirements, this inspection may just be a visual inspection or it may involve non-destructive evaluation (NDE) methods or it may involve torque stripe inspection and torque verification. The contractor shall be required to perform hardware inspections, generating proper documentation and within schedule constraints, so that the hardware may be used in subsequent missions.

2.0 Electrical

Much STS electrical flight hardware is also used on multiple missions. After each flight, reusable electrical hardware must undergo a post-flight inspection, usually visual. The hardware is also subjected to functional testing using ground support equipment and bench checkout equipment. The contractor shall support such inspections and testing and shall follow approved test and checkout procedures. At times the contractor shall be required to modify or create new functional test procedures; the Government prior to use must approve all such procedures.

W. Training

The contractor shall provide training support of astronauts, the payload team (including the payload customer and staff), and the mission ground support team for space flight mission operations. Areas of training include flight documentation, mission re-planning and execution, flight rules, flight plan, payload operations control center operations, spacecraft to ground telecommunications, spacecraft attitude, and operational constraints. In that mission simulations contribute to training of mission support staff, the contractor shall be responsible for planning and coordinating intra- and intercenter mission simulations prior to launch of the spacecraft and payload.

X. CAD/CAE Facility Support Services

Provide operational and technical support for the Code 540 CAD/CAE facilities and systems as needed. The key software tools in use are: NASTRAN, SDRC I-DEAS and PTC's Pro-Engineer running on a mixed network of Unix and latest Windows operating systems. The contractor shall also provide any needed training for any CAD/CAE software tools employed by the Mechanical Systems Division.

Y. Hardware Storage

The contractor shall provide a temperature/humidity controlled area maintained between 60 degrees F and 80 degrees F with relative humidity maintained between 30% and 50%, and of at least 8,000 square feet where Government and contractor property including flight mechanical structures shall be stored. This facility shall be within the Washington Metropolitan area.

The contractor shall provide a temperature/humidity controlled area, with the same limits as the above property storage area, as a bonded storage facility of at least 700 square feet where flight electronics equipment and parts are stored. The contractor shall organize this area by tasks. Contractor task leaders shall have full authority and ability to remove/pull items associated with the corresponding task. Emergency procedures shall exist to allow access to bonded storage after normal working hours and on weekends.

FUNCTION 4 – RESEARCH AND TECHNOLOGY SERVICES

The contractor shall be able to perform the following list of research and technology development (R&TD) support services to support new NASA missions and applications, with emphasis on the services that have full descriptions below. R&TD support services under this contract shall include but not be limited to:

- Miniaturization and Micro-Electromechanical (MEMS) Devices
- Inflatable Structures
- Materials Development
- Magnetic Bearings
- Advanced Electro-mechanical Systems
- Light-weight precision deployable structures
- Robotics

A. Advanced Thermal Control Systems

Develop advanced thermal control technologies to support new NASA missions and applications. This might include capillary pumped loops, variable emittance thermal control surfaces, loop heat pipes, cryogenic heat pipes, heat pumps, alternative materials, and other such technologies. Support the development of thermal flight experiments.

B. Optics and Opto-Mechanical Systems

Develop advanced optical and opto-mechanical technology for components, subsystems, and systems for space-flight and GSE optical instrumentation to support new NASA missions and applications. Such technology might include novel materials for lightweight optical components, mounts, and support structures; state-of-the art diffractive optics and characterization; novel thin film design, fabrication, and characterization processes, new optical design concepts and analysis techniques; state-of-the-art optical fabrication and test methods, etc.

C. Cryogenic and Fluid Systems

Develop advanced cryogenic and fluid systems to support new NASA missions and applications. Such systems might include structural and thermal interfaces to mechanical refrigerators, components for an advanced adiabatic demagnetization refrigerator, and cryogenic actuators.

D. Advanced Coatings and Film Technology

Develop, procure and calibrate, and test new technology to apply, test, and maintain new or existing coatings and films. Provide offsite support for the use of these techniques. Write and present papers documenting the development and application of this new technology.

FUNCTION 5 – SUPPORT SERVICES

The Contractor shall provide support services covering all items within the scope of this SOW, as specified in task assignments. All work shall be performed in accordance with the latest versions of the applicable documents, specifications and standards under this SOW, and as further specified on individual task orders.

A. Documentation Services

The Contractor shall provide documentation services for all levels of hardware and software within the scope of this Statement of Work, as specified in task assignments. Documents shall conform to applicable documents and specifications. These shall include, but are not limited to, pertinent NHBs, SMAP, and/or Program/Project specific performance assurance guidelines, quality standards, GSFC standards, documents of other NASA Centers, Federal standards, military standards, and commercial standards.

The Contractor shall provide documentation services, including instrument conceptual designs, program plans, systems analyses, illustrations, technical and implementation plans, test plans, test procedures, test scripts, software documentation, and the full range of system hardware and software documentation. These shall also include up-to-date drawings, specifications, certifications, reports, interface control documents, and agreements.

1.0 Document Services Specific Tasks – The Contractor shall provide electronic media and document services, including:

- a. Technical writing
- b. Editing
- c. Drafting
- d. CAD/CAM
- e. Photographic
- f. Video
- g. Reproduction
- h. CD, DVD
- i. Posters and Displays

2.0 Photo and Video Specific Tasks – The Contractor shall use photos and video for maintenance, engineering, or as documentation to explain a problem. They shall become supplemental to assist in unit repair or future development and maintenance. A scale shall be included to indicate relative dimensions in photographs and/or video, where appropriate.

B. Computer Technology Support Services

The Contractor shall provide computer technology services, including:

1.0 Computer Support Specific Tasks – The Contractor shall provide computer technology services, including:

- a. Engineering support to analyze data acquisition, processing, distribution, archival/storage, and measurement problems
- b. Data reduction to include statistical and thematic trends analyses
- c. Diagnostics assistance for instrument checkout between test consoles and test components
- d. Program services to utilize test instruments in aerospace system test and analysis, including GPIB type operation and GUI based software system
- e. General in-house computer software maintenance to include, but not be limited to, updating and debugging programs
- f. Design, coding, integration, test, documentation, and maintenance of special applications programs
- g. Updating of existing technical in-house computer databases
- h. Transfer of programs from one system to another and testing for functional operations and real time data transfer between dissimilar systems
- i. Debugging of general utility programs, such as graphic packages
- j. Assistance in analyzing and implementing solutions to computer hardware interface problems
- k. Assistance in network and operating system configurations, troubleshooting, installation, and maintenance
- l. Design and debug of test procedures

2.0. IT Systems Security and System Administrator Function

The contractor shall provide Windows, Macintosh, Linux, UNIX, Web, LAN systems administration services to desktops, workstations and servers, including:

- a. Logging, reporting, diagnosing and correcting system faults
- b. Configuring systems for performance, security and network compatibility
- c. Performing updates of the operating system and associated software for desktops and workstations
- d. Assisting in the preparation and updating of IT security and system administration documentation
- e. Working with the Code 297, CNE, and SET on implementing IT security initiatives
- f. Assisting users with software/hardware installation
- g. Performing Help Desk functions including problem diagnosis and answering user questions regarding applications
- h. Monitoring system and network security and availability
- i. Repairing workstations, desktops and printers on an emergency basis

j. Data backup, archive, and retrieval

In addition to any other requirements of this contract, all individuals who perform tasks as a system administrator or have authority to perform tasks normally performed by system administrator shall be required to demonstrate knowledge appropriate to those tasks. This demonstration, referred to as the NASA System Administrator Security Certification, is a NASA funded two-tier assessment to verify that system administrators are able to –

1. Demonstrate knowledge in system administration for the operating systems for which they have responsibility.
2. Demonstrate knowledge in the understanding and application of Network and Internet Security.

Certification is granted upon achieving a score above the certification level on both an Operating System test and the Network and Internet Security Test. The Certification earned under this process will be valid for three years. The criteria for this skills assessment has been established by the NASA Chief Information Officer. The objectives and procedures for this certification can be obtained by contacting the IT Security Awareness and Training Center at (216) 433-2063.

A system administrator is one who provides IT services, network services, files storage, web services, etc. to someone else other than themselves and takes or assumes the responsibility for the security and administrative controls of that service or machine. A lead system administrator has responsibility for information technology security (ITS) for multiple computers or network devices represented within a system; ensuring all devices assigned to them are kept in a secure configuration (patched/mitigated); and ensuring that all other system administrators under their lead understand and perform ITS duties. An individual that has full access or arbitrate rights on a system or machine that is only servicing themselves does not constitute a "system administrator" since they are only providing or accepting responsibility for their system. An individual that is only servicing themselves is not required to obtain a System Administrator Certification.

3.0 Web Page Development and Maintenance Function – The contractor shall provide web development services to help promote organizational capabilities, including:

- a. Development, maintenance, and upgrade of web sites
- b. Management of mission test facilities that require significant computer capabilities
- c. Compliance to Agency and Center policy (GSFC Webmaster) such as 508 compliance and Post 9-11 accessibility compatibility
- d. Defining with customer the look and feel of the web site, and reviewing web site requirements
- e. Developing prototype web sites for maturing web based concepts
- f. Providing maintenance services to keep web site up to date and compliant

C. Maintenance Services

The Contractor shall provide maintenance support to ensure long term reliability through an integrated and efficient approach, including:

1.0. Preventive Maintenance

The Contractor shall perform preventative maintenance on hardware and software within the scope of this Statement of Work as specified in task assignments.

2.0 Emergency Repair Services

The Contractor shall provide expeditious emergency repair services for hardware and software within the scope of this Statement of Work, as specified in task assignments. The Contractor shall respond to the Government within four hours of notification to determine and implement a mutually agreeable course of action. In some cases, there shall be 24-hour coverage during flight hardware and software evaluation, verification, and test. This service shall comprise of repair, modification, or replacement of components, codes, subassemblies, and assemblies. Documentation updates shall be required as a result of any change.

D. Sustaining Engineering Services

The Contractor shall provide sustaining engineering services for hardware and software within the scope of this Statement of Work, including:

1. Modifications of hardware/firmware and software, including installation of elements for improved reliability and/or performance
2. Modifications of wiring to improve circuit performance
3. Non-flight fabrication, assembly, wiring, and testing of printed circuit assemblies where necessary to update old circuitry or improve reliability
4. Engineering, non-flight fabrication, testing of assemblies or sub-assemblies to replace outdated circuitry to eliminate component or circuit failures
5. Engineering, non-flight fabrication, assembly, and testing of engineering circuits to correct problems encountered
6. Modifications of mechanical assemblies, structures, and mechanisms to correct or improve the design
7. Update of drawings, manuals, and technical data to reflect current status at the time of modifications
8. Firmware and software modifications in response to approved changes, including problem fixes.

E. Education Services

The Contractor shall provide education services, including:

1. Supporting the GSFC engineering education and development programs
2. Supporting educational outreach programs with universities and NASA headquarters
3. Supporting GSFC division or branch-level educational programs and training

F. Standards and Process

The Contractor shall provide support for engineering standards work and engineering process work, including:

1. International Standard Organization (ISO) documentation and process generation
2. Engineering standards documentation and review
3. Engineering process documentation
4. Activities in support of engineering process improvement

IV. APPLICABLE DOCUMENTS AND SPECIFICATIONS

The contractor shall adhere to all applicable portions of the following documents and/or specifications in the performance of this contract. Documents and specifications include, but are not limited to, those shown below. Additional applicable documents shall be specified on a task order basis. The latest updated version shall apply:

General:

NPR 7120.5B, "NASA Program and Project Management Processes and Requirements"
GPR 8070.4, "Administration and Application of the Goddard Rules for the Design, Development, Verification and Operation of Flight Systems"
GSFC-STD-1000, "Rules for the Design, Development, Verification, and Operation of Flight Systems."

Launch Vehicles:

EWB 127-1, "Eastern and Western Range Safety Requirements"
NSTS 1700.7B, "Safety Policy and Requirements for Payloads Using the Space Transportation System"
2.45 SPW S-100/KHB 1700.7B, "Space Shuttle Payload Ground Safety Handbook"

Conformal Coating and Staking:

NASA-STD-8739.1, "Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies"

Soldering – Flight, Surface Mount Technology:

NASA-STD-8739.2, "Surface Mount Technology"

Soldering – Flight, Manual (hand):

NASA-STD-8739.3, "Soldered Electrical Connections"

Soldering – Ground Systems:

Association Connecting Electronics Industries (IPC)/Electronics Industry Alliance (EIA)
J-STD-001C, "Requirements for Soldered Electrical and Electronic Assemblies"

Electronic Assemblies – Ground Systems:

IPC-A-610, "Acceptability of Electronic Assemblies"

Crimping, Wiring, and Harnessing:

NASA-STD-8739.4, "Crimping, Interconnecting Cables, Harnesses, and Wiring"

Fiber Optics:

NASA-STD-8739.5, "Fiber Optic Terminations, Cable Assemblies, and Installation"

Electro-Static Discharge (ESD) Control:

ANSI/ESD S20.20, "Protection of Electrical and Electronic Parts, Assemblies and Equipment" (excluding electrically initiated explosive devices)

Printed Wiring Board (PWB) Design:

500-PG-8700.2.2, Electronics Design and Development Guidelines
 500-PG-8700.2.4, Mechanical Design and Development Guidelines,
 GSFC X-673-64-1F, "Engineering Drawing Standards Manual" (December 1994)
 IPC-2221, "Generic Standard on Printed Board Design"
 IPC-2222, "Sectional Design Standard for Rigid Organic Printed Boards"
 IPC-2223, "Sectional Design Standard for Flexible Printed Boards"
 IPC D-275 "Design Standard for Rigid Printed Boards and Rigid Printed Board Assemblies"

PWB Manufacture:

GSFC 311-INST-002, "Instructions for EEE Parts Selection, Screening, and Qualification"
 IPC A-600, "Acceptability of Printed Boards"
 IPC-6011, "Generic Performance Specification for Printed Boards"
 IPC-6012, "Qualification and Performance Specification for Rigid Printed Boards"
 Flight Applications – Supplemented with: GSFC/S312-P-003, Procurement Specification For Rigid Printed Boards for Space Applications and Other High Reliability Uses
 IPC-6013 "Qualification and Performance Specification for Flexible Printed Boards"
 IPC-6018 "Microwave End Product Board Inspection and Test"

IT System Administration

NASA PIC 04-03, "04-03 Procurement Information Circular"

Mechanical Design

GSFC Fastener Integrity Requirements
http://msc-docsrv.gsfc.nasa.gov/GDMS_docs/Pgwi500/541-PG-8072.1.2-.pdf

Testing

GEVS-SE, for STS and ELV Payloads, Subsystems and Components

V. REFERENCE DOCUMENTS AND SPECIFICATIONS

The following documents and/or specifications are provided as reference material for the performance of this contract. The latest updated version shall apply:

SP-6105, NASA Systems Engineering Handbook, June 1995

VI. ACRONYM LIST

ACS	Attitude Control System
ADP	Automatic Data Processing
AETD	Applied Engineering and Technology Directorate
AIMS	Aerial Image Measuring Systems
ANSI	American National Standards Institute
ASAP	Advanced Sensor Analysis Program
ASIC	Application-Specific Integration Circuit
ASTM	American Society for Testing Materials
ATR	Approved Technical Representative
BSDF	Bidirectional Scattering Distribution Function
CAD	Computer Aided Design
CAE	Computer Aided Engineering
CAM	Computer Aided Manufacturing
CCB	Change Control Board
CD	Compact Disk
C&DH	Communication and Data Handling
CIA	Calibration, Integration and Alignment
CM	Configuration Management
CMMI	Capability Maturity Model® Integration
CNE	Center Network Environment
CODE V	Optical Design Software by Optical Research Associates (ORA)
COTR	Contracting Officer's Technical Representative
CPL	Capillary Pumped Loop
CVCM	Collected Volatile Condensable Materials
DM	Documentation Management
DVD	Digital Video Disk
EED	Electrical Engineering Division
EEE	Electronic, Electrical, and Electromechanical
ELV	Expendable Launch Vehicle
EMI	Electromagnetic Interference
EMC	Electromagnetic Compatibility
EP	Electrical Propulsion
ESD	Electro-Static Discharge
ETR	Eastern Test Range
ETU	Engineering Test Unit
EVA	Extra-Vehicular Activities
EWR	Eastern/Western Range
F	Fahrenheit
FEM	Finite Element Model
FEMAP	Finite Element Modeling and Post-processing
FFTB	Formation Flying Test Bed

FMEA	Failure Modes and Effects Analysis
FMECA	Failure Modes, Effects, and Criticality Analysis
FPGA	Field Programmable Gate Array
FRB	Failure Review Board
FRED	Optical Software Engineering Package by Photon Engineering
FTA	Fault Tree Analysis
GEVS-SE	General Environmental Verification Specification For STS & ELV Payloads, Subsystems, and Components
GFE	Government Furnished Equipment
GIDEP	Government Interagency Data Exchange Program
GLAD	Physical Optics and Laser Analysis Software by Applied Optics Research
GN&C	Guidance Navigation and Control
GPG	Goddard Procedures and Guidelines
GPIB	General-Purpose Interface Bus
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
GUI	Graphical User Interface
ICD	Interface Control Drawing/Document
IDEAS	Software by EDS (formerly by Structural Dynamics Research Corporation)
IEC	International Electrotechnical Commission
IEST	Institute of Environmental Sciences and Technology
IMDC	Integrated Mission Design Center
ISO	International Standard Organization
ISS	International Space Station
ISTD	Instrument Systems and Technology Division
IT	Information Technology
I&T	Integration and Test
ITS	Information Technology Security
LAN	Local Area Network
LHP	Loop Heat Pipes
LIGA	German Acronym for Lithography, Plating and Molding
MEMS	Micro Electromechanical
MESA	Mission Engineering and Systems Analysis Division
MIL	Military
MIMO	Multiple Input/Multiple Output
MIP	Mandatory Inspection Point
MOLEKIT	Molecular Kinetics
MRB	Material Review Board
MSD	Mechanical Systems Division
MSES	Mechanical Systems Engineering Services
N	Newton
NASA	National Aeronautics and Space Administration
NASTRAN	NASA Structural Analysis Program

NDE	Nondestructive Evaluation
NDI	Non-destructive Inspection
NHB	NASA Handbook
NPR	NASA Procedures and Requirements
NSTS	National Space Transportation System
OMS	Orbiter Maneuvering System
ORU	Orbital Replacement Unit
PAR	Product Assurance Requirement
PCB	Printed Circuit Board
PFR	Problem Failure Reporting
PG	Procedures and Guidelines
PIC	Procurement Information Circular
PR	Problem Reporting
PRA	Probability Risk Assessment
PWB	Printed Wiring Board
QCM	Quality Control Management
REA	Radiation Effects Analysis
RF	Radio Frequency
RMS	STS Remote Manipulator System
R&TD	Research and Technology Development
SEMP	System Engineering Management Plans
SINDA	Systems Improved Numerical Differencing Analyzer
SISO	Single Input/Single Output
SMAP	Software Mission Assurance Plan
SSPTA	Simplified Space Payload Thermal Analyzer
STD	Standard
STOL	Spacecraft Testing and Operations Language
STOP	Structural-Thermal-Optical Performance
STS	Space Transportation System
TCON	TCON™ is a thermal modeling tool developed by Frederick A. Costello, Inc.
TMG	Thermal Model Generator
TML	Total Mass Loss
TOMS	Task Order Management System
TRASYS	Thermal Radiation Analyzer System
TSS	Thermal Synthesizer Systems
UAV	Unmanned Aerial Vehicle
UNIX	Operating System Software
UV	Ultra Violet
WI	Work Instruction
WTR	Western Test Range
WVR	Water Vapor Regained
ZEMAX	Optical Design Software Program by ZEMAX Development Corporation
ZYGO	Brand name of optical metrology equipment by Zygo Corporation



NNG07CA21C

ATTACHMENT B

Attachment B1: Prime Direct Labor Rate Matrix

Attachment B2: Prime Indirect Cost Rate Matrix

Attachment B3: Prime Award Fee Rate Matrix

Attachment B4: Subcontractor Loaded Labor Rate Matrix – Northrop Grumman (NG)

Attachment B4: Subcontractor Loaded Labor Rate Matrix – Ball Aerospace & Technologies (BATC)

Attachment B4: Subcontractor T&M Rate Matrix – Sigma Space (Sigma)

Attachment B4: Subcontractor T&M Rate Matrix – Edge Space Systems (ESS)

Attachment B5: Position Descriptions



BI. PRIME (SGT) DIRECT LABOR RATE MATRIX (FOR ALL TASK ORDERS):

The Contractor shall not exceed the rates as specified below for pricing all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum amount and maximum amount as provided in Clause B.2.

On-Site

** Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Program Manager						
Chief Engineer						
Sr. Project Staff Engineer						
Sr. Structural Dynamics Engr.						
Structural Dynamics Engineer						
Sr. Stress Analysis Engineer						
Stress Analysis Engineer						
Jr. Mechanical Engineer						
Sr. Thermal Engineer						
Thermal Engineer						
Jr. Thermal Engineer						
Contamination Engineer						
Jr. Contamination Engineer						
Thermal Coatings Engineer						
Thermal Development Engr.						
Senior Systems Analyst						
Sr. Systems Safety Engineer						
Sr. Mechanical Systems Engr.						
Mechanical Systems Engineer						
Sr. Mechanical Designer						
Mechanical Designer						
Jr. Mechanical Designer						
Engineering Analysis Tech.						
Engineering Technical Writer						
Electronic Technician						
Configuration Management Sp						
Mechanical Technician						
Technical Typist						
Systems Engineer						
Sr. Systems Engineer						
GN&C Engineer						
Ground Systems Engineer						
C&DH Engineer						
Cryogenics Engineer						
Detector Instrument Engineer						
Detector Technician						
Optical Analyst						
Electro-Optical Engineer						
Packaging Engineer						
Flight Software Engineer						
Sr. Flight Software Engineer						
Flight Operations Sys. Engr.						
Jr. Software Engineer						



** Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Software Engineer						
Sr. Software Engineer						
Sr. Electrical Engineer						
Electrical Engineer (Analog)						
Electrical Engineer (Digital)						
Sr. Electromechan. Sys. Engr.						
Electromechanical Sys. Engr.						
Sr. Test and Integration Engr.						
Test and Integration Engineer						
Test and Integration Tech.						
Manufacturing Engineer						
Sr. Product Assurance Engr.						
Quality Assurance Specialist						
Computer Systems Engineer						
Radiation Engineer						
Radiation Technician						
Reliability Engineer						
Parts Engineer						
Materials Engineer						

**Labor Categories – The Offeror shall provide direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing prime contractor task orders. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.



B1. PRIME (SGT) DIRECT LABOR RATE MATRIX (FOR ALL TASK ORDERS):

The Contractor shall not exceed the rates as specified below for pricing all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum amount and maximum amount as provided in Clause B.2.

Off-Site

** Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Program Manager						
Chief Engineer						
Sr. Project Staff Engineer						
Sr. Structural Dynamics Engr.						
Structural Dynamics Engineer						
Sr. Stress Analysis Engineer						
Stress Analysis Engineer						
Jr. Mechanical Engineer						
Sr. Thermal Engineer						
Thermal Engineer						
Jr. Thermal Engineer						
Contamination Engineer						
Jr. Contamination Engineer						
Thermal Coatings Engineer						
Thermal Development Engr.						
Senior Systems Analyst						
Sr. Systems Safety Engineer						
Sr. Mechanical Systems Engr.						
Mechanical Systems Engineer						
Sr. Mechanical Designer						
Mechanical Designer						
Jr. Mechanical Designer						
Engineering Analysis Tech.						
Engineering Technical Writer						
Electronic Technician						
Configuration Management Sp						
Mechanical Technician						
Technical Typist						
Systems Engineer						
Sr. Systems Engineer						
GN&C Engineer						
Ground Systems Engineer						
C&DH Engineer						
Cryogenics Engineer						
Detector Instrument Engineer						
Detector Technician						
Optical Analyst						
Electro-Optical Engineer						
Packaging Engineer						
Flight Software Engineer						
Sr. Flight Software Engineer						
Flight Operations Sys. Engr.						
Jr. Software Engineer						



** Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Software Engineer						
Sr. Software Engineer						
Sr. Electrical Engineer						
Electrical Engineer (Analog)						
Electrical Engineer (Digital)						
Sr. Electromechan. Sys. Engr.						
Electromechanical Sys. Engr.						
Sr. Test and Integration Engr.						
Test and Integration Engineer						
Test and Integration Tech.						
Manufacturing Engineer						
Sr. Product Assurance Engr.						
Quality Assurance Specialist						
Computer Systems Engineer						
Radiation Engineer						
Radiation Technician						
Reliability Engineer						
Parts Engineer						
Materials Engineer						

**Labor Categories – The Offeror shall provide direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing prime contractor task orders. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.



B2. PRIME (SGT) INDIRECT COST RATE MATRIX (FOR ALL TASK ORDERS):

The Contractor shall not exceed the bid rates as specified below for pricing all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure (see Clause B.3, Limitation of Indirect Costs, for ceilings on reimbursement of indirect costs). Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum amount and maximum amount as provided in Clause B.2.

***Indirect Expenses	*CY1	CY2	CY3	CY4	CY5	CY6
MSES II/A Overhead						
MSES II/A Facility Rate						
Procurement Burden						
General & Administrative						

***Indirect Expenses - The Offeror shall complete all indirect categories, which apply to the representative task orders and the SOW. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.

*CY = Contract Year

B3. PRIME (SGT) AWARD FEE RATE MATRIX (FOR ALL TASK ORDERS):

****Award Fee Rate	*CY1	CY2	CY3	CY4	CY5	CY6
Award Fee	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%

**** The Offeror shall complete the award fee rate, which shall be used to calculate the maximum available award fee for all task orders issued under the resultant contract.

*CY = Contract Year



B4. SUBCONTRACTOR (NG) LOADED LABOR RATE MATRIX (FOR ALL TASK ORDERS):

The Contractor shall not exceed the rates as specified below for pricing the subcontractor labor hours on all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum quantity and maximum quantity as provided in Clause B.2.

On-Site

++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Program Manager						
Chief Engineer						
Sr. Project Staff Engineer						
Sr. Structural Dynamics Eng						
Structural Dynamics Eng						
Sr. Stress Analysis Eng						
Stress Analysis Engineer						
Jr. Mechanical Engineer						
Senior Thermal Engineer						
Thermal Engineer						
Jr. Thermal Engineer						
Contamination Engineer						
Jr. Contamination Eng						
Thermal Coatings Eng						
Thermal Development Eng						
Senior Systems Analyst						
Sr. Systems Safety Eng						
Sr. Mechanical Systems Eng						
Mechanical Systems Eng						
Sr. Mechanical Designer						
Mechanical Designer						
Jr. Mechanical Designer						
Engineering Analysis Tech						
Engineering Technical Writer						
Electronic Technician						
Configuration Mgmt Specialist						
Mechanical Technician						
Technical Typist						
Systems Engineer						
Sr. Systems Engineer						
Guidance, Navigation & Control Eng						
Ground Systems Engineer						
Command & Data Handling Eng						
Cryogenics Engineer						
Detector Instrument Engineer						
Detector Technician						
Optical Analyst						
Electro-Optical Engineer						
Packaging Engineer						
Flight Software Engineer						



++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Sr. Flight Software Engineer						
Flight Operations Systems Engineer						
Jr. Software Engineer						
Software Engineer						
Sr. Software Engineer						
Sr. Electrical Engineer						
Electrical Eng (Analog Electronics)						
Electrical Eng (Digital Electronics)						
Sr. Electromechanical Sys Eng						
Electromechanical Systems Eng						
Senior Test and Integration Eng						
Test and Integration Eng						
Test and Integration Technician						
Manufacturing Engineer						
Sr. Product Assurance Engineer						
Quality Assurance Specialist						
Computer Systems Engineer						
Radiation Engineer						
Radiation Technician						
Reliability Engineer						
Parts Engineer						
Materials Engineer						

++Labor Categories - The Offeror shall provide loaded subcontractor direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing subcontractor labor hours. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.



B4. SUBCONTRACTOR (NG) LOADED LABOR RATE MATRIX (FOR ALL TASK ORDERS):

The Contractor shall not exceed the rates as specified below for pricing the subcontractor labor hours on all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum quantity and maximum quantity as provided in Clause B.2.

Off-Site (SGT Facility)

++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Program Manager						
Chief Engineer						
Sr. Project Staff Engineer						
Sr. Structural Dynamics Eng						
Structural Dynamics Eng						
Sr. Stress Analysis Eng						
Stress Analysis Engineer						
Jr. Mechanical Engineer						
Senior Thermal Engineer						
Thermal Engineer						
Jr. Thermal Engineer						
Contamination Engineer						
Jr. Contamination Eng						
Thermal Coatings Eng						
Thermal Development Eng						
Senior Systems Analyst						
Sr. Systems Safety Eng						
Sr. Mechanical Systems Eng						
Mechanical Systems Eng						
Sr. Mechanical Designer						
Mechanical Designer						
Jr. Mechanical Designer						
Engineering Analysis Tech						
Engineering Technical Writer						
Electronic Technician						
Configuration Mgmt Specialist						
Mechanical Technician						
Technical Typist						
Systems Engineer						
Sr. Systems Engineer						
Guidance, Navigation & Control Eng						
Ground Systems Engineer						
Command & Data Handling Eng						
Cryogenics Engineer						
Detector Instrument Engineer						
Detector Technician						
Optical Analyst						
Electro-Optical Engineer						
Packaging Engineer						
Flight Software Engineer						



++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Sr. Flight Software Engineer	\$86.23	\$89.17	\$92.70	\$96.37	\$100.19	\$104.15
Flight Operations Systems Engineer	\$86.23	\$89.17	\$92.70	\$96.37	\$100.19	\$104.15
Jr. Software Engineer						
Software Engineer						
Sr. Software Engineer						
Sr. Electrical Engineer						
Electrical Eng (Analog Electronics)						
Electrical Eng (Digital Electronics)						
Sr. Electromechanical Sys Eng						
Electromechanical Systems Eng						
Senior Test and Integration Eng						
Test and Integration Eng						
Test and Integration Technician						
Manufacturing Engineer						
Sr. Product Assurance Engineer						
Quality Assurance Specialist						
Computer Systems Engineer						
Radiation Engineer						
Radiation Technician						
Reliability Engineer						
Parts Engineer						
Materials Engineer						

++Labor Categories - The Offeror shall provide loaded subcontractor direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing subcontractor labor hours. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.



B4. SUBCONTRACTOR (NG) LOADED LABOR RATE MATRIX (FOR ALL TASK ORDERS):

The Contractor shall not exceed the rates as specified below for pricing the subcontractor labor hours on all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum quantity and maximum quantity as provided in Clause B.2.

Off-Site (Lanham Manufacturing Facility)

++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Electronic Technician						
Mechanical Technician						
Detector Technician						
Test and Integration Technician						
Manufacturing Engineer						
Quality Assurance Specialist						
Radiation Technician						
Electronic Technician						
Mechanical Technician						
Detector Technician						

++Labor Categories - The Offeror shall provide loaded subcontractor direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing subcontractor labor hours. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.



B4. SUBCONTRACTOR (BATC) LOADED LABOR RATE MATRIX (FOR ALL TASK ORDERS):

The Contractor shall not exceed the rates as specified below for pricing the subcontractor labor hours on all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum quantity and maximum quantity as provided in Clause B.2.

On-Site

++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Program Manager						
Chief Engineer						
Sr. Project Staff Engineer						
Sr. Structural Dynamics Eng						
Structural Dynamics Eng						
Sr. Stress Analysis Eng						
Stress Analysis Engineer						
Jr. Mechanical Engineer						
Senior Thermal Engineer						
Thermal Engineer						
Jr. Thermal Engineer						
Contamination Engineer						
Jr. Contamination Eng						
Thermal Coatings Eng						
Thermal Development Eng						
Senior Systems Analyst						
Sr. Systems Safety Eng						
Sr. Mechanical Systems Eng						
Mechanical Systems Eng						
Sr. Mechanical Designer						
Mechanical Designer						
Jr. Mechanical Designer						
Engineering Analysis Tech						
Engineering Technical Writer						
Electronic Technician						
Configuration Mgmt Specialist						
Mechanical Technician						
Technical Typist						
Systems Engineer						
Sr. Systems Engineer						
Guidance, Navigation & Control Eng						
Ground Systems Engineer						
Command & Data Handling Eng						
Cryogenics Engineer						
Detector Instrument Engineer						
Detector Technician						
Optical Analyst						
Electro-Optical Engineer						
Packaging Engineer						
Flight Software Engineer						



++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Sr. Flight Software Engineer						
Flight Operations Systems Engineer						
Jr. Software Engineer						
Software Engineer						
Sr. Software Engineer						
Sr. Electrical Engineer						
Electrical Eng (Analog Electronics)						
Electrical Eng (Digital Electronics)						
Sr. Electromechanical Sys Eng						
Electromechanical Systems Eng						
Senior Test and Integration Eng						
Test and Integration Eng						
Test and Integration Technician						
Manufacturing Engineer						
Sr. Product Assurance Engineer						
Quality Assurance Specialist						
Computer Systems Engineer						
Radiation Engineer						
Radiation Technician						
Reliability Engineer						
Parts Engineer						
Materials Engineer						

++Labor Categories - The Offeror shall provide loaded subcontractor direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing subcontractor labor hours. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.

**B4. SUBCONTRACTOR (BATC) LOADED LABOR RATE MATRIX (FOR ALL TASK ORDERS):**

The Contractor shall not exceed the rates as specified below for pricing the subcontractor labor hours on all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum quantity and maximum quantity as provided in Clause B.2.

Off-Site (SGT Facility)

++ Labor Categories	^CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Program Manager						
Chief Engineer						
Sr. Project Staff Engineer						
Sr. Structural Dynamics Eng						
Structural Dynamics Eng						
Sr. Stress Analysis Eng						
Stress Analysis Engineer						
Jr. Mechanical Engineer						
Senior Thermal Engineer						
Thermal Engineer						
Jr. Thermal Engineer						
Contamination Engineer						
Jr. Contamination Eng						
Thermal Coatings Eng						
Thermal Development Eng						
Senior Systems Analyst						
Sr. Systems Safety Eng						
Sr. Mechanical Systems Eng						
Mechanical Systems Eng						
Sr. Mechanical Designer						
Mechanical Designer						
Jr. Mechanical Designer						
Engineering Analysis Tech						
Engineering Technical Writer						
Electronic Technician						
Configuration Mgmt Specialist						
Mechanical Technician						
Technical Typist						
Systems Engineer						
Sr. Systems Engineer						
Guidance, Navigation & Control Eng						
Ground Systems Engineer						
Command & Data Handling Eng						
Cryogenics Engineer						
Detector Instrument Engineer						
Detector Technician						
Optical Analyst						
Electro-Optical Engineer						
Packaging Engineer						
Flight Software Engineer						



++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Sr. Flight Software Engineer						
Flight Operations Systems Engineer						
Jr. Software Engineer						
Software Engineer						
Sr. Software Engineer						
Sr. Electrical Engineer						
Electrical Eng (Analog Electronics)						
Electrical Eng (Digital Electronics)						
Sr. Electromechanical Sys Eng						
Electromechanical Systems Eng						
Senior Test and Integration Eng						
Test and Integration Eng						
Test and Integration Technician						
Manufacturing Engineer						
Sr. Product Assurance Engineer						
Quality Assurance Specialist						
Computer Systems Engineer						
Radiation Engineer						
Radiation Technician						
Reliability Engineer						
Parts Engineer						
Materials Engineer						

++Labor Categories - The Offeror shall provide loaded subcontractor direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing subcontractor labor hours. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.



B4. SUBCONTRACTOR (BATC) LOADED LABOR RATE MATRIX (FOR ALL TASK ORDERS):

The Contractor shall not exceed the rates as specified below for pricing the subcontractor labor hours on all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum quantity and maximum quantity as provided in Clause B.2.

Off-Site (Manufacturing)

++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Program Manager						
Chief Engineer						
Sr. Project Staff Engineer						
Sr. Structural Dynamics Eng						
Structural Dynamics Eng						
Sr. Stress Analysis Eng						
Stress Analysis Engineer						
Jr. Mechanical Engineer						
Senior Thermal Engineer						
Thermal Engineer						
Jr. Thermal Engineer						
Contamination Engineer						
Jr. Contamination Eng						
Thermal Coatings Eng						
Thermal Development Eng						
Senior Systems Analyst						
Sr. Systems Safety Eng						
Sr. Mechanical Systems Eng						
Mechanical Systems Eng						
Sr. Mechanical Designer						
Mechanical Designer						
Jr. Mechanical Designer						
Engineering Analysis Tech						
Engineering Technical Writer						
Electronic Technician						
Configuration Mgmt Specialist						
Mechanical Technician						
Technical Typist						
Systems Engineer						
Sr. Systems Engineer						
Guidance, Navigation & Control Eng						
Ground Systems Engineer						
Command & Data Handling Eng						
Cryogenics Engineer						
Detector Instrument Engineer						
Detector Technician						
Optical Analyst						
Electro-Optical Engineer						
Packaging Engineer						
Flight Software Engineer						



++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Sr. Flight Software Engineer						
Flight Operations Systems Engineer						
Jr. Software Engineer						
Software Engineer						
Sr. Software Engineer						
Sr. Electrical Engineer						
Electrical Eng (Analog Electronics)						
Electrical Eng (Digital Electronics)						
Sr. Electromechanical Sys Eng						
Electromechanical Systems Eng						
Senior Test and Integration Eng						
Test and Integration Eng						
Test and Integration Technician						
Manufacturing Engineer						
Sr. Product Assurance Engineer						
Quality Assurance Specialist						
Computer Systems Engineer						
Radiation Engineer						
Radiation Technician						
Reliability Engineer						
Parts Engineer						
Materials Engineer						

++Labor Categories - The Offeror shall provide loaded subcontractor direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing subcontractor labor hours. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.



B4. SUBCONTRACTOR (SIGMA) LOADED LABOR RATE MATRIX (FOR ALL TASK ORDERS): T&M INCLUDING FEE

The Contractor shall not exceed the rates as specified below for pricing the subcontractor labor hours on all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum quantity and maximum quantity as provided in Clause B.2.

On-Site

++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Sr. Project Staff Engineer						
Jr. Mechanical Engineer						
Sr. Mechanical Systems Engr.						
Mechanical Systems Engineer						
Sr. Mechanical Designer						
Mechanical Designer						
Jr. Mechanical Designer						
Electronic Technician						
Mechanical Technician						
Technical Typist						
Optical Analyst						
Electro-Optical Engineer						

++Labor Categories - The Offeror shall provide loaded subcontractor direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing subcontractor labor hours. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.



B4. SUBCONTRACTOR (SIGMA) LOADED LABOR RATE MATRIX (FOR ALL TASK ORDERS): T&M INCLUDING FEE

The Contractor shall not exceed the rates as specified below for pricing the subcontractor labor hours on all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum quantity and maximum quantity as provided in Clause B.2.

Off-Site (SGT Facility)

++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Sr. Project Staff Engineer						
Jr. Mechanical Engineer						
Sr. Mechanical Systems Engr.						
Mechanical Systems Engineer						
Sr. Mechanical Designer						
Mechanical Designer						
Jr. Mechanical Designer						
Electronic Technician						
Mechanical Technician						
Technical Typist						
Optical Analyst						
Electro-Optical Engineer						

++Labor Categories - The Offeror shall provide loaded subcontractor direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing subcontractor labor hours. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.



B4. SUBCONTRACTOR (SIGMA) LOADED LABOR RATE MATRIX (FOR ALL TASK ORDERS): T&M INCLUDING FEE

The Contractor shall not exceed the rates as specified below for pricing the subcontractor labor hours on all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum quantity and maximum quantity as provided in Clause B.2.

Off-Site (Sigma Facility)

++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Electronic Technician						
Mechanical Technician						
Test and Integration Technician						
Quality Assurance Specialist						

++Labor Categories - The Offeror shall provide loaded subcontractor direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing subcontractor labor hours. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.



B4. SUBCONTRACTOR (ESS) LOADED LABOR RATE MATRIX (FOR ALL TASK ORDERS): T&M INCLUDING FEE

The Contractor shall not exceed the rates as specified below for pricing the subcontractor labor hours on all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum quantity and maximum quantity as provided in Clause B.2.

On-Site

++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Sr. Project Staff Engineer						
Sr. Thermal Engineer						
Thermal Engineer						
Jr. Thermal Engineer						
Contamination Engineer						
Jr. Contamination Engineer						
Thermal Coatings Engineer						
Thermal Development Engr.						

++Labor Categories - The Offeror shall provide loaded subcontractor direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing subcontractor labor hours. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.



B4. SUBCONTRACTOR (ESS) LOADED LABOR RATE MATRIX (FOR ALL TASK ORDERS): T&M INCLUDING FEE

The Contractor shall not exceed the rates as specified below for pricing the subcontractor labor hours on all task orders contemplated or issued in accordance with Clause H.7, Task Ordering Procedure. Any task orders issued in accordance with Clause H.7 will be applied to the guaranteed minimum quantity and maximum quantity as provided in Clause B.2.

Off-Site (SGT Facility)

++ Labor Categories	*CY1 ^HR Rate	CY2 HR Rate	CY3 HR Rate	CY4 HR Rate	CY5 HR Rate	CY6 HR Rate
Sr. Project Staff Engineer						
Sr. Thermal Engineer						
Thermal Engineer						
Jr. Thermal Engineer						
Contamination Engineer						
Jr. Contamination Engineer						
Thermal Coatings Engineer						
Thermal Development Engr.						

++Labor Categories - The Offeror shall provide loaded subcontractor direct labor rates by direct labor category, in accordance with the Position Descriptions in Section 5 of this attachment.

*CY = Contract Year

^HR = Hourly Rate: These are not-to-exceed rates for pricing subcontractor labor hours. The Contractor may propose lower rates when pricing task orders. Clearly delineate on-site (Government facility) and off-site (Contractor facility) rates.



B5. POSITION DESCRIPTIONS (FOR ALL OFFEROR DIRECT LABOR CATEGORIES):



SGT Team Position Descriptions for MSES II/A

No.	Position	Scope	Responsibilities	Position Qualifications
1	Program Manager	Manages and directs the overall effort on all tasks to meet the technical, cost, and schedule requirements of the contract.	Provides oversight on the technical, cost, and schedule performance on all tasks. Serves as the single point of contact with the Technical Officer and the Contracting Officer. Develops necessary management systems to assure accuracy of technical, cost, and schedule information provided to government.	This position requires a minimum of 15 years of experience with a particular background in the development of aerospace hardware. This experience must include supervisory/management responsibilities and significant interaction with project management. Aerospace hardware test activity experience is also required. A Bachelor of Science degree in engineering, mathematics, or physics is required.
2	Chief Engineer	The Chief Staff engineer is a world-renowned expert in his/her primary field of expertise.	His/her duties include: support of complex and/or technologically challenging tasks including the leadership in generating the Task Plan and Work Control Plan, providing guidance during the task implementation, conducting technology assessments and making recommendations for technology insertions, making trade study assessments, and recommendations, supporting CDR and PDR, and reviewing deliverables, providing technical consultation advice to Task Managers regarding design issues, development and test approaches, and test result assessments, leading teams established by the Program Manager to conduct investigations of programmatic or task-level problems and to make recommendations for recovery plans; and providing recommendations regarding Mission Assurance-Program Implementation considerations. Provides world-renowned expertise in space and/or ground hardware and/or software systems analysis, design, development, integration, test, validation, and orbital operations.	This position requires a minimum of thirty (30) years of space/ground system design and development experience including at least fifteen (15) years of experience analyzing system and performance requirements. Individual should have an extensive knowledge in the development and/or implementation of space ground hardware and/or software systems. A Bachelor of Science degree or equivalent education and experience in Engineering, Computer Science or Mathematics is required.
3	Senior Project Staff Engineer	Manages and directs individual engineering tasks to meet the technical requirements of the contract.	Develops task plans, budgets, and schedules from a set of task requirements provided by the contracting officer. Manages specific task teams of engineers and designers. Provides guidance and direction in developing and maintaining schedules. Serves as expert advisor in directing the technical approach to task problems.	This position requires a minimum of 15 years of experience in the aerospace industry with specific demonstrated technical expertise in relevant analytical areas such as structures, thermal, or electromechanical systems. Technical team leadership experience and spacecraft project review experience is required. A Bachelor of Science in engineering, mathematics, or physics is required.
4	Senior Structural Dynamics Engineer	Directs or performs analyses directed toward evaluating spacecraft structural designs in the areas of static and dynamic response to flight environments	Provides leadership in developing new analytical tools in response to task requirements. Under the direction of the Senior Project Staff Engineer, supports the development of structural designs. Analyzes and evaluates structural performance to show that specified requirements are satisfied. Provides direction and guidance to lower level Structural Analysis Engineers.	This position requires a minimum of 10 years in the analysis and design of aerospace structures. This experience is to include the analysis of aerospace subsystems and components when subjected to static, transient/ steady state dynamic, and random vibration loads. Extensive experience with finite element and numerical analysis techniques in general is required. Some experience in the use of DEC VAX and IBM RS6000 computing systems is required. Technical team leadership experience is desired. A Bachelor of Science degree in engineering, mathematics, or physics is required.



No.	Position	Scope	Responsibilities	Position Qualifications
5	Structural Dynamics Engineer	Directs or performs analyses directed toward evaluating spacecraft structural designs in the areas of static and dynamic response to flight environments.	Develops new analytical tools in response to task requirements. Under the direction of a Senior Structural Analysis Engineer, supports the development of structural designs. Analyzes and evaluates structural performance to show that specified requirements are satisfied. Provides direction and guidance to lower level Structural Analysis Engineers.	This position requires a minimum of 3 years of experience in structural analysis, development of analytical techniques, and computer simulation of aerospace hardware. This experience is to include the analysis of aerospace subsystems and components when subjected to static, transient/steady state dynamic, and random vibration loads. Extensive experience with the NASTRAN analysis program and in use of DEC VAX and IBM RS6000 computing Systems is required. A Bachelor of Science degree in engineering, mathematics, or physics is required.
6	Senior Stress Analysis Engineer	Directs or performs analyses directed toward evaluating structural designs and predicting the stresses and detailed stress distributions in spacecraft structural members.	Provides leadership in developing new analytical tools in response to task requirements. Under the direction of the Senior Project Staff Engineer, supports the development of structural designs. Analyzes and evaluates structural strength to show that specified requirements are satisfied. Provides direction and guidance to lower level Stress Analysis Engineer.	This position requires a minimum of 10 years of directly related experience in stress analysis. This experience must include a broad knowledge of materials and material properties and specific background with aerospace hardware. This must include extensive experience in stress analysis and fracture mechanics analysis. Experience in use of DEC VAX and IBM RS6000J computers is required. Technical team leadership experience is desired. A Bachelor of Science degree in engineering, mathematics, or physics is required.
7	Stress Analysis Engineer	Directs or performs analyses directed toward evaluating structural designs and predicting the stresses and detailed stress distributions in spacecraft structural members.	Develops new analytical tools in response to task requirements. Under the direction of a Senior Stress Analysis Engineer, supports the development of structural designs. Analyzes and evaluates structural strength to show that specified requirements are satisfied. Provides direction and guidance to lower level Stress Analysis Engineers.	This position requires a minimum of 3 years of experience in the analysis of structures and broad knowledge of material properties and structural analysis techniques. This must include some experience in stress analysis and fracture mechanics analysis. Familiarity with the NASTRAN analyses program and engineering drawings systems is required.
8	Junior Mechanical Engineer	Performs rudimentary engineering tasks in support of senior level engineers.	Under the direction of a senior level engineer, supports the development of structural designs. Tasks may include, but are not limited to: math modeling, dynamic analyses, static strength analyses, mass properties calculations, test hardware set-up, and conceptual designs. Performs interface definition, examines designs for proper form, fit, and function. Develops test plans and procedures, and assists in the reduction/analysis of test data.	This position requires some knowledge of the generation of math models and the computer analysis of engineering problems. The individual must either have the equivalent of a Bachelor of Science degree in engineering, mathematics, or physics, or be within 6 semester hours of completing the degree requirements and anticipate receiving the degree within 12 months.
9	Senior Thermal Engineer	Directs or performs analyses directed toward evaluating thermal designs and predicting the temperatures and detailed temperature distributions in spacecraft structures.	Provides leadership in developing new analytical tools in response to task requirements. Under the direction of the Senior Project Staff Engineer, supports the development of thermal designs. Analyzes and evaluates temperatures and power requirements to show that specified requirements are satisfied. Provides direction and guidance to lower level Thermal Analysis Engineers.	This position requires a minimum of 10 years of experience in thermal design and thermal analysis. This experience must include conceptual thermal design, development of thermal analytical models and thermal analyses of spacecraft and instruments for ELV and/or STS payloads. Extensive experience with thermal computer programs like SINDA™ and use of the DEC VAX computer system is required. Technical team leadership experience is desired. A Bachelor of Science degree in engineering, mathematics, or physics is required.



No.	Position	Scope	Responsibilities	Position Qualifications
10	Thermal Engineer	Directs or performs analyses directed toward evaluating thermal designs and predicting the temperatures and detailed temperature distributions in spacecraft structures.	: Develops new analytical tools in response to task requirements. Under the direction of the Senior Thermal Engineer, supports the development of thermal (including cryogenic) designs. Analyzes and evaluates temperatures and power requirements to show that specified requirements are satisfied. Provides direction and guidance to lower level Thermal Analysis Engineers.	This position requires a minimum of 3 years of experience in thermal design and thermal analysis. This experience should include development of thermal analytical models and thermal analyses of spacecraft and instruments for ELV and/or STS payloads. Extensive experience with thermal computer programs like SINDA™ and use of the DEC VAX computer system is required. A Bachelor of Science degree in engineering, mathematics, or physics is required.
11	Junior Thermal Engineer	Performs analyses directed toward evaluating thermal designs and predicting the temperatures and detailed temperature distributions in spacecraft structures.	Under the direction of a Thermal Engineer, supports the development of thermal designs. Analyzes and evaluates temperatures and power requirements to show that specified requirements are satisfied.	This position requires some experience in thermal design and thermal analysis. Some experience in the use of the DEC VAX computer system is required. A Bachelor of Science in engineering, mathematics, or physics is required.
12	Contamination Engineer	Directs or performs analyses directed toward predicting contamination depositions. Develops contamination control plans. Monitors, reviews, and evaluates overall contamination control management implementation and development.	Reviews contamination control requirements, performs detailed contamination analyses, develops contamination control plans, and implements contamination control plans. Develops new analytical tools in response to task requirements. Provides direction and guidance to lower level Contamination Engineers.	This position requires a minimum of 3 years of experience in contamination management and contamination analyses. This experience must include contamination control requirement development, detailed environmental analyses, and contamination impact assessment. Experience with DEC VAX computer system, contamination programs like CAP, MOLFLUX, ISEM, and DSMC is required. A Bachelor of Science degree in engineering, mathematics, or physics is required.
13	Junior Contamination Engineer	Performs analyses directed toward predicting contamination depositions. Monitors and reviews overall contamination control management implementation and development.	Under the direction of a Contamination Engineer, reviews contamination control requirements, performs detailed environmental analyses of all phases of assembly, integration, test, transportation, pre-launch, on-orbit, and descent, and implements contamination control plans. Operates clean room facilities, performs BRDF light scattering measurements and conducts particulate contamination characterizations.	This position requires experience in contamination management and contamination analyses. This experience must include contamination control requirement development and detailed contamination analyses. Some experience in the use of DEC VAX computer system and knowledge of FORTRAN language is required. A Bachelor of Science degree in engineering, mathematics, or physics is required.
14	Thermal Coatings Engineer	Performs tests directed toward evaluating thermal control coatings for use on specific spacecraft.	Analyzes planned usage of thermal control coatings for applicability to specific mission goals. Determines necessary environmental testing and conducts and reports results of such testing. Performs routine maintenance on government-owned equipment.	This position requires a Bachelor of Science degree in Materials engineering, or Physics. Knowledge of data collection systems is also required.



No.	Position	Scope	Responsibilities	Position Qualifications
15	Thermal Development Engineer	Directs or develops designs and/or analysis directed towards developing advanced thermal control technologies.	Develops advanced thermal control hardware and software in response to task requirements. Supports advanced thermal control technology development. Quantifies requirements, develops appropriate design and/or analytical solutions, and conducts tests. Provides guidance and direction to lower level advanced development engineers.	This position requires a minimum of 3 years experience in thermal design and analysis. This experience must include detailed hardware design, development and use of analytical tools, test experience, and some exposure to flight hardware. Knowledge of heat pipes, capillary pumped loops, heat pumps, and similar thermal control devices are highly desired. A Bachelor of Science degree in engineering or physics is required.
16	Senior Systems Analyst	Directs or performs the systems analyses of the optical, Electro-optical and RF aspects of space flight and special test equipment subsystems, systems, instruments and spacecraft.	Provides the technical expertise to perform or direct the systems analyses in response to task requirements. Expert in the use of analytical tools or capable of developing new analytical tools: This includes developing interfaces to existing analysis tools such as NASTRAN or CODE V for interdisciplinary analysis. Knowledgeable of the electro-optical, electronic and mechanical requirements of space flight and special test equipment subsystems, systems, instruments and spacecraft. Capable of evaluating and analyzing system requirements and system error budgets to show that specific performance requirements can be met. Provide direction and guidance to lower-level systems analysts.	This position requires a minimum of 10 yrs experience in the analysis and design of space flight systems. This experience is to include component tolerancing and tolerancing sensitivity; radiometry (receivers, detectors and detector arrays); stray light/energy; alignment and calibration; Structural-Thermal-Optical (STO P) analysis; system behavior and system error budgets and tolerances of subsystems, instruments and spacecraft; the establishment of component tolerances based on allowable tolerance sensitivities, performance degradation, and error budgets; control systems and the effects of structural modes on control system performance; and RF, digital and analog circuit design and analysis.
17	Senior Systems Safety Engineer	Directs or performs analyses directed toward evaluating the safety of spacecraft systems and subsystems.	Under the direction of a Senior Project Staff Engineer, analyzes and evaluates the safety of spacecraft systems in flight and ground operations. Supports the design of spacecraft systems. Prepares safety documentation in accordance with launch vehicle requirements, and supports safety reviews at various government installations.	This position requires a minimum of 10 years of experience with spacecraft design and operation, including familiarity with spacecraft mechanisms, electromechanical systems, communications, power and propulsion. Must have demonstrated experience in STS safety requirements and should have been responsible for the safety assessment and documentation of at least one major STS spacecraft program. Technical team leadership experience is desired. A Bachelor of Science degree in engineering, mathematics, or physics is required.
18	Senior Mechanical Systems Engineer	Directs or performs the integration of the design, analysis, and testing functions to achieve the development of spacecraft mechanical systems which meet all requirements.	Under the direction of the Senior Project Staff Engineer, provides leadership in the development of hardware designs which meet specified requirements. Performs or directs mechanical engineering tasks to assure proper form, fit and function. Assures design suitability for fabrication, mass property control, material suitability, interface definition. Develops and implements test plans and procedures. Provides direction and guidance to lower level Mechanical Systems Engineers.	This position requires a minimum of 10 years of experience with the design and testing of aerospace hardware. This experience must include specific aerospace project related design and analysis tasks associated with the development of spacecraft mechanical systems, and subsystems. Technical team leadership is desired. A Bachelor of Science in engineering, mathematics, or physics is required.



No.	Position	Scope	Responsibilities	Position Qualifications
19	Mechanical Systems Engineer	Directs or performs the integration of the design, analysis, and testing functions to achieve the development of spacecraft mechanical systems which meet all requirements.	Under the direction of the Senior Mechanical Systems Engineer, supports the development of hardware designs which meet specified requirements. Performs or directs mechanical engineering tasks to assure proper form, fit and function. Assures design suitability for fabrication, mass property control, material suitability, interface definition. Develops and implements test plans and procedures.	This position requires a minimum of 3 years of experience associated with the analysis, design, testing, and optical alignment of aerospace hardware. This experience must include specific aerospace project related engineering tasks associated with the development of spacecraft mechanical subsystems. A Bachelor of Science degree in engineering, mathematics, or physics is required.
20	Senior Mechanical Designer	Conceives design concepts for spacecraft mechanical/structural systems and translates the concepts into mechanical and/or fabrication drawings.	Provides leadership in the development of spacecraft mechanical/structural designs. Under the direction of a Senior Mechanical Systems Engineer, directs or performs geometrical layout studies, sizing calculations, and generates mechanical drawings representing designs that satisfy all requirements. Provides direction to lower level Mechanical Designers.	This position requires a minimum of 10 years of experience in the design and development of aerospace hardware. This background must include specific spacecraft hardware design experience and detailed knowledge of current aerospace design practices and hardware. Extensive knowledge of NASA Engineering Drawing Standards Manual (X-673-64-1) and Dimensioning and Tolerancing per ANSI Y14.5M is required. Technical team leadership experience is desired.
21	Mechanical Designer	Conceives design concepts for spacecraft mechanical/structural systems and translates the concepts into mechanical and/or fabrication drawings.	Under the direction of a Senior Mechanical Designer, directs or performs geometrical layout studies, sizing calculations, and generates mechanical drawings representing designs that satisfy all requirements. Provides direction to lower level Mechanical Designers.	This position requires a minimum of 3 years of experience in the design of aerospace or related hardware. This background must include Specific design experience with layout or piece part drawings. Extensive knowledge of NASA Engineering Drawing Standards Manual (X-673-64-1) and Dimensioning and Tolerancing per ANSI Y14.5M is required.
22	Junior Mechanical Designer	Conceives design concepts for spacecraft mechanical/structural elements and translates the concepts into mechanical and/or fabrication drawings.	Under the direction of a Senior or mid-level Mechanical Designer, directs or performs geometrical layout studies, sizing calculations, and generates mechanical drawings representing designs that satisfy all requirements.	This position requires a minimum of 1 year of experience in the design of aerospace or related hardware. This background must include specific design experience with layout or piece part drawings. Some knowledge of NASA Engineering Drawing Standards Manual (X-673-64-1) and Dimensioning and Tolerancing per ANSI Y14.5M is required.
23	Engineering Analysis Technician	Supports engineers and designers with preparation of engineering data, plots, reports, and other documentation.	Prepares engineering data for computer analysis using simple hand or computer calculations. Enters data into the computer and recovers the results in the form of plots or summary tables. Compiles reports and documentation from material provided by engineers and designers. Operates drawing and document reproduction equipment.	This position requires a minimum of 1 year of college education in an engineering curriculum; it also requires a basic knowledge of engineering terms and units and a basic understanding of computer analysis techniques.
24	Engineering Technical Writer	Develops technical documentation related to spacecraft systems	Prepares complex technical documentation related to spacecraft systems analysis, design, environmental testing, launch operations, safety, and operations of thermal, mechanical and electromechanical systems. Provides coordination between engineering and operations personnel.	This position requires a minimum of 4 years experience in the writing and preparation of technically and grammatically correct documentation. Experience with word processing, and desktop publishing systems is highly desirable. A Bachelor of Science degree in engineering, mathematics, or physics is required.



No.	Position	Scope	Responsibilities	Position Qualifications
25	Electronic Technician	Applies electronic theory, principles of electrical circuits, electrical testing procedures, engineering mathematics, physics, etc. to layout, build, test, troubleshoot, repair, and modify system components and the equipment to test the components.	Discuss the layout and assembly problems with electronic engineers and draw sketches to clarify design details and functional criteria of electronic units. Recommend changes in circuitry or installation specifications to simplify assembly and maintenance. Assemble circuitry using engineering instruction, technical manuals, and knowledge of electronic systems and components and their functions. Set up standard test apparatus or conceive test equipment and circuitry, and conduct function, operational, environmental and life test to evaluate the performance and reliability of prototype or production models. Analyze and interpret test data. Adjust, calibrate, align, and modify circuitry and components and record unit performance. Wires chassis, harness, consoles, racks, and PC boards from wire lists, schematics, logic diagrams; cuts wire in specified lengths using wire cutters and measuring jig; strips insulation from wire ends using stripping tool; solders wires to specified plugs and terminals; performs layout and fabrication of printed circuit boards.	This position requires a technical school graduate with 3 years experience in aerospace flight/ground support equipment assembly and evaluation. Experience in the design and testing of analog and digital electronic circuit using discrete and integrated circuit technology. Basic knowledge of prototype board layout and build procedures, and ability to read and interpret electrical schematics. Must be familiar with and certified to the requirements of NHB 5300.4(3A-2).
26	Configuration Management Specialist	To provide support in the areas of configuration management and engineering data management to insure that engineering change notices/proposals, deviations, waivers, drawings, drawing change orders, and drawing revisions are properly managed, and addressed.	Maintain control over change activity by attending, as recording secretary, change control board meetings and by coordinating activities related to the processing and preparation of Engineering Change Notices/Proposals, drawings, deviations, and waivers. Coordinates the release of program documentation to insure that Configuration/Data Management (CMDM) requirements are satisfied. Identify the plans and procedures to be used and the data to be delivered within the framework of overall program schedules. Prepare and implement CMDM plans and procedures responsive to requirements for specific program assignments.	A Bachelor of Science degree with at least 5 years of experience in functions which provided a very detailed working knowledge of government regulations and standards for CMDM. Demonstrated ability to analyze, plan, control, and report the status of all contractually delivered documentation and to administer configuration management support operations on one or more assigned programs.
27	Mechanical Technician	To perform mechanical fabrication and assembly of flight and ground support hardware.	Set up and operate machines such as lathes, milling machines, shapers, jig bores, brakes, shears, and heavy duty presses. Cut, bend, align, and form metal plates, sheets, and structural shapes as specified by engineering drawings, layouts, and templates. Read engineering drawings for product specifications such as dimensions and tolerances, and tooling instructions. May be required to operate grinder, spot welder, and other machine tools. Assemble hardware as specified by engineering drawings. Assist in the performance of mechanical tests.	Five years of machine shop experience is required of which a minimum of 3 years shall be in the fabrication and assembly of aerospace flight hardware. Ability to perform with minimal supervision and ability to work from sketches and drawings.
28	Technical Typist	Provides clerical support to engineering staff.	Types engineering specifications, design review reports and analyses, test plans and procedures, minutes of meetings, systems analyses, and documentation related to the design development, and testing of spacecraft systems.	This position requires a minimum of 3 years experience in typing and word processing including 1 year of clerical work in support of an engineering or aerospace organization. A high school diploma is required.



No.	Position	Scope	Responsibilities	Position Qualifications
29	Systems Engineer	Ensures that space/ground systems requirements are achieved, analyzes system requirements, develops functional performance requirements, conducts trade studies, and allocates requirements to space and ground system elements.	Is responsible for interface control during development and maintenance activities and for the integration and test planning necessary to verify (prelaunch) that system requirements have been realized. Also, responsible for balancing specialty engineering requirements such that system performance requirements are achieved.	This position requires a minimum of 2 years experience as an aerospace systems engineer performing several of the analysis, design and integration functions described above. A Bachelor of Science degree or equivalent education and experience, in engineering, computer science or mathematics.
30	Senior Systems Engineer	Ensures that systems requirements are achieved.	Responsible for interface control during development and maintenance activities and for the integration and test planning necessary to verify that system requirements have been realized. Other duties include: a) Perform engineering for a system or subsystems using methodologies and techniques appropriate to the engineering discipline. Provide expert advice and support during the entire life cycle from the specification and analysis of requirements, through the design of the hardware or software, procurement, fabrication, assembly, to integration and test, and launch and operation of the spacecraft. Identify and solve technical problems during all phases. Develop technical reports and documentation. b) If functioning as a lead engineer, provide technical direction for the definition and development of a system or subsystem and coordinate all appropriate engineering activities. c) If functioning as a senior subject matter expert, perform engineering analysis, design, development, test or troubleshooting.	Ten years of spacecraft design and development experience including at least 7 years of experience analyzing system requirements, developing functional performance requirements, and allocating those requirements to the system elements. A Bachelor of Science degree in Computer Science, Mathematics, or Engineering
31	GN&C Engineer	Serves as a lead engineer in the development of a GN&C system.	Directs and performs analyses and trade studies directed toward one element of the GN&C system. Performs spacecraft GN&C system engineering, designing, developing, and test supervision. Provides technical guidance to the flight software developers	Ten years of progressively responsible experience relating to the position responsibilities in the development of GN&C hardware, software, sensor hardware, sensor interfaces, or GN&C testing. A Bachelor of Science degree, or equivalent education and experience, in engineering or mathematics.
32	Ground Systems Engineer	Leads the development of ground data systems for satellite/instruments.	Include ground systems requirement analysis, specifications, design, development, integration and testing, and postlaunch support for spacecraft command and control, telemetry data capture and processing, science data processing, and archiving/distribution of processed data to the users. Works with hardware engineers to define ground segment requirements, interface control documents, and simulators. Conducts internal design reviews, monitor ground hardware and software development, and supports PDR/CDR.	Five years of experience in spacecraft design and development and at least 3 years of command and data handling systems engineering experience. A Bachelor of Science degree, or equivalent education and experience, in Engineering, Computer Sciences, Mathematics or the Physical Sciences.
33	C&DH Engineer	Directs or develops designs and/or analysis directed towards developing cryogenic systems for spacecraft systems and instruments.	Conducts research and development work on cryogenic cooling systems for spacecraft systems or instruments. This includes conceiving, designing, and directing the testing of liquid helium, helium-3, adiabatic demagnetization, and dilution refrigerator systems or components. Interface and support the development, fabrication, and testing of components.	This position requires a minimum of four years experience in the development and qualification of low temperature hardware. A Bachelor of Science degree, or equivalent education and experience, in engineering, physical science, or mathematics is required.



No.	Position	Scope	Responsibilities	Position Qualifications
34	Cryogenics Engineer	Directs or develops designs and/or analysis directed towards developing cryogenic systems for spacecraft systems and instruments.	: Conducts research and development work on cryogenic cooling systems for spacecraft systems or instruments. This includes conceiving, designing, and directing the testing of liquid helium, helium-3, adiabatic demagnetization, and dilution refrigerator systems or components. Interface and support the development, fabrication, and testing of components.	This position requires a minimum of four years experience in the development and qualification of low temperature hardware. A Bachelor of Science degree, or equivalent education and experience, in engineering, physical science, or mathematics is required.
35	Detector Instrument Engineer	Performs activities associated with detector/instrument systems engineering.	Performs detector/instrument engineering studies, analyses, and development in support of flight, airborne, and ground mechanical and electrical hardware including all scientific and support software required to operate and/or test the associated equipment and/or facility.	This position requires a minimum of ten years experience with an interdisciplinary background in the development of aerospace hardware. A minimum of 3 years of flight detector/instrument hardware/software development experience is also required. A Bachelor of Science degree, or equivalent education and experience, in Electrical Engineering, Physics, or Computer Science.
36	Detector Technician	Carries out detector calibration and performance tests, develops test fixtures, sets up test hardware, prepares flight hardware for testing, and perform testing and test data analysis and test report writing.	Is well acquainted with critical space hardware cleanliness requirements and contamination control in the handling and protection of detector devices and subsystem in clean room and laminar flow bench environments, and be ESD cognizant, trained and certified to handle flight hardware. Performs, applies and operates optical alignments, integrating spheres, broad band and single line light sources, monochrometers, optical filters, proper soldering techniques, appropriate bonding materials and methods, cryogenic and vacuum equipment, high and low voltage power supplies, and other electronic and computer interface equipment.	Requires five years of experience with laboratory test equipment such as light sources. Including lasers, monochrometers, calibrated detector systems, integrating spheres, and electronic support and test equipment. An Associate's degree or equivalent education and experience, in electronics or electro-optics.
37	Optical Analyst	Provides system level analysis support for electro-optic instrument and experiment design, calibration, and verification.	Perform analysis of electro-optic elements, subsystems, and systems that comprise an optical instrument. Specific duties include system end-to-end studies, digital communication signal to noise analysis, establishing error budgets, etc.	Ten years of experience in optical systems analysis with extensive knowledge in analysis techniques and methodology required during development of aerospace flight systems, components, and related ground support equipment. A Bachelor of Science degree, or equivalent education and experience, in physics or engineering.
38	Electro-Optical Engineer	Provides system level design, development, calibration and evaluation of electro-optic instruments.	Perform design, development, calibration, and evaluation of electro-optic elements, subsystems, and systems for spaceflight and ground-based systems. Included are lasers, detectors, and beam control assemblies.	Five years experience in the design, fabrication, and testing of lasers, detectors, and control assemblies. A Bachelor of Science degree, or equivalent education and experience, in physics or engineering.
39	Packaging Engineer	The Packaging Engineer has overall responsibility for electronics box (unit) level packaging, working closely with other engineers responsible for unit level design including Electrical Engineers responsible for circuit card design.	Determines conceptual box level packaging design including: overall package envelope dimensions; printed wiring board envelop dimensions; special placement criteria for heat dissipating piece parts; packaging considerations for EMI/EMC; and packaging considerations for radiation shielding. The Packaging Engineer uses the mass properties developed for each component to monitor spacecraft parameters such as center of gravity, weight (dry and wet), and moments of inertia.	Three years electronics packaging experience with spacecraft electronics boxes. A Bachelor of Science degree, or equivalent education and experience, in Mechanical or Electrical Engineering from an accredited institution.



No.	Position	Scope	Responsibilities	Position Qualifications
40	Flight Software Engineer	Supports development of flight software systems through software life cycle.	Performs flight software requirement analysis, specifications, design, development, integration and testing, and on-orbit software maintenance for spacecraft command and data handling (C&DH) and attitude control systems (ACS), and instrument payloads. The Flight Software Engineer shall code, document, configure and debug flight software, simulators and test software. The Flight Software Engineer shall assist in preparation of design review (PDR/CDR) material.	Five years of related professional experience in flight software systems development for spacecraft/aircraft and/or space borne/airborne instruments or equivalent experience with embedded systems. A Bachelor of Science degree, or equivalent education and experience, in computer sciences, electrical engineering, mathematics.
41	Senior Flight Software Engineer	Leads the development of flight software systems through software life cycle.	Performs flight software requirement analysis, specifications, design, development, integration and testing, and on-orbit software maintenance for spacecraft command and data handling (C&DH) and attitude control systems (ACS), and instrument payloads. The Sr. Flight Software Engineer shall work with flight hardware engineers to define flight segment requirements, interface control documents, simulators, prepare and present design review (PDR/CDR) material. The Sr. Flight Software Engineer shall conduct internal software design reviews and monitor flight software development.	Ten years of related professional experience in flight software systems development for spacecraft/aircraft and/or space borne/airborne instruments. A Bachelor of Science degree, or equivalent education and experience, in computer sciences, electrical engineering, mathematics.
42	Flight Operations Systems Engineer	Supports the development, operations and maintenance of mission or science operations control centers for spacecraft/instrument command and control, telemetry data processing and analysis.	Works with the flight and ground systems developers prelaunch to specify the operations requirements, integrate and test the flight and ground systems. The Flight Operations Systems Engineer shall work with the operations and maintenance personnel postlaunch to enhance the control centers, and assist in anomaly resolution.	Five years of related professional experience in operations of mission or sciences operations control centers. A Bachelor of Science degree, or equivalent education and experience, in engineering, mathematics or physics.
43	Junior Software Engineer	Provides software project development support including the coding of software modules and the documentation of same.	Develops code in accordance with applicable requirements documentation and must also be able to document and maintain existing software systems.	One year professional experience related to programming and software systems. A Bachelor of Science degree, or equivalent education and experience, in Computer Science, Mathematics, or Engineering.
44	Software Engineer	Develops code in accordance with applicable requirements documentation as well as develops test plans for software system verification and acceptance.	Develops code and test plans as well as provides computer systems and facilities management support.	Four years professional experience with 3 years of directly related experience in programming and software systems. A Software Engineer must have experience providing software project development support including the generation of software specifications, analysis of software systems, coding of software modules, interfacing and coding of communication/network subsystems, and generation of related documentation. A Bachelor of Science degree, or equivalent education and experience, in Computer Science, Mathematics, or Engineering from an accredited institution.



No.	Position	Scope	Responsibilities	Position Qualifications
45	Senior Software Engineer	Provides software project development support.	Includes the management of software specifications, analysis of software systems, coding of software modules, integration of hardware and software systems, and generation of related documentation. A Senior Software Engineer will also be responsible for systems software and facilities management efforts.	Ten years professional experience with a minimum of 7 years of directly related experience in programming and software systems. The Senior Software Engineer must have discipline specific expertise in one or more of the following areas: Robotics Control Real-Time Processes and Controls Space Flight Data Systems Systems and Systems Drivers Programming Communication/Network System and Subsystems A Bachelor of Science degree in Computer Science, Mathematics, or Engineering.
46	Senior Electrical Engineer	Directs or performs analysis, design, fabrication, test and integration of electrical Systems for ground support and space borne applications including magnetic, electromagnetic and electronic components and subsystems.	Interprets system level requirements as they apply to the development of electrical systems and components, identifies design alternatives and performs trade-off studies, error budget, sensitivity, reliability, failure mode and worst case analysis to determine the optimum approach for the design, and to predict performance of the system for the expected operational and environmental conditions. Supports the development of models that describe the behavior and performance of the actuators and sensors, together with the associated controller, drive, command and telemetry electronics that are required for the analysis and design of the control system. Designs or performs test sequences to measure and characterize the performance of electrical components and systems, and, subsequently, analyzes and interprets the test results and prepares summary reports.	This position requires a minimum of 10 years of experience in the analysis, design and development of electrical and electronic systems for space borne applications including hands-on work in the fabrication, ground test and integration and on-orbit operation of flight hardware. Experience the analysis, design and test of analog and digital circuitry for the measurement and control of thermal and electromechanical systems using continuous or sampled data techniques; including the use of programmable logic arrays, software development and hardware interfacing in microprocessor based systems. Experience in analysis and design of control systems, the operation and interfacing to the spacecraft's command and telemetry and power subsystems, sensors and actuators. Experience in the design of electronic instrumentation systems from the standpoint of grounding, shielding and Electromagnetic Compatibility (EMC); component ratings, performance limitations and the effects of cosmic radiation; and the modeling and management of the thermal effects that result from the power dissipation in electrical components. Experience in the use of electronic instrumentation and test equipment and of computer aided analysis, design and simulation tools such as PSpice™, ELECTRO™, MAGNETO™, COULOMB™, and AMPERE™. A Bachelor of Science degree in Engineering, physics or mathematics is required.



No.	Position	Scope	Responsibilities	Position Qualifications
47	Electrical Engineer (Analog)	Performs the analysis, design, fabrication, test and integration of electronic components and systems for ground support and space borne applications with emphasis in the area of analog circuit design.	Performs trade-off studies, noise, sensitivity, reliability, failure mode and worst-case performance analysis to design and optimize electronic circuits and systems to meet the functional specifications and perform over the expected range of environmental conditions. Supports the development of models that describe the behavior and performance of the actuators and sensors, together with the sensor conditioning, and the actuator drive and control electronics. Designs or performs test sequences to measure and characterize the performance of electronic components and systems, and subsequently analyzes and interprets the test results and prepares summary reports.	This position requires a minimum of 5 years of experience with emphasis in the analysis, design and development of circuits for analog signal processing and power electronics as they apply to the measurement and control of space borne thermal and electromechanical systems. Experience should include the design of precision, low noise electronics including analog-to-digital and digital to analog conversion circuitry. Must be an expert in the use of electronic test equipment and computer tools such as PSpice™, for the design and analysis of analog circuits. Knowledge of logic circuit design, microprocessors, feedback systems, sensors and actuators, and the operation and interfacing to the spacecraft's command and telemetry and power subsystems is required. Experience must also include hands-on work in the fabrication, testing, integration and on-orbit operation of flight electronic hardware. A Bachelor of Science degree in engineering, physics or mathematics is required.
48	Electrical Engineer (Digital)	Performs the analysis, design, fabrication, test and integration of electronic components and systems for ground support and space borne applications with emphasis in the area of digital and microprocessor based electronics design.	Performs hardware and software trade-off studies, timing, reliability, failure mode and worst case analysis to determine and optimize digital electronic circuits and systems to meet the functional specifications and perform over the expected range of environmental conditions. Supports the development of models that describe the behavior and performance of the actuators and sensors, together with the associated command, telemetry and control electronics. Designs or performs test sequences to measure and characterize the performance of electronic components and systems, and subsequently analyzes and interprets the test results and prepares summary reports.	This position requires a minimum of 5 years of experience with emphasis in the analysis, design and development of digital and microprocessor based electronic systems as they apply to the measurement and control of space borne thermal and electromechanical systems. Experience should include the design, development and testing of microprocessor code for processing digital data in real time. Must be an expert in the use of electronic test equipment and of computer tools such as ViewLogic YK™, for the design and analysis of digital circuits. Knowledge of analog circuit design including analog to digital and digital to analog conversion circuitry, feedback systems, sensors and actuators, and the operation and interfacing to the spacecraft's command and telemetry and power subsystems is required. Experience must also include hands-on work in the fabrication, testing, integration and on-orbit operation of flight electronic hardware. A Bachelor of Science degree in engineering, physics or mathematics is required.
49	Senior Electromechanical Systems Engineer	Directs and performs conceptual and detailed analytical studies for the design, optimization and performance verification of electronic, electromechanical, and thermal control systems.	Provides the technical expertise to perform and direct the analysis, design, and specification of control systems in response to task requirements. This includes the selection and modeling of actuators and sensors for feedback control systems, the use of classical and modern control techniques in the analysis of linear and non-linear feedback systems, an understanding of how to use test data and simulation results to verify system performance, extract model parameters, estimate margins and sensitivities to parameter variations, and predict performance in the disturbance environment of on-orbit operation.	This position requires a minimum of 10 years experience in the analysis and design of space flight control systems. This experience should include hands-on work with flight hardware at all stages of development, design, build, test, qualification, and on-orbit operation. Emphasis should be placed on an understanding of control/structure interaction, and performance in the presence of jitter. This position also requires expertise in the modeling of mechanical, electronic, electromechanical, and thermal control systems using tools such as MATLAB™. A Bachelor of Science degree in Engineering, Mathematics or Physics is required.



No.	Position	Scope	Responsibilities	Position Qualifications
50	Electromechanical Systems Engineer	Performs conceptual and detailed analytical studies for the design, optimization and performance verification of electronic, electromechanical, and electro-mechanical control systems.	Provides the technical expertise to perform the analysis, design, and specification of control systems in response to task requirements. This includes the selection and modeling of actuators and sensors for feedback control systems, the use of classical and modern control techniques in the analysis of linear and nonlinear feedback systems, an understanding of how to use test data and simulation results to verify system performance, extract model parameters, estimate margins and sensitivities to parameter variations, and predict performance in the disturbance environment of on-orbit operation.	This position requires a minimum of 5 years experience in the analysis and design of space flight control systems. Emphasis should be placed on an understanding of control structure interaction and performance in the presence of jitter, and hands-on experience in the modeling of mechanical, electronic, and electromechanical control systems using tools such as MATLAB™. A Bachelor of Science degree in Engineering, Mathematics or Physics is required.
51	Senior Test and Integration Engineer	Directs and performs the operations required in the test and integration of electronic, electromechanical, and thermal systems.	Provides the technical expertise to perform and direct the test and integration of thermal, electronic, and electromechanical systems and subsystems in response to task requirements. This includes the design, fabrication, and operation of ground support equipment (both electronic GSE, and mechanical test fixtures), the design of test sequences, the specification of pass/fail criteria, and the generation of test procedures. This position requires expertise in determining test methodologies, specifying the instrumentation (e.g. accelerometers, thermistors), and test equipment (e.g. DSA's, Laser ranging interferometers) necessary for test directing the test, and subsequently analyzing the resulting data (statistically, in the time and frequency domain) and preparing summary reports. This requires expertise in operation of various test equipment, and instrumentation sensors, and in the manipulation and processing of resultant data. Tests will often involve measuring system or subsystem performance over temperature, and in the presence of a disturbance environment.	This position requires a minimum of 10 years experience in the test and integration of space flight mechanical, electronic, electromechanical, and thermal systems. This experience should include hands-on work with flight hardware at all stages of development, design, build, test, qualification, and on-orbit operation. Emphasis should be placed on an understanding of control/structure interaction, and performance in the presence of jitter. This position also requires expertise in the collection, manipulation and interpretation of test data. A Bachelor of Science degree in Engineering, Mathematics or Physics is required.
52	Test and Integration Engineer	Performs the operations required in the test and integration of electronic, electromechanical, and thermal systems.	Provides the technical expertise to perform the test and integration of thermal, electronic, and electromechanical systems and subsystems in response to task requirements. This includes the design, fabrication, and operation of ground support equipment (both electronic GSE, and mechanical test fixtures), the design of test sequences, the specification of pass/fail criteria, and the generation of test procedures. This position requires expertise in determining test methodologies, specifying the instrumentation (e.g. accelerometers, thermistors), and test equipment (e.g. DSA's, laser ranging interferometers) necessary for test directing the test, and subsequently analyzing the resulting data (statistically, in the time and frequency domain) and preparing summary reports. This requires expertise in operation of various test equipment, and instrumentation sensors, and in the manipulation and processing of resultant data. Tests will often involve measuring system or subsystem performance over temperature, and in the presence of a disturbance environment.	This position requires a minimum of 3 years experience in the test and integration of space flight mechanical, electronic, electromechanical, and thermal systems. This experience should include hands-on work with flight hardware. Emphasis should be placed on an understanding of control/structure interaction, and performance in the presence of jitter, and in the collection, manipulation and interpretation of test data. A Bachelor of Science degree in Engineering, Mathematics or Physics is required.
53	Test and Integration Technician	Supports the Test and Integration Engineer in the test and integration of electronic, electromechanical, and thermal systems.	Under the direction of Test and Integration Engineer, provides support in the test and integration of thermal, electronic, and electromechanical systems and subsystems in response to task requirements. This includes the breadboarding of test electronics, the fabrication of test harnesses, the interfacing and operation of various test hardware, instrumentation, and equipment, and the documentation of test sequences, and test procedures. It also includes the ability to read and interpret schematics, and efficiently operate computers including the ability to write simple programs.	This position requires a minimum of 5 years experience in the test and integration of space flight hardware. This position requires experience and NASA approved verification in soldering, wire wrapping, handling ESD sensitive parts, and contamination control. This position requires a minimum of 1 year of education in an engineering technical program; it also requires knowledge of engineering terms and units and computer analysis techniques.



No.	Position	Scope	Responsibilities	Position Qualifications
54	Manufacturing Engineer	Provide insight/oversight in the manufacturing and assembly areas.	Define assembly sequence and procedures for complete manufacturing of space qualified hardware. Document all manufacturing aids and controls. Resolve technical and/or operational situations as they arise and continually monitor manufacturing and assembly for conformance to required specifications.	Five years experience in development, manufacturing, assembly and qualification of aerospace hardware. Knowledge of existing assembly techniques and various Military and Industry specifications. Experience with techniques and procedures for assembly and inspection. A Bachelor of Science Degree in an appropriate engineering discipline or related physical science degree.
55	Senior Product Assurance Engineer	To establish, maintain, and coordinate appropriate product assurance system(s) and disciplines in compliance with requirements specified in individual task assignments.	Prepare, maintain, and implement Performance Assurance Implementation Plans (PAIP) in compliance with requirements. Coordinate all applicable performance assurance activities including testing, system safety, EEE parts program, materials assurance, reliability, quality assurance, contamination control, and software assurance. Provide required performance assurance (PA) documentation and prepare PA status reports.	Eight years related experience in product assurance. Knowledge of product assurance disciplines as defined in the NASA Handbooks (NHB 5300.4 series). Ability to coordinate activities of personnel in associated performance assurance disciplines (EEE pans, materials, safety, reliability, etc.). A Bachelor of Science Degree in Engineering or an appropriate physical science.
56	Quality Assurance Specialist	To inspect flight hardware, flight support equipment, spares, and engineering units for compliance with the requirements of the applicable documents that are specified in the individual task assignments.	Verify that the hardware, pans, and materials are in compliance with the procurement documents and engineering drawings. Ensure that hardware, pans, and materials are being handled and stored properly to prevent degradation and/or damage. Ensure compliance with the configuration control plan, and verify the configuration of the deliverable hardware. Ensure the processes pertaining to soldering, crimping, conformal coating, electronic welding, stitch-wire welding, structural welding, etc., are being complied with by the fabricator and/or operator.	Experience in all aspects of mechanical and electrical fabrication, receiving, and shipping inspection. Must have 3 years experience in quality control pertaining to aerospace hardware and/or systems. Thorough knowledge of quality assurance activities as defined in the NASA Handbooks (NHB 5300.4 series) and ability to implement the requirements with minimal supervision. Must be certified to the requirements of NHB 5300.4 (3A-2).
57	Computer Systems Engineer	Plans and controls the use of computing resources.	Computing Resources includes general purpose computers and peripherals, work stations, and Local Area Networks, software operating systems, software development tools and packages. Coordinates maintenance and upgrades to the computer hardware and software operating systems.	Five years of computer systems experience in a complex software environment with multiple computer systems and operating systems in a Local Area Network, and must have knowledge of software engineering principles. A Bachelor of Science degree, or equivalent education and experience, in computer sciences, mathematics, or engineering.
58	Radiation Engineer	Identifies potentially susceptible components and perform radiation calculations to determine expected exposure levels based on hardware configuration and shielding, mission duration, and orbit/altitude of spacecraft.	Determines probability of single event upset and partial or catastrophic failures due to calculated levels of exposure. Conducts parts evaluation and selection based on expected radiation dose levels and durations and reliability requirements. Oversees the Radiation Technician in performance of radiation testing including determining test levels and exposure durations and reviewing and interpreting all test results and conclusions and writing test reports.	Four years of professional experience and a minimum of 3 years of experience directly related to design and development of space radiation hardened components and systems. A Bachelor of Science degree, or equivalent education and experience, in electrical engineering or physics.



No.	Position	Scope	Responsibilities	Position Qualifications
59	Radiation Technician	Carries out detector calibration and performance tests, develop test fixtures, setup test hardware, prepare flight hardware for testing, and perform testing and test data analysis and test report writing.	Must be well acquainted with critical space hardware cleanliness requirements and contamination control in the handling and protection of detector devices and subsystems in clean room and laminar flow bench environments, and be ESD cognizant, trained and certified to handle flight hardware. Is familiar with optical alignment techniques, integrating spheres, broad band and single line light sources, monochrometers, optical filters, proper soldering techniques, appropriate bonding materials and methods, cryogenic and vacuum equipment, high and low voltage power supplies, and other electronic and computer interface equipment.	Five years of experience with laboratory test equipment such as light sources including lasers, monochrometers, calibrated detector systems, integrating spheres, and electronic support and test equipment. An Associate's degree, or equivalent education and experience, in Electronics or Electro-Optics
60	Reliability Engineer	To provide reliability engineering support to aerospace hardware development programs.	Perform reliability engineering tasks related to Flight hardware development programs which includes reliability and circuit design analysis such as FMEA, Fault Tree Analysis, and circuit stress analysis; detailed review of hardware designs and participation in design reviews; critical item identification and control; and definition of requirements for, and evaluation of, reliability programs of other GSFC hardware contractors.	At least 4 years experience in reliability engineering. Thorough knowledge of the NASA reliability engineering program requirements as defined by NHB 5300.4(A) and the ability to perform reliability analyses (i.e., reliability prediction, FMEA, etc.) normally required for aerospace programs. A Bachelor of Science Degree in an appropriate field of engineering or physical science.
61	Parts Engineer	Plan and implement an Electrical, Electronic, and Electromechanical (EEE) Parts Control Program in accordance with the requirements of the individual task assignment.	Establish and maintain an EEE Parts Control program. Procure, inspect, screen, qualify, and store EEE parts. Generate test specifications, NSP ARS, and part identification list per the requirements of the applicable task assignment.	This position requires a minimum of 3 years experience in the aerospace industry, with demonstrated technical expertise in parts engineering. A Bachelor of Science Degree in electrical engineering Four (5) years related experience in parts engineering. Knowledge of the requirements in GSFC PPL, Mil-Std-875, MIL-M-38510, Mil-S-19500, and Mil-Std-883C.
62	Materials Engineer	Plans and implements a comprehensive Materials and Processes Program in accordance with the specific task assignment.	Ensures the safety and success of the mission by the appropriate selection, processing, inspection, and testing of the materials employed to the operational requirement of the application. Generates and maintains materials lists per the requirements of the task. Issues Material Usage Agreements for government approval, when applicable.	This position requires a minimum of 3 years experience in the aerospace industry with demonstrated technical expertise in materials engineering. A Bachelor of Science Degree in materials engineering or related field.

FINANCIAL MANAGEMENT REPORTING REQUIREMENTS

General

Financial Management Reports shall be submitted by the Contractor on the NASA 533 series reports, in accordance with the instructions on the reverse of the forms, NASA Procedures and Guidelines NPR 9501.2D entitled, "NASA Contractor Financial Management Reporting," effective date May 23, 2001, and additional instructions issued by the Contracting Officer.

a. Level of Detail

The Contractor's 533 reports shall contain a summary of total contract costs, as well as a separate 533 sheet for each Task Order. The reports shall contain a breakdown of each area by element of cost, i.e. direct labor hours/dollars (by category), overhead, general & administrative (G&A), travel, equipment, material, and other direct costs.

The government reserves the right to require a lower level of 533 reporting for particular task orders on a case by case basis as specified by the Contracting Officer. The purpose of this is to allow the government to separate costs on task orders that support multiple WBS elements on in-house instruments and/or missions.

b. Distribution

The Contractor shall distribute 533 reports to each addressee indicated in the Basic Contract Clause G.1 FINANCIAL MANAGEMENT REPORTING. These reports shall be distributed no later than the fifteenth (15) calendar day following the month being reported.

c. Reporting Requirements

Each report shall provide cost data for reporting categories presented below:

Direct Labor Hours

Onsite

(List applicable labor categories)

Offsite

(List applicable labor categories)

Direct Labor Dollars

Onsite

(List according to applicable labor categories)

Offsite

(List according to applicable labor categories)

Total Direct Labor Hours On-site
Total Direct Labor Hours Off-site
Total Prime's Hours
Teaming Subcontractor Hours
Subcontractor Hours
Total Labor Hours

Total Direct Labor Onsite
Total Direct Labor Offsite

Total Onsite Overhead
Total Offsite Overhead
Total Overhead Prime
Other Direct Costs
 Material
 Subcontractors
 Travel
 Miscellaneous
 Total ODC's

Subtotal (Direct Cost plus Overhead)

Team Member Costs

Subcontractor Administration Charge

G&A Expense

Total Cost

Award Fee

Total Cost Plus Award Fee (CPAF)

The 533 for each task order shall report direct labor hours by category.

d. Other Special Reports

The Contractor shall submit, as required, special cost or manpower reports either in the areas of actuals, projections or both. These reports may take the form of labor, overhead, other direct charges, billing analyses or other business information. When required, specific instructions will be provided by the Contracting Officer.

e. Additional Requirements

1. Before the summary 533 sheet, the Contractor shall submit a financial summary containing a one-line summary for all tasks on the contracts. It shall include the following columns:

- Task Number
- Status
- Cumulative to Date Actual \$
- Cumulative to Date Actual \$ Plus Month 1 planned \$
- Contractor Estimate \$
- Cumulative to Date Planned Hours
- Cumulative to Date Actual On-site Hours
- Cumulative to Date Actual Off-site Hours (Including Subs)

2. In addition to the hardcopy of the summary sheet, the Contractor shall provide the summary sheet in an e-mail file or on a CD as a comma-delimited text file. Below are the requirements:

The contractor cost data for import into the CORTS2 application will come from the contractor as a comma-delimited text file. The file should be saved as the name of ContractorCost.txt. The lay out of the import file is shown in the table below.

Only one contract can be included in one import file.

The contractor cost data can be loaded from the file either in the CORTS2 director of the C drive or in the CD Drive (E:\)

Two types of data will be included in the import file: column title and column data.

Column titles must be provided in the first row for each data column in the import file. The name and order of each column title must be exactly the same as illustrated in the "Column Title in File" column in the table below, with a comma as a delimiter. Please note that the data for the Contract Number and Task Number must be within double quotes to indicate that they are text data. In the event of no data, enter the default data as specified in the table.

Two tables will be updated in CORTS2: Task Summary and Task Information.

The Report Ending Date is in the MM/YYYY format and must be the previous month of the current import date. If it's not, no data will be imported into CORTS2.

When task number exists, the task will be treated as an existing task and the associated task summary amount fields will be overwritten with the corresponding amounts in the import file. The prorated rules will then be applied to all task detail records. Please see the attached Import Scenarios for detail.

When a task number does not exist, a new task summary record and associated task detail record will be created as described in the Import Scenarios as attached.

No deletion will be performed in this process.

Data Element Name	Column Title In File	Type	Size	Value (0-optional, 9-	Mandatory	Default	Comments
Report Ending Date	ReportDate	Text	7	99/9999	Yes		Must be the previous month of the current import date.
Contract Number	ContractNo	Text	5	99999	Yes		
Task Number	TaskNumber	Text	7	0009.0	Yes		
Cumulative Cost	CumCost	Integer	9	000000000	No	0	
Accrued Cost	AccruedCost	Integer	9	000000000	No	0	
Cost Estimate	CostEstimate	Integer	9	000000000	No	0	
Hours Estimated	EstHours	Integer	9	000000000	No	0	
On Site Hours	OnSiteHours	Integer	9	000000000	No	0	
Off Site Hours	OffSiteHours	Integer	9	000000000	No	0	

The contractor will use the Task Order Management System (TOMS) for submitting individual task Contractor Task Plans in PDF format and possibly individual task 533's in the future.

THIS DD FORM 254 IS FOR PRE-AWARD PURPOSES ONLY – "DRAFT"				1. CLEARANCE AND SAFEGUARDING	
DEPARTMENT OF DEFENSE CONTRACT SECURITY CLASSIFICATION SPECIFICATION (The requirements of the DoD Industrial Security Manual apply)				a. FACILITY CLEARANCE REQUIRED	
				SECRET	
				b. LEVEL OF SAFEGUARDING REQUIRED	
				None	
2. THIS SPECIFICATION IS FOR: (X and complete as applicable)			3. THIS SPECIFICATION IS: (X and complete as applicable)		
X	a. PRIME CONTRACT NUMBER		a. ORIGINAL (Complete date in all cases)		Date (YYMMDD)
	NNG07CA21C				
	b. SUBCONTRACT NUMBER		b. REVISED (Supersedes all previous specs)		Revision No.
				Date (YYMMDD)	
c. SOLICITATION OR OTHER		Due Date (YYMMDD)	FINAL (Complete Item 5 in all cases)		Date (YYMMDD)
4. IS THIS A FOLLOW-ON CONTRACT?			NO. If Yes, complete the following:		
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO					
Classified material received or generated under <u>NAS5-01090</u> (Preceding Contract Number) are transferred to this follow-on contract.					
5. IS THIS A FINAL DD FORM 254?			NO. If Yes, complete the following:		
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO					
In response to the contractor's request dated _____, retention of the classified material is authorized for the period _____					
6. CONTRACTOR (Include Commercial and Government Entity (CAGE) Code)					
a. NAME, ADDRESS, AND ZIP CODE		b. CAGE	c. COGNIZANT SECURITY OFFICE (Name, Address, and Zip)		
SGT, Inc. 7701 Greenbelt Rd, Suite 400 Greenbelt, MD 20770		1DDX3	Defense Security Service		
7. SUBCONTRACTOR					
a. NAME, ADDRESS, AND ZIP CODE		b. CAGE	c. COGNIZANT SECURITY OFFICE (Name, Address, and Zip)		
8. ACTUAL PERFORMANCE					
a. LOCATION		b. CAGE	c. COGNIZANT SECURITY OFFICE (Name, Address, and Zip)		
Greenbelt, MD					
9. GENERAL IDENTIFICATION OF THIS PROCUREMENT					
Mechanical Systems Engineering Services (MSES II/A) provides mechanical systems and engineering services and technology development in order to design, analyze, fabricate, integrate, test and launch advanced scientific instruments for GSFC spacecraft programs.					
10. CONTRACTOR WILL REQUIRE ACCESS TO:		YES	NO	11. IN PERFORMING THIS CONTRACT, THE CONTRACTOR	
a. COMMUNICATIONS SECURITY (COMSEC) INFORMATION		X		a. HAVE ACCESS TO CLASSIFIED INFORMATION ONLY AT ANOTHER CONTRACTOR'S FACILITY OR A GOVERNMENT ACTIVITY	
b. RESTRICTED DATA			X	b. RECEIVE CLASSIFIED DOCUMENTS ONLY	
c. CRITICAL NUCLEAR WEAPON DESIGN INFORMATION			X	c. RECEIVE AND GENERATE CLASSIFIED MATERIAL	
d. FORMERLY RESTRICTED DATA			X	d. FABRICATE, MODIFY, OR STORE CLASSIFIED HARDWARE	
e. INTELLIGENCE INFORMATION				e. PERFORM SERVICES ONLY	
(1) Sensitive Compartmented Information (SCI)			X	f. HAVE ACCESS TO U.S. CLASSIFIED INFORMATION OUTSIDE THE U.S., PUERTO RICO, U.S. POSSESSIONS AND TRUST TERRITORIES	
(2) Non-SCI			X	g. BE AUTHORIZED TO USE THE SERVICES OF DEFENSE TECHNICAL INFORMATION CENTER (DTIC) OR OTHER SECONDARY DISTRIBUTION CENTER	
f. SPECIAL ACCESS INFORMATION			X	h. REQUIRE A COMSEC ACCOUNT	
g. NATO INFORMATION			X	i. HAVE TEMPEST REQUIREMENTS	
h. FOREIGN GOVERNMENT INFORMATION			X	j. HAVE OPERATIONS SECURITY (OPSEC) REQUIREMENTS	
i. LIMITED DISSEMINATION INFORMATION			X	k. BE AUTHORIZED TO USE THE DEFENSE COURIER SERVICE	
j. FOR OFFICIAL USE ONLY INFORMATION		X		l. OTHER (Specify)	
k. OTHER (Specify)					

12. PUBLIC RELEASE Any information (classified or unclassified) pertaining to this contract shall not be released for public dissemination except as provided by the Industrial Security Manual unless it has been approved for public release by appropriate U.S. Government authority. Proposed public releases shall be submitted for approval prior to release

Direct Through (Specify)

NASA/GODDARD SPACE FLIGHT CENTER 130/PUBLIC AFFAIRS OFFICE GREENBELT, MD 20771

CC To the Public Affairs Division, NASA Headquarters, Washington, D.C. 20546 for review.

13. SECURITY GUIDANCE. The security classification guidance needed for this classified effort is identified below. If any difficulty is encountered in applying this guidance or if any other contributing factor indicates a need for changes in this guidance, the contractor is authorized and encouraged to provide recommended changes; to challenge the guidance or the classification assigned to any information or material furnished or generated under this contract; and to submit any questions for interpretation of this guidance to the official identified below. Pending final decision, the information involved shall be handled and protected at the highest level of classification assigned or recommended. (Fill in as appropriate for the classified effort. Attach, or forward under separate correspondence, any documents/guides/extracts referenced herein. Add additional pages as needed to provide complete guidance.)

In performance of this contract, some personnel may require access to classified information up to and including the SECRET level. The contract must have a sufficient number of cleared employees assigned duties under this contract to be able to complete all classified work assignments up to and including SECRET.

1. DoD 5220.22-M National Industrial Security Program Operating Manual (NISPOM)
2. DoD 5220.22-M COMSEC Annex to the NISPOM (Coordination Copy)
3. NCSC-1 – National Policy for Safeguard and Control of COMSEC Material Communications Security Classification Guide, 1/8/87
4. NASA Space Network Security Classification Guide, 9/16/96 (currently under revision)
5. GHB 1600.1A GSFC Security Manual (and all subsequent revisions)
6. NPR 1600.1, NASA Security Program Procedural Requirements w/Change 1, 11/8/05
7. NPD 1600.2D, NASA Security Policy Revalidated 2/1/06
8. NPD 1660.1, NASA Counterintelligence (CI) Policy 2/27/02
9. NPR 1660.1, NASA Counterintelligence (CI)/Counterterrorism (CT) Procedural Requirements 12/21/04
10. NPR 2810.1, NASA Security of Information Technology, Revalidated 8/12/04
11. NPD 2810.1C, NASA Information Security Policy 4/7/04
12. OMB Circular A.130 Appendix III, Security of Federal Automated Information Resources
13. Computer Security Act of 1987, as amended

14. ADDITIONAL SECURITY REQUIREMENTS. Requirements, in addition to ISM requirements, are established for this contract. (If Yes, identify the pertinent contractual clauses in the contract document itself, or provide an appropriate statement which identifies the additional requirements. Provide a copy of the requirements to the cognizant security office. Use Item 13 if additional space is needed.) Yes No

15. INSPECTIONS. Elements of this contract are outside the inspection responsibility of the cognizant security office. (If Yes, explain and identify specific areas or elements carved out and the activity responsible for inspections. Use Item 13 if additional space is needed.) Yes No

16. CERTIFICATION AND SIGNATURE. Security requirements stated herein are complete and adequate for safeguarding the classified information to be released or generated under this classified effort. All questions shall be referred to the official named below.

<p>a. TYPED NAME OF CERTIFYING OFFICIAL Pamela A. Starling</p>	<p>b. TITLE Industrial Security Specialist</p>	<p>c. TELEPHONE (Include Area Code) 301-286-6865</p>												
<p>d. ADDRESS (Include Zip Code) NASA Goddard Space Flight Center Code 240 Greenbelt, MD 20771</p>	<p>17. REQUIRED DISTRIBUTION</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 20px; text-align: center;"><input checked="" type="checkbox"/></td><td>a. CONTRACTOR</td></tr> <tr><td style="text-align: center;"><input checked="" type="checkbox"/></td><td>b. SUBCONTRACTOR</td></tr> <tr><td style="text-align: center;"><input checked="" type="checkbox"/></td><td>c. COGNIZANT SECURITY OFFICE FOR PRIME AND SUBCONTRACTOR</td></tr> <tr><td style="text-align: center;"><input type="checkbox"/></td><td>d. U.S. ACTIVITY RESPONSIBLE FOR OVERSEAS SECURITY ADMINISTRATION</td></tr> <tr><td style="text-align: center;"><input checked="" type="checkbox"/></td><td>e. ADMINISTRATIVE CONTRACTING OFFICER</td></tr> <tr><td style="text-align: center;"><input checked="" type="checkbox"/></td><td>f. OTHERS AS NECESSARY NASA Headquarters, Code OSPP</td></tr> </table>		<input checked="" type="checkbox"/>	a. CONTRACTOR	<input checked="" type="checkbox"/>	b. SUBCONTRACTOR	<input checked="" type="checkbox"/>	c. COGNIZANT SECURITY OFFICE FOR PRIME AND SUBCONTRACTOR	<input type="checkbox"/>	d. U.S. ACTIVITY RESPONSIBLE FOR OVERSEAS SECURITY ADMINISTRATION	<input checked="" type="checkbox"/>	e. ADMINISTRATIVE CONTRACTING OFFICER	<input checked="" type="checkbox"/>	f. OTHERS AS NECESSARY NASA Headquarters, Code OSPP
<input checked="" type="checkbox"/>	a. CONTRACTOR													
<input checked="" type="checkbox"/>	b. SUBCONTRACTOR													
<input checked="" type="checkbox"/>	c. COGNIZANT SECURITY OFFICE FOR PRIME AND SUBCONTRACTOR													
<input type="checkbox"/>	d. U.S. ACTIVITY RESPONSIBLE FOR OVERSEAS SECURITY ADMINISTRATION													
<input checked="" type="checkbox"/>	e. ADMINISTRATIVE CONTRACTING OFFICER													
<input checked="" type="checkbox"/>	f. OTHERS AS NECESSARY NASA Headquarters, Code OSPP													
<p>e. SIGNATURE </p>														

Any employee, who observes or becomes aware of the deliberate or suspected compromise of classified national security information, shall promptly report such information personally to the GSFC Counterintelligence (CI) Office. If sensitive but unclassified (SBU) information appears compromised by or on behalf of foreign or domestic powers, organizations or persons, employees shall report such information to the GSFC CI Office. If an employee becomes aware of information pertaining to international or domestic terrorist activities, employees shall also report to the GSFC CI Office. If the information indicates a computer compromise or other cyber intrusion, the Office of Inspector General shall be promptly notified.



APPENDIX D

SGT

Safety and Health Plan

for

***Mechanical Systems Engineering Services
(MSES II/A)***

October 3, 2006

This Safety and Health Plan for MSES II/A will be implemented as approved by the Government. I will take personal responsibility for its implementation, and the enforcement of safety and health program requirements. SGT will not invalidate the integrity of any MSES II/A safety systems without proper authorization. I will ensure that this Plan and the requirement for maintaining the integrity of MSES II/A safety systems are flowed down to all subcontractors/suppliers with task value over \$500,000 or where subcontracting efforts meet the conditions of NFS 1852.223-70(g).

A handwritten signature in black ink, appearing to read "Andrew S. Endal".

Andrew S. Endal

SGT MSES II/A Program Manager



TABLE OF CONTENTS

INTRODUCTION D-1

APPLICABLE DOCUMENTS D-4

1. MANAGEMENT LEADERSHIP AND EMPLOYEE PARTICIPATION D-4

1.1 POLICY D-4

1.2 GOALS AND OBJECTIVES D-5

1.3 MANAGEMENT LEADERSHIP D-6

1.4 SGT TEAM MSES II/A EMPLOYEE INVOLVEMENT/RESPONSIBILITIES D-6

1.5 ASSIGNMENT OF RESPONSIBILITY D-7

1.6 PROVISION OF AUTHORITY D-9

1.7 ACCOUNTABILITY D-9

1.8 PROGRAM EVALUATION D-9

1.9 GOVERNMENT INSIGHT D-9

1.10 GOVERNMENT ACCESS TO SAFETY AND HEALTH PROGRAM DOCUMENTATION D-10

1.11 REVIEW OF SAFETY REQUIREMENTS D-11

1.12 PROCUREMENT D-11

2. WORKPLACE ANALYSIS D-11

2.1 HAZARD IDENTIFICATION D-11

2.2 INSPECTIONS D-14

2.3 EMPLOYEE REPORTS OF HAZARDS D-14

3. MISHAP INVESTIGATION AND RECORD ANALYSIS D-15

3.1 MISHAP INVESTIGATION D-15

3.2 TREND ANALYSIS D-16

4. HAZARD PREVENTION AND CONTROL D-16

4.1 APPROPRIATE CONTROLS D-16

4.2 FACILITIES BASELINE DOCUMENTATION D-21

4.3 PREVENTIVE MAINTENANCE D-21

4.4 MEDICAL PROGRAM D-21

5. EMERGENCY PREPAREDNESS AND RESPONSE D-22

6. SAFETY AND HEALTH TRAINING D-24

Attachment 1 Program Evaluation Profile D1-1

Attachment 2 Hazardous Material Identification and Material Safety Data D2-1

Attachment 3 Facility Inspection Items D3-1

Attachment 4 NASA Form 1627 D4-1

Attachment 5 SGT Safety Briefing Materials D5-1

Attachment 6 Sample Safety and Health Training Curriculum D6-1

FIGURES

D-1. SGT Team MSES II/A Organization D-7

D-2. GSFC's and SGT's Safety Philosophy Summary D-25



TABLES

D-1. SGT S&H Plans Prepared In Accordance With NASA and GSFC Requirements	D-2
D-2. Selected MSES Facility Safety Assessment	D-12
D-3. Job Hazard Analysis	D-13
D-4. Risk Assessment Code.....	D-17
D-5. Hazard Analysis/Control Responsibilities	D-18

**APPENDIX D. SAFETY AND HEALTH PLAN (SUBFACTOR D)****A Note From the President of SGT**

We believe that our employees are our most important asset and their safety is our most important responsibility. It is our policy to provide a safe and healthy work environment for our employees whether they are in SGT, other company, or Government work spaces. Our responsibility is to ensure that safe practices and a safe work environment are established and maintained for the protection of our employees, their co-workers, government workers, other contractors, and guests. We take this responsibility most seriously as evidenced by SGT's superior safety record since our founding. As President of SGT, I give you my personal commitment that I will ensure that SGT continues to emphasize safety as a top priority and a value. The following Safety and Health Plan is SGT's blueprint for carrying out that commitment.

-Harold S. Stinger

INTRODUCTION**Compliance with Health and Safety Plan Requirements**

SGT has developed this Safety and Health (S&H) Plan for the Mechanical Systems Engineering Services (MSES II/A) contract in accordance with the requirements of NPR 8715.3, NASA Safety Manual, and in particular Appendix H of that document, which serves as the outline/structure of our S&H Plan. Our S&H Plan also addresses the MSES II/A RFP Clause H.5, Safety and Health – Additional Requirements; Clause I.4, Hazardous Material Identification and Material Safety Data; Clause I.5, Notice of Radioactive Materials; L.10, Safety and Health Plan; L.14.3.D, Safety and Health; the AETD Safety Program Plan (500-PG-8715.1.2); and the Mechanical Systems Division Safety Manual, Volume II (540-PG-8715.1.2A). We have coordinated our plan development with the GSFC Safety and Environmental Division (Code 250). Table D-1 maps our approach to the RFP requirements, including elements identified by GSFC safety personnel as key to a compliant S&H Plan. SGT has also served as on-site GSFC Alternate Facility Operations Managers (FOMs) and Building Fire Wardens and is a member of the GSFC Contractor Safety Forum. Thus we are able to properly integrate our S&H activities into the Center's S&H program.

Flowdown to Subcontractors/Coordination of Team Safety and Health Programs

The requirements of this plan, as approved by the CO, will be flowed to all subcontractors/suppliers, including our Teammates, whose subcontracts are expected to exceed \$500,000, or when subcontracting efforts meet the conditions of NFS 1852.223-70(g). Our Teammates are

As part of its proposal process, SGT has verified that our Teammates' existing safety programs and existing NASA Safety and Health Plans comply with our top-level S&H requirements, namely, that any contractor doing business with NASA comply with NASA safety and health requirements, on and off-site, and in particular that if a S&H Plan is required, that it conform to NPR 8715.3, Appendix H. In addition to ongoing coordination between the MSES Safety Officer and safety representatives of our subcontractors for the management of our Safety Program on MSES, we will require annual certification from subcontractors that they are in compliance with the MSES contract S&H Plan.



Table D-1. SGT S&H Plans Prepared In Accordance With NASA and GSFC Requirements

S&H Plan Requirements	Where Addressed in SGT's Safety and Health Plan
Description: Work to be performed on site, include hazards likely to be encountered	Introduction; Table D-2
Contractor's on site safety point of contact	On site POC is our Deputy program Manager as stated in 1.5e
Contractor's statement of policy re: enforcement of S&H program requirements	Signature page: statement is signed by SGT's MSES II/A Program Manager
Contractor's safety program objectives	1.2
Responsibilities of contractor's key personnel	1.3
Extent of safety meetings, surveys and inspection reports	1.2, 1.3, 1.8, 1.9, 1.10, 2.1, 2.2, 3, 4.1
Type(s) of personal protective equipment required; how and when it will be used and enforced	Table D-2, 1.3
Safety training required for tasks performed, including certifications and/or recertifications where applicable	1.2, 1.4, 1.5d Table D-2, 4.1, 6
GSFC emergency procedures defined	3.1, 5
Methods to comply with requirements for immediate report of accidents to CO	3.1
Statement that contractor will not invalidate the integrity of safety systems without proper authorization	Signature page: statement is signed by SGT's MSES II/A Program Manager
Procedures of emergency actions taken to secure dangerous conditions; protect personnel and work areas	3.1
Procedures for securing accident site, remains secure until GSFC Safety and Environments Branch personnel arrive; remains secure until released by CO or S&E personnel	3.1
Plan must reference the following documents: 1. NPR 8715.3 (Jan 2000) NASA Safety Manual 2. NPD 8621.1 – NASA Mishap Reporting & Investigation Policy 3. USDOL/OSHA Standards (29 CFR 1910 or 29 CFR 1926 as applicable) 4. Any state, county and/or local safety codes as applicable	Introduction Our document is structured to comply with S&H Plan requirements as specified in NPR 8715.3, Appendix H. 3.1 (NPG 8621.1)
Contractor's past performance with respect to NASA contracts	Introduction (OSHA Form 300s are referenced)
Contractor's past performance with respect to DOL/OSHA and/or State Plan compliance	Introduction
Contractor's Injury/illness rates	Introduction
H.5 S&H – Additional Requirements	3.1 Mishap Investigation
I.4 Hazardous Material Identification	1.9.b, Attachment 2
I.5 Notice of Radioactive Materials	4.1.1
L.10 Safety and Health Plan	Introduction (flowing down of requirements to our subcontractors). Our S&H plan is structured to comply with NPR 8715.3, Appendix H
500-PG-8715.1.2; 540-PG-8715.1.2A	Introduction; Table D-2; evacuation special assistance needs (1.5a); hazardous materials requirements (1.9b); the SGT Team will comply with the requirements of these safety documents in accordance with the Applicability section (P.2) of these two documents.

SGT Team Safety Record

The SGT Team has an excellent safety record. SGT's OSHA reporting requirements are met each year, including submission of the OSHA Form 300A summary report. Since its inception in 1994, SGT has had eleven recordable accidents and no OSHA citations. SGT's Lost Time Incident Rate (LTIR) for the last 5 years is .37 cases per 100 employees. Our teammates LTIRs for the past 5 years are as follows:

Our teammates have received recognition for their safety programs, including the Advanced Technology Laboratory component of the which was given a significant safety award



SGT's safety record has been achieved in support of customers at numerous locations, for example, GSFC, KSC, the GISS facility in New York, JPL, the White Sands Complex, the Wallops Flight Facility, Glenn Research Center, Stennis Space Center, and the EROS Data Center in Sioux Falls, SD. We have provided engineering integration and test, radiation effects analysis, satellite ground station antenna services, launch site support, satellite operations, logistics, maintenance, and facility operations support, complying with all safety/environmental requirements. Our Team operates facilities highly relevant to the MSES II/A requirements, including state-of-the-art spacecraft manufacturing capabilities at the

locations. We will

bring this demonstrated commitment to safety to MSES II/A.

Scope of Work

The MSES II/A contract provides engineering and related services to MSD and related organizations throughout GSFC, as required, for the formulation, design, development, fabrication, integration, testing, verification, and operations of space flight and ground system hardware and software, including development and validation of new technologies to enable future space and science missions. The engineering areas of emphasis are multidisciplinary with concentration in the mechanical engineering areas of materials, structural analysis and loads, mechanical design, electromechanical design, thermal, contamination and coatings, manufacturing and integration and test. The contractor provides on/off-site multidisciplinary engineering services. These services include the personnel, facilities, and materials (unless otherwise provided by the Government) to accomplish the tasks.

Services are provided in all aspects of mission and instrument development and implementation for components, subsystems, systems, science instruments, observatories, launch, ground system, spacecraft, and suborbital craft (e.g., aircraft, sounding rockets, UAVs, balloons), including attached shuttle or Space Station, payloads, free-flying spacecraft, and suborbital craft payloads, as well as ground support equipment, simulators, non-flight models, and prototypes; candidate, feasibility, and systems definition studies; project management; systems engineering; analysis; preliminary design; detailed design; non-flight and flight fabrication; assembly; integration; test and verification; test instrumentation; data systems management; launch, on-orbit and post-launch operations; research and technology unique to system development; documentation; maintenance; sustaining engineering; configuration management; mission assurance; architectural trades; performance, cost, risk assessment; and systems safety.

Hazards likely to be encountered include crane, centrifuge, and a variety of machine shop tools and equipment operation, as well as hazardous materials related to spacecraft and instrument development. Section 2.1 of this plan provides a summary of selected facilities and related safety concerns likely to be encountered on MSES II/A, both on-site at GSFC and also at our off-site contractor facilities.

An off-site facility in the vicinity of GSFC will be maintained by SGT for contract management and for housing off-site personnel.

The top-level allocation of technical/functional work area primary responsibility is as follows:

- SGT: Materials and Contamination/Coatings, Mechanical Systems Analysis, Information Systems and Mission Engineering
-



APPLICABLE DOCUMENTS

SGT will comply with the applicable S&H requirements specified in the following documents:

- All safety related MSES II/A contract clauses. The RFP clauses are as follows: H.5, I.4, I.5, L.10, L.14
- Public Law 91-596, Occupational Safety and Health Act of 1970.
- Title 29 Code of Federal Regulations, Part 1904.
- Title 29 Code of Federal Regulations, Part 1910.
- Title 29 Code of Federal Regulations, Part 1910.1200 Hazard Communication.
- Title 29 Code of Federal Regulations, Part 1910.1450, OSHA Laboratory Standard
- Title 29 Code of Federal Regulations, Part 1926.
- Title 29 Code of Federal Regulations, Part 1960.
- NPD 8621.1, NASA Mishap Reporting.
- NPD 8710.1, Emergency Preparedness Program.
- NPD 8710.2, NASA Safety and Health Program Policy.
- NPG 5100.4, NASA Federal Acquisition Regulations Supplement.
- NPG 8715.1, NASA Safety and Health Handbook.
- NPR 8715.3, NASA Safety Manual.
- NPR 8715.3A, NASA General Safety Requirements
- GPR 8710.2A, Emergency Preparedness Program Plan for Greenbelt
- 500-PG-8715.1.2, AETD Safety Manual
- 540-PG-8715.1.2A, Mechanical Systems Division Safety Manual – Volume II
- GPR 1700.2, GSFC Chemical Hygiene Program
- Safety GPRs (see selected list at Section 5, Emergency Preparedness and Response)
- USDOL OSHA Standards (as applicable).
- Any applicable state, county, and/or local safety codes.

1. MANAGEMENT LEADERSHIP AND EMPLOYEE PARTICIPATION

1.1 POLICY. As presented at the beginning of our plan in the words of SGT's President, "We believe that our employees are our most important asset and their safety is our most important responsibility. It is our policy to provide a safe and healthy work environment for our employees whether they are in SGT, other company, or Government work areas. Our responsibility is to ensure that safe practices and a safe work environment are established and maintained for the protection of our employees, their co-workers, Government workers, other contractors, guests, and the general public."



Our policy also includes the commitment to ensure that SGT continues to emphasize safety as a top priority and value. GSFC's Safety Policy is found on the GSFC Safety Homepage, and begins as follows:

"GSFC's most important core value is safety – safety of the public, astronauts and pilots, safety of our civil servant and contractor personnel, and safety of our high value ground and space equipment and property. It is GSFC's policy to provide a safe and healthy environment for all civil servants, contractor employees, and visitors."

We believe our policy aligns well with that of GSFC, including our commitment to open communication with our employees, especially from their perspective of reporting conditions that they think are unsafe, in an atmosphere free from fear of recrimination for having made such a report. The CAIB report states plainly that the physical cause of the loss of Columbia and its crew (a breach in the Thermal Protection System on the leading edge of the left wing) was not the only reason for this tragedy: "...the NASA organizational culture had as much to do with this accident as the foam." (CAIB, p97). These cultural factors are complex and include the critical mischaracterization of the Shuttle as an operational system. But these factors also show a "silent safety program," a safety program based on success rather than rigorous, independent Safety and Mission Assurance involvement, and "organizational barriers which prevented effective communication of critical safety information and stifled professional differences of opinion." (CAIB, p177). At SGT we are committed to an open culture where safety concerns are voiced across the organization and not only heard, but when appropriate, rewarded (refer to Section 2.3).

1.2 GOALS AND OBJECTIVES. Specific safety and health goals and objectives include:

- Communication of S&H policy to all employees including our teammates and any lower level subcontractors to ensure a full understanding of safety requirements.
- An accident-free workplace with 0 lost days.
- An effective ongoing training program, including HAZCOM, HAZMAT, HAZWOPER, first aid, Cardiopulmonary Resuscitation (CPR), Automated External Defibrillator (AED), fire prevention, use of fire extinguishers, chemical spill/contamination response, and accident reporting procedures. Our goal for CPR/AED certification is to ensure two certified staff in every building occupied by SGT employees (see 6 for progress toward this goal on-site at GSFC).
- Efficient and compliant workplace/workforce safety & health reporting and inventory management, and trend analysis.
- Demonstrated management safety leadership and authority.
- Regular communication with Building FOMs.
- Conscientious performance of assigned building safety duties, for example, Area Warden responsibilities.
- Effective, appropriate inspections.
- Clearly established responsibility for safety and health at all levels in the MSES II/A SGT Team organization.

The SGT Team will use OSHA's Program Evaluation Profile (PEP) survey (see Attachment 1) as a means to evaluate our safety program. The PEP rates the program in the following key



areas: management leadership and employee participation, workplace analysis, accident and record analysis, hazard prevention and control, emergency response, and safety and health training. SGT will strive to attain and maintain Level 5. A specific milestone schedule will be developed after the initial PEP survey has been completed and assessed, within 3 months after contract start.

1.3 MANAGEMENT LEADERSHIP. At the corporate level, senior SGT management has established the SGT Safety Committee to oversee safety programs and bring consistency across all SGT programs/contracts. This committee is appointed by the company President and is chaired by the SGT Safety Officer. Permanent members include SGT's Quality Officer and senior managers in Human Resources and Contracts. Annual rotating membership in the committee is held by senior members of technical management and employee representatives. All SGT Program Safety Officers attend the quarterly meeting of the SGT Safety Committee. The Safety Committee's primary responsibility is to review and make recommendations to SGT's President on any changes to SGT's S&H policies, procedures, plans, or standards, including on-going monitoring of OSHA requirements for updates/new requirements. The committee also reviews the results of all safety audits and mishap reports, develops lessons learned, and makes recommendations to correct any deficiencies in SGT's policies and plans.

At the program-specific level, effective implementation of the SGT Team's S&H Plan starts with the leadership of the MSES II/A Program Manager (PM) to motivate and hold accountable his entire staff for all aspects of the S&H Plan. The Mission Assurance and Safety (MA&S) Manager is the designated Safety Officer for the MSES II/A Program; the Group Leads are the designated Safety Representatives for their respective areas. Figure D-1 shows the placement of the Safety Officer and Representatives within the overall program organization/structure, as well as the on-going coordination between the SGT Safety officer and the Safety Officers of our Teammates. This coordination includes flowdown of any new/changed safety requirements, audits, and analysis of any mishaps. The PM will ensure that all MSES II/A safety requirements are enforced with subcontractors and suppliers. A signed statement of the PM's personal commitment to the safety program, the integrity of safety systems, and flowing down the safety requirements can be found on the signature page of this document.

The PM will ensure:

- Total compliance with the S&H Plan by all employees of the SGT Team in every facility location.
- The MSES II/A Safety Officer communicates with him on: (1) the status of any risks or hazards that are identified by the Safety Representatives or the FOMs; (2) status of ongoing root cause analysis/corrective action plans; and (3) documentation status in response to S&H audits and inspections.
- The CO and COTR are kept informed on status of all S&H events/actions.

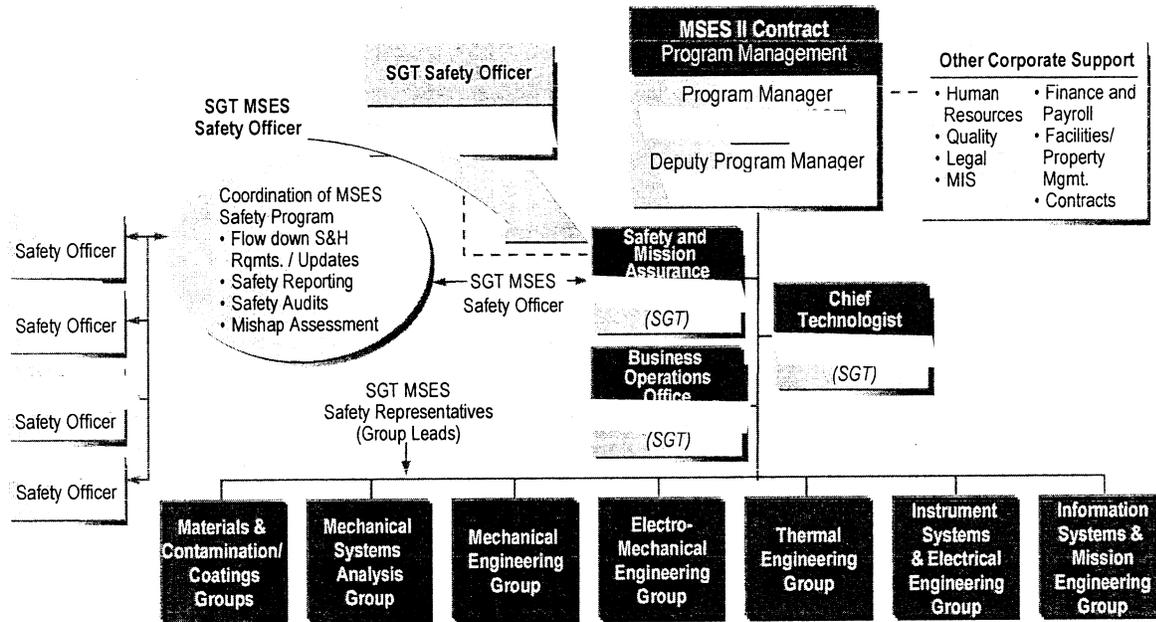
1.4 SGT TEAM MSES II/A EMPLOYEE INVOLVEMENT/RESPONSIBILITIES

MSES II/A employees will:

- Read, understand, and comply with the MSES II/A S&H Plan.
- Satisfy all applicable S&H training requirements.
- Comply with NASA's safety, health, and environmental standards.



Figure D-1. SGT Team MSES II/A Organization



MSES II D-1 Safety Org

- Comply with the safety requirements listed in any applicable Material Safety Data Handling Sheets (MSDS).
- Maintain an understanding of current safety plans and procedures affecting their work areas, including relevant evacuation plans.
- Wear protective equipment when required.
- Seek and obtain training in the safe operation of specialized equipment.
- Keep immediate work areas neat and orderly.
- Assist Code 250 personnel during inspections, surveys, and investigations.
- Notify SGT Safety Representatives and appropriate facilities staff of any new equipment that may require SGT action for reporting.
- Report any suspected safety or health hazards to the appropriate building safety personnel.
- Obtain necessary emergency medical care.
- Promptly report occupational injuries and illnesses as directed by area procedures.

1.5 ASSIGNMENT OF RESPONSIBILITY

a. Safety Representatives/MSES II/A Group Leads. Safety Representatives will:

- Conduct monthly walk through inspections of work areas to ensure compliance to the MSES II/A S&H Plan and to identify and take corrective action to eliminate any potential hazard or safety risk; coordinate any corrective action with the Safety Officer and the FOM.
- Work with the Safety Officer and the FOM on any planned adjustments in the work place layout or equipment changes and any planned moves; conduct before and after inspections to



ensure no hazards have been created and report results to the MSES II/A Safety Officer and the FOM.

- Work with the FOM to support the Center's fire safety program and serve as evacuation Point of Contact (POC) as assigned, including informing the Branch Head and other evacuation POCs of any SGT Team employee needing assistance during emergency situations.
- b. Company Physician. SGT does not employ a company physician. Our SGT Human Resources Director, Ms. Linda Baumgart, is the MSES II/A point of contact with the GSFC Medical Unit. Her contact information follows:

SGT, Inc.
7701 Greenbelt Rd.
Greenbelt, MD 20770
(301) 486-3134

SGT will communicate this medical data point of contact to the GSFC Medical Unit upon award of contract. We will promptly communicate to GSFC any changes to this contact information.

c. Building Fire Wardens. We will communicate with our Building FOMs upon contract award so that during transition we can establish the requirement for SGT MSES II/A personnel to serve as Building Fire Wardens. SGT staff currently fills this position in some GSFC buildings on our Program Analysis and Control (PAAC) contract.

d. Designated Safety Officer/SGT MSES II/A Safety Officer. The S&MA Manager is the designated Safety Officer for MSES II/A. The primary duties of the Safety Officer follow:

- Ensure all personnel are trained and understand all of the MSES II/A S&H Plan requirements.
- Serve as SGT's senior safety point of contact, including designated interface with Code 250.
- Implement and maintain the S&H Plan for the program, including coordination with all subcontractors for ongoing verification of their safety programs and for communication of safety initiatives across MSES.
- Support and audit the Safety Representatives' efforts for employee training, FOM interactions, and timely inspections to identify risks, hazards, and potentials for accidents; analyze all findings and implement appropriate corrective action.
- Coordinate with the SGT Human Resources department to maintain S&H training records.
- Administer the awards program to promote S&H.
- Coordinate with the SGT Business Operations department to flow down S&H requirements into our teammates' subcontracts.
- Ensure the PM and COTR/CO are informed and current on all S&H status.
- In accordance with Clause H.5, generate quarterly reports specifying incidents, disabling injuries, lost work days incident rate, days lost, property damage cost, man-hours worked/month, and total employees. This report will be developed using the template at <http://safety1st.gsfc.nasa.gov>.



- Conduct investigations of all work-related incidents, accidents, and close calls; determine their causes; and provide the CO with an appropriate report.
- Take appropriate corrective action in response to any non-compliance identified by the CO.
 - e. On-site Point-of-Contact. Our Deputy Program Manager is our designated on-site safety point of contact.

1.6 PROVISION OF AUTHORITY. This S&H plan was developed in accordance with guidelines provided by Code 250, the NASA Safety Manual NPR 8715.3, and relevant FAR and NFS clauses. SGT will comply with all applicable federal, state, county, and local safety ordinances. At our present corporate office in Greenbelt, our Facility Manager (FM) interfaces with the Building Engineer on a regular basis to ensure we are compliant with building safety regulations. At our new MSES facility, our FM will conduct monthly safety inspections throughout our office spaces and follow up with corrective action as necessary. The FM reports to the SGT Safety Committee on status of corrective actions. Our SGT Safety Officer is responsible for periodic review of federal, state, and local safety ordinances.

Our GSFC on-site Safety Representatives will interface with Building FOMs to review requirements of safety ordinances and communicate with our MSES II/A Safety Officer. We will monitor web site announcements (such as OSHA and the Goddard Safety Home Page) and updates to applicable regulations and revise our S&H Plan as appropriate.

1.7 ACCOUNTABILITY. SGT's President has delegated accountability for all matters related to the safety of SGT workers whether at SGT, contractor, or Government facilities to the SGT Safety Officer and to our Program/Project Directors/Managers. SGT's supervisors and employees are accountable for ensuring that they understand and comply with SGT's safety policy and procedures.

1.8 PROGRAM EVALUATION. In addition to inspections, reports, and coordination with GSFC FOMs and Code 250, SGT's Safety Officer will use the PEP survey to evaluate our safety program. We will conduct the program evaluation annually and report the results to GSFC. The Safety Officer and PM will develop any necessary corrective action plans. PEP results will also be submitted to the SGT corporate Safety Committee which monitors safety performance across all SGT programs and takes appropriate corporate action in response to any negative findings or trend analyses. The SGT President will receive a written report from the SGT Safety Committee of any negative PEP findings or mishap reports.

1.9 GOVERNMENT INSIGHT. As required in the RFP at Clause H.5, SGT will provide a Quarterly Health and Safety Report using the template identified in the RFP. We will also comply with the requirements at H.5(b) regarding immediate notification and prompt reporting (NFS clause 1852.223-70) to the GSFC Safety and Environmental Branch and to the Contracting Officer. SGT understands that this notification is also required for any unsafe or environmentally hazardous condition associated with Government-owned property that is provided or made available for the MSES II/A contract. We will communicate these requirements across our contract staff, including subcontractors. During transition we will communicate with the CO and Code 250 to specify reporting requirements and other data to which the Government requires access. We will facilitate electronic access if requested by the Government.

- a. Roster of Terminated Employees



We will provide throughout the life of the contract, a roster of terminated employees, and the required information specified in Appendix H, NPR 8715.3, paragraph 1.9a.

b. Material Safety Data

Under Maryland law, employees must have access to information about potentially hazardous substances in their work place. Major elements of our procedures to comply with this requirement include the following:

- Maintaining a site notebook with all MSDSs available for employees at all times.
- Ensuring that vendors provide an MSDS with product delivery.
- Giving new employees a safety orientation that includes their right to know about materials they will be handling.
- Supervisors demonstrating by example the proper use of materials that may be hazardous.
- Supervisors checking the proper use of protective devices.
- Properly labeling all materials by marking precautions clearly on containers. (If a substance or material is removed from its original container, the new container must be marked with the name of the item and precautions.)
- Sending a copy of each MSDS upon receipt of the material for use on NASA property to Code 250, along with the name, address, and telephone extension of the contractor representative to be contacted for questions or other information. Another copy will be available for on-site use.

SGT will maintain inventory of all hazardous materials it has located at its facilities and on Government property and which are within the scope of Title 29 CFR 1910.1200—Hazard Communication and Federal Standard 313—Material Safety Data, Transportation Data, and Disposal Data for Hazardous Materials Furnished to Government Activities, as revised. This listing will provide:

- The identity of the material.
- The location of the material by building and room.
- The maximum quantity used, disposed of, or otherwise released during the year for each material.

We will submit a report annually as requested by Code 250.

SGT and its teammates maintain lists of all hazardous materials at their sites. Attachment 2 is a sample of such a list, this being the hazardous materials at one of our teammate's site (Northrop Grumman/Lanham).

We will comply with I.4 and submit a list (in the format given at I.4) of any hazardous materials to be delivered under this contract. We will assess this requirement upon receipt of initial task orders and throughout the life of the contract. Our initial assessment of potential hazardous materials that could be delivered under MSES II/A is also provided in Attachment 2.

SGT Team employees will comply with GPR 1700.2 (GSFC Chemical Hygiene Program) and 29 CFR 1910.1450 (OSHA Laboratory Standard) in the use of hazardous chemicals

1.10 GOVERNMENT ACCESS TO SAFETY AND HEALTH PROGRAM DOCUMENTATION. SGT will make available all safety documentation deemed by the Government as requiring scrutiny. Specifically, we will maintain the MSDSs and Hazardous



Materials Inventory as described below. We will also comply with the requirements of clause 52.223-3 (included as Attachment 2). This clause includes requirements for hazardous material identification, maintenance of MSDSs, periodic updates of the hazardous materials list, Government rights to data, notification to personnel of hazards to which they might be exposed, and shipping container identification.

1.11 REVIEW OF SAFETY REQUIREMENTS. SGT will participate in the review and modification of safety requirements that may be implemented at the direction of the GSFC COTR in accordance with established NASA directives and procedures.

1.12 PROCUREMENT. All procurements will be reviewed for safety and environmental considerations to ensure that specifications contain appropriate criteria and instructions. SGT will comply with governing FAR and NFS clauses and coordinate with Code 250 to remain up-to-date on GSFC-specific new requirements.

2. WORKPLACE ANALYSIS

2.1 HAZARD IDENTIFICATION. SGT understands the complexity of lab/work space environments in which MSES II/A support will be carried out. Table D-2 summarizes selected, key MSES II/A facilities at GSFC and our off-site SGT Team facilities and highlights related safety concerns. The description of on-site GSFC MSES II/A facilities reflects information provided during the GSFC on-site tour/site visit, conducted on March 24, 2006, and requirements/operations described in 540-PG-8715.1.2A.

During transition we will verify safety requirements, including training/certifications, with the appropriate FOMs and Lab Managers. Under existing SGT Team contracts at GSFC, including SGT's METS prime contract, the SGT Team has in-depth experience with many GSFC labs and other work environments (both on and off site) that demand special attention to safety regulations/procedures. This experience gives us substantial insight that will aid our worksite analysis during transition.

Hazardous conditions/operations within SGT's worksite (on- and off-site) will be identified for the duration of the contract (see Table D-3). The information collection processes will include surveys, analyses, and inspections of the worksite. Hazards on GSFC property will be subject to the review and concurrence of Code 250. We will conduct an inventory of hazards associated with the work to be performed on this contract. This inventory of hazards will address the work specified in this contract as well as operations and work environments that are performed in the vicinity or in proximity to contract operations. The results will be reported to the Government in a manner suitable for inclusion in facilities baseline documentation as a permanent record of the facility. Results will also be provided to the SGT Safety Committee for lessons learned across all programs.

To minimize the exposure of hazardous materials to employees in adjacent areas, we will substitute non-hazardous or less hazardous materials whenever possible. We will also apply the latest EPA guidelines (available from Code 250) to materials purchased under the contract.

a. Comprehensive Survey. In addition to ongoing, daily attention to safety by our staff, during MSES II/A contract phase-in and then semi-annually, the SGT Safety Officer and Representatives will conduct a formal comprehensive assessment of our assigned work spaces including facilities, equipment, processes, procedures, and materials (including waste) using the inspection guide provided as Attachment 3. SGT will coordinate the surveys with Building FOMs and submit our findings to Code 250 and COTR for their review and concurrence. As part of our proposal process we have already completed inspections (using Attachment 3) of our teammates' facilities.



Table D-2. Selected MSES Facility Safety Assessment

Facility	Activities	Safety Concerns
Contamination Lab Building 84	Particle contamination quantification, including measurements from contaminated optics and reflective surface	Laser radiation; cleanroom ops (CO2 snow cleaning of optics); PPE; hazmat; use of MSDSs; eyewash/shower.
Coating Measurement Lab Building 7/Room 12	Exposes thermal coatings to ultraviolet radiation and to bombard them with low energy protons and electrons to measure thermal coating degradation	Radiation testing; oven and vacuum chamber operations; PPE; hazmat; use of MSDSs; eyewash/shower.
Vapor Deposition and Spray Facility Building 4/ Room 195	Deposits thin film coatings on items such as astronaut visors for enhanced thermal or optical properties	Spray booth, oven, Veco chamber operations; high melting point coating chamber (e.g., titanium); ignition concern – high volatility of spray; thermal control coatings (urethane, silicate), other hazardous materials; PPE (including respiratory); use of MSDSs; eyewash/shower.
Thermal Technology Development Facility Building 4/Room 193	Design and test of advanced thermal control systems.	Cleanroom and bake-out box operations; PPE; hazmat; use of MSDSs; eyewash/shower.
Technology Development Lab Building 4/Room 189	R&D of thermal mitigation	Thermal vacuum chamber, cryogenic chamber, spray cooling, heat pipe development operations; PPE; hazmat; use of MSDSs; eyewash/shower.
Building 30, various labs, including: - Long-term Life Testing - Thermal Cycling Chamber - Mechanical Test Lab - X-ray Diffraction Lab - Optical Emission Spectroscopy Lab - Outgas Test lab - Polymer Processing Lab - Ultrasound Tank	These labs conduct laboratory investigations to solve material problems and conduct applied research activities in materials technology and development in support of future needs of the GSFC spacecraft, instrument, and technology programs	Multiple lab operations; laser radiation; extreme temperature testing; spill response (kits); building vapor and gas beacon evacuation; x-ray exposure; PPE (including respiratory equipment); hazmat; use of MSDSs; eyewash/shower.

b. Change Analysis. SGT will analyze modifications in facilities, equipment, processes, and materials (including waste), and related procedures for operations and maintenance. Change analyses periodically will be driven by new or modified regulatory and/or GSFC requirements.

c. Hazard Analysis. Based on the findings of our hazard identification activities, SGT will analyze facilities, systems/subsystems, operations, processes, materials (including waste), and specific tasks. SGT will list each hazardous operation and/or unique hazard to be performed, and other key operations required or planned in the performance of the contract. GSFC and SGT will jointly decide which operations are to be considered hazardous, with GSFC as the final authority. Before hazardous operations commence, SGT will submit for GSFC concurrence: (1) a list of required procedures for all hazardous operations and identification of the written procedures or



responsibility for their development; and/or (2) qualification standards or required certifications for personnel involved in hazardous operations.

Table D3: Job Hazard Analysis

Conducting the Job Hazard Analysis

- Are there materials on the floor that could trip a worker?
- Is lighting adequate?
- Are there any live electrical hazards at the jobsite?
- Are there any chemical, physical, biological, or radiation hazards associated with the job or likely to develop?
- Are tools – including hand tools, machines, and equipment – in need of repair?
- Is there excessive noise in the work area, hindering worker communication or causing hearing loss?
- Are job procedures known and are they followed or modified?
- Are emergency exits clearly marked?
- Are trucks or motorized vehicles properly equipped with brakes, overhead guards, backup signals, horns, steering gear, and identification, as necessary?
- Are all employees operating vehicles and equipment properly trained and authorized?
- Are employees wearing proper personal protective equipment for the jobs they are performing?
- Are lockout procedures used for machinery deactivation during maintenance procedures?
- Can the worker be struck by an object or lean against or strike a machine part or object?
- Can the worker fall from one level to another?
- Do environmental hazards – dust, chemicals, radiation, welding rays, heat, or excessive noise – result from the performance of the job?
- Have any employees complained of headaches, breathing problems, dizziness, or strong odors?
- Is ventilation adequate, especially in confined or enclosed spaces?
- Have tests been made for oxygen deficiency and toxic fumes in confined spaces before entry?
- Are work stations and tools designed to prevent back and wrist injuries?
- Are employees trained in the event of a fire, explosion, or toxic gas release?

Source: Job Hazard Analysis – OSHA 3071



2.2 INSPECTIONS. In coordination with our Building FOMs, SGT will develop requirements and procedures for control of and regularly scheduled inspections for fire and explosion hazards. The results of inspections conducted at contractor facilities, on GSFC or other Government property will be documented in safety program evaluations or the quarterly Accident/Incident Summary Reports. Inspections will identify the following:

- Discrepancies between observed conditions and current requirements.
- New (not previously identified) or modified hazards.
- Root cause/corrective action process.

2.3 EMPLOYEE REPORTS OF HAZARDS. One of the most important elements of employee reporting of hazardous conditions or close calls is the assurance that SGT management values such reporting. Every employee shall report immediately any unsafe conditions, as well as actual mishaps or close calls. As stated in the GSFC Safety Pocket Guide, "Reprisal or disciplinary action against an employee who initiates a safety concern shall not be tolerated." SGT not only requires reporting, but where appropriate, we provide an award to employees whose alert observation and timely reporting contribute to increasing the safety of our work environments. Safety and Health Awards, cash and a certificate, are also presented for any significant contribution to our safety program. SGT will reinforce the role of the Ombuds Program in safety and hazard reporting. NASA has described this program as follows:

"NASA implemented the agency-wide Ombuds Program to provide an additional, confidential channel of person-to-person communication to raise concerns about safety, health, organizational performance and mission success. NASA Ombuds are empowered to listen to and act on employee concerns related to safety, organizational performance, and mission success. The Ombuds serve as a safety valve when employees feel regular channels for raising issues and concerns are not effectively working." The GSFC Ombuds is Larry Watson (301-286-9078).

Other avenues for reporting if normal channels are considered ineffective are: NASA HQ senior safety and health officials; the NASA Safety Reporting System (<http://www.hq.nasa.gov/nsrs>); the Office of Federal Agency Safety and Health Programs/OSHA; and the NASA Office of Inspector General.



3. MISHAP INVESTIGATION AND RECORD ANALYSIS

3.1 MISHAP INVESTIGATION. Any employee having knowledge of a mishap (including fire and hazardous materials releases) or near miss should first call 911 (Greenbelt and KSC) or 1333 (Wallops) and then report it immediately to an SGT MSES II/A Safety Representative, MSES II/A Safety Officer, or MSES II/A PM. The MSES II/A Safety Representative, Officer or PM will report the accident/incident immediately in accordance with the instructions at Clause H.5 of the RFP, as follows:

“The immediate notification and prompt reporting required by paragraph (d) of NFS clause 1852.223-70 shall be to the GSFC Safety and Environmental Branch (Code 2005.2), 301-286-2281 and to the Contracting Officer. This should be a verbal notification and confirmed by fax or email. This notification is also required for any unsafe or environmentally hazardous condition associated with Government-owned property that is provided or made available for performance of the contract.”

If any MSES II/A Safety Representative, the Safety Officer or the PM is not available, the employee will call 911 (or 1333, as appropriate), and then report to the SGT HR Director. CO notification will follow. SGT will report using Form 1627 (see Attachment 4) or NASA Incident Reporting Information System (IRIS). All mishaps will be investigated for root cause and corrective action determination (NPG 8621.1 provides procedures for conducting investigations). A report will be submitted to the CO and a copy to Code 250. SGT will coordinate with GSFC to implement and monitor corrective actions.

The MSES II/A Safety Officer shall:

- Categorize and identify the severity of the problem/mishap.
- Conduct an investigation in a timely and complete manner.
- Make a report and recommendations to the SGT Safety Committee.
- Verify that the proper corrective action is undertaken and validate that the action was effective.
- Comply with all GSFC and OSHA reporting requirements. The MSES II/A Safety Officer will provide a monthly Accident/Incident Summary Report with the status for all mishaps, including vehicle accidents, incidents, injuries, fires, and any close calls. The report will be delivered to the CO and Code 250 by the 10th day of each month of the contract. A copy of the annual OSHA 300 and 300A log will be provided annually to the CO and Code 250. A copy of the OSHA 300A will be posted each year during the months of March and April in areas accessible to MSES II/A personnel.
- Inform SGT HR of the situation in the event of an injury for Workers Compensation reporting purposes.

SGT personnel will comply with specific emergency action procedures documented in the Facility Emergency Action Plan and building evaluation plans. These procedures include emergency actions for securing dangerous conditions and accident sites until released by the CO and Code 250.



3.2 TREND ANALYSIS. The SGT MSES II/A Safety Officer with support from the Safety Representatives will perform monthly trend analyses of occupational injuries and illnesses; facilities, systems, and equipment performance; and maintenance findings. In conjunction with our FOMs and Code 250, we will identify causes of workplace-related illness and performance issues, and develop approaches to resolve them. For each element on and off GSFC property that performs work on this contract, SGT will deliver to the Government (under separate cover letter) a copy of our annual summary of occupational injuries and illnesses (or equivalent) as described in Title 29 Code of Federal Regulations, Subpart 1904.5. If we are exempt by regulation from maintaining and publishing such logs, equivalent data will be provided. Data will be compiled and reported by calendar year and provided to the Government within 45 days after the end of the year to be reported (not later than February 15 of the year following).

4. HAZARD PREVENTION AND CONTROL The MSES II/A Safety Officer will work with the CO and Code 250 to determine the reporting format to document identified hazards, discrepancies, and corrective/preventive action for ease of input into GSFC hazard analysis data system to support risk management. The Safety Officer will ensure coordination of hazard prevention with the safety, health, and environmental organizations at GSFC.

The scope of hazard prevention and control involves all engineering tasks that may result in electrical energies, hazardous equipment or processes, hazardous chemicals, and/or waste that may have an effect on the health and safety of personnel, equipment, facilities, environment, and neighboring communities.







4.1.1 Hazardous Operations. SGT's overall approach to operations involving the use of hazardous materials and situations employs the following major actions. SGT will:

- Review the hazards (hazard analysis) for our operations. In areas where the hazards have not been identified, management and employees will work together to identify the process steps, the applicable hazards, and the controls put in place to eliminate the hazard or minimize the risk (see 2.1c). Ensure all personnel involved in these operations have received the appropriate hazards communication (HAZCOM), hazardous material (HAZMAT), and other required safety training. Of particular importance is the requirement for use of the buddy system for work in confined spaces and other hazardous operations (including jobs that involve height, high voltage, toxic chemicals, and oxygen deficient areas). The buddy system ensures that no one works alone under dangerous conditions and that if something goes wrong, there is another person who can summon help.
- Ensure all personnel receive training to become familiar with, utilize, and maintain the required Personal Protective Equipment (PPE). Personnel are required to notify their immediate supervisor/manager when PPE becomes non-functional or damaged. The PPE must be replaced before the employee resumes the task where the PPE is required.
- Ensure all personnel are familiar with emergency procedures regarding their operations.
- Ensure all equipment used in these operations is in proper working order.

SGT will routinely examine and analyze hazards associated with individual jobs, operations, and processes (see 2.1c.). The Task Safety Analysis Worksheet (GSFC 23-60) will be used to document the process steps, the potential hazards, and the recommended safe practices. GSFC policy will serve as a guide for defining, classifying, and prioritizing hazardous operations.

In coordination with our FOMs and Code 250, SGT will develop and maintain a list of hazardous operations to be performed during the life of this contract. The list of hazardous operations will be provided to the CO. Before hazardous operations commence, SGT will provide a schedule to identify and/or develop written hazardous operations procedures with particular emphasis on identifying the job safety steps required.

As specified in Clause I.5, Notice of Radioactive Materials, SGT will notify the Contracting Officer or designee, in writing 30 days prior to the delivery of, or prior to the completion of any servicing required by the MSES II/A contract, of items containing either (1) radioactive material requiring specific licensing under the regulations issued pursuant to the Atomic Energy Act of 1954, as amended ..., in effect on the date of the MSES II/A contract, or (2) other radioactive material not requiring specific licensing in which the specific activity is greater than 0.002 microcuries per gram or the activity per item equals or exceeds 0.01 microcuries.

All items, parts, or subassemblies which contain radioactive materials in which the specific activity is greater than 0.002 microcuries per gram or activity per item equals or exceeds 0.01 microcuries, and all containers in which such items, parts, or subassemblies are delivered to the Government will be clearly marked and labeled as required by the latest revision of MIL-STD 129 in effect on the date of the MSES II/A contract.

4.1.2 Written Procedures. As required and in coordination with GSFC, SGT will develop written procedures for all hazardous operations, including required safety equipment, testing, maintenance, repairs, and handling of hazardous materials and hazardous waste. Procedures will be developed in a format suitable for use as safety documentation and be readily available to personnel as required to correctly perform their duties.



4.1.3 Protective Equipment. SGT has begun its analysis of the worksite environment (Figure 4-3 and the walkthrough safety inspections conducted at our teammates' facilities) and the protective equipment that would be appropriate to a given activity. Based on completion of this analysis during transition, SGT will develop or reference procedures for obtaining, inspecting, and maintaining protective equipment as required. A procedure will be developed for keeping records of such inspections and maintenance activities.

4.1.4 Hazardous Operations Permits. In coordination with Code 250, SGT will identify operations or tasks where hazardous operations permits will be required as specified in GSFC's local requirements. These operations include:

- a. SGT will adhere to GSFC procedures for operations involving potential asbestos exposures. Asbestos removal will be performed by licensed asbestos removal professionals and disposed of by the removal contractor. Asbestos removal and disposal will be accomplished in accordance with an GSFC approved Asbestos Abatement Plan.
- b. SGT will coordinate, prior to beginning work, with Code 250 for evaluation of operations involving exposures to toxic or unhealthful materials.
- c. Operations Involving Hazardous Waste. As appropriate, and in coordination with GSFC, we will develop procedures to manage hazardous waste from point of generation through disposal. With guidance from Code 250, we will clearly identify divisions of responsibility between contractor and GSFC for hazardous waste generated throughout the life of the contract. GPR 8500.3A provides guidance and structure to the MSES II/A process to handle hazardous waste from point of generation to disposal. This procedure identifies the responsibilities of GSFC organizations and MSES team member employees that include:
 - Waste management pertaining to solid waste, recyclable materials, paper products, beverage containers, toner and laser cartridges, equipment and bulk items, packaging material, petroleum products and used oil, chemicals for reuse, ozone-depleting substances, precious metals, radioactive waste, and unidentified material.
 - MSES II/A team members will provide data from task work areas to support GSFC requirements to compile a Biennial Hazardous Waste Report and submit it to the applicable state agency.
 - Requirements for satellite accumulation area management, container requirements, labeling, storage requirements, secondary containment, signage, inspection, MSDS, spill kits, housekeeping, supplies, staging facilities, transferring and handling, and hazardous waste disposal procedures.
- d. Waste Minimization. MSES II/A will make a concerted effort to reduce the volume and toxicity of waste whenever possible. Efforts to achieve waste reduction will concentrate on the source rather than taking an end-of-pipe approach. Suggestions to accomplish this include:
 - Evaluate hazardous material substitution with environmentally friendly materials and coordinate with GSFC for the acquisition of possible substitutes
 - Turn in unused and non-expired materials to GSFC for reuse
 - Minimize shelf-life loss by ordering materials only in the quantities and container sizes needed



- Pursue environmentally friendly systems to implement process changes and equipment modification
 - Acquire material recycling systems
 - Perform regular maintenance and good housekeeping to avoid equipment leaks and materials spills
 - Purchase recycled products
 - Segregate non-hazardous wastes from hazardous wastes to prevent cross-contamination
- e. Operations Involving New or Modified Emissions/Discharges to the Environment. As appropriate, SGT will develop methods for identifying new or modified emissions/discharges and coordinating results with the GSFC Environmental Team. These procedures will strive to minimize or eliminate environmental pollution. We will address management of hazardous materials, substitution of non-hazardous or less hazardous materials for hazardous materials, proper segregation of hazardous wastes from non-hazardous wastes, and other methods described by GSFC. Emphasis will be placed on providing for sufficient lead time for processing permits through appropriate State agency and/or the EPA.

4.2 FACILITIES BASELINE DOCUMENTATION. When tasked, SGT will provide any facilities baseline documentation (including safety engineering), as provided in the Government approved MSES II/A SGT Health and Safety Plan.

4.3 PREVENTIVE MAINTENANCE. For Government-owned property, SGT will coordinate with GSFC facilities operations staff to support established preventive maintenance requirements. Contractor-owned equipment will be maintained in accordance with manufacturer/vendor specifications and industry best practice. We will promote awareness when preventive maintenance reveals design or operational concerns in facilities and equipment. SGT, on its PAAC contract, uses its PAAC website to alert employees to safety concerns via bulletins. We will use appropriate distribution techniques to “get out the safety word” on MSES II/A via our project management information system, SyNGIN (the Next Generation Integrated Network).

4.4 MEDICAL PROGRAM. All MSES II/A staff have access to GSFC emergency medical services and for some conditions, we may qualify for treatment at the Health Unit. SGT, in coordination with our COTR, will manage employee training on-site for CPR, AED, first aid, and emergency response. We will certify at least one individual per shift and building in these medical-related areas.

SGT’s employees are encouraged to seek medical attention when workplace injuries occur. SGT and our teammates offer a full medical insurance package that covers all foreseeable emergency and non-emergency health care requirements. Employees with workplace injuries are required to report those injuries to the PM and to HR. SGT offers paid medical leave as part of its comprehensive benefits package. Employees may be required to have a doctor’s certification to return to work after taking medical leave for a work-related injury.

As required by NPR 8715.3, 1.5, Assignment of Responsibility, our point of contact is SGT Human Resources, 7701 Greenbelt Rd, Suite 400, Greenbelt, MD 20770, 301-486-3134. We will provide this contact information to the GSFC Medical Facility.



SGT Team

Providing High Quality and Minimizing Cost

(b)(4) will facilitate communication of medical data to the GSFC Medical Facility. SGT does not employ a resident company physician.

5. EMERGENCY PREPAREDNESS AND RESPONSE



SGT Team

Providing High Quality and Minimizing Cost



6. SAFETY AND HEALTH TRAINING

SGT will conduct a safety orientation briefing for all current and new employees, including the videotape "NASA/GSFC Safety, Environmental, and Security Awareness." Attachment 5 provides sample briefing materials. SGT will conduct additional training over the course of the MSES II/A contract as necessary, for example, as a result of any mishaps or near misses where lessons learned/corrective action plans indicate the need for such additional training.

SGT's safety training includes a corporate commitment to have at least two employees per building certified in CPR and AED. As of April 2006, for our employees on-site at GSFC (approximately 480), we have certified at least two employees in the following buildings: 3, 5, 6, 7, 8, 11, 12, 13, 16, 16W, 17, 22, 23, 28, 29, 32, 33, and the Aerospace Building. This trained staff provides 100% coverage in CPR/AED for our on-site population. We will continue to maintain this goal, including recertifications. SGT also facilitates safety and security training by local law enforcement organizations (Greenbelt and Prince George's County Police). Representatives from these organizations have presented seminars on Workplace Security and Safe Driving. We recently arranged for the Workplace Security seminar to be provided to the Contractor Safety Forum. In the CPR/AED initiatives, SGT applied lessons learned from incidents affecting the well-being and safety of our employees, in one case, a heart attack, and in the other, a parking lot security concern.

All employees and subcontractors involved in hazardous operations, and in handling hazardous materials are required to be trained and certified on the safety procedures for the operations and for handling those materials. The Safety Representatives are responsible for identifying employees requiring additional safety training. The MSES II/A Safety Officer is responsible for coordinating training and certifications across the MSES II/A contract. Copies of training completion certificates or logs will be maintained by the MSES II/A Safety Officer and all MSES II/A team members HR departments in the employee file.

The SGT Team has excellent, established training programs. As part of our commitment to continuous improvement, we will share best practices in safety training across the program. Attachment 6 is an example of a safety training curriculum conducted by

SGT will coordinate with appropriate FOMs and Code 250 to identify appropriate on-site training resources. We will distribute safety bulletins on a regular basis. An example of such a safety awareness bulletin, which also serves well to summarize GSFC's and our safety philosophy, is shown in Figure D-2. We are confident that our policy aligns well with that of GSFC and provides a strong framework for a safe working environment.



Figure D-2. GSFC's and SGT's Safety Philosophy Summary

Safety Accountability Program Key Points

1. All injuries can be prevented. Safety is an attitude. Be safety conscious. Some people work twenty years at a job and never get hurt and others have several injuries in just a month or two.
2. All hazards can be controlled. Over 90% of injuries are due to unsafe acts. Choose to be safety conscious. Sometimes the other person is not being safety conscious. Just as you drive defensively, you need to work defensively. Approach the task with some caution. Think about the potential hazards.
3. If there is an unsafe condition, report it to your supervisor so it can be corrected. Management is responsible and accountable for preventing injuries. If you need further assistance, contact Code 205.
4. Think of others before you leave an unsafe condition unresolved. If you spill coffee on the floor, clean it up before someone slips on it.
5. Wear personal protective equipment when it has been issued to you. Expensive equipment does no good if it remains on a hook in the locker.
6. Obey and enforce safety standards. If you are unclear about a safety policy, call Code 205. They will be glad to clarify any safety policies. Remember that working safely is a condition of employment.
7. Don't let the same mishap occur again. Investigate mishaps and near-misses not only to learn lessons, but also to facilitate permanent correction of policies.
8. Inspect equipment for hazards. Be proactive towards safety. Unsafe conditions left uncorrected will cause injuries.
9. Attend accident prevention training classes. A number of classes are available at the center. Contact the OHR Training Office for information.
10. Make safety the first part of every day and every job. Whenever there is a conflict between safety objectives and mission objectives, safety shall be our first consideration.

(Source: "Safety First" Supervisor's Safety Meeting Training Package)



Attachment 1

Program Evaluation Profile



THE PROGRAM EVALUATION PROFILE (PEP)

Each of the elements and factors of the PEP may be scored from 1 to 5, indicating the level of the S&H Program, as follows:

Overall Score	Level of Safety and Health Program
5	Outstanding program
4	Superior program
3	Basic program
2	Developmental program
1	No program or ineffective program

Scoring. Score the establishment on each of the factors and elements after obtaining the necessary information to do so. These shall be given a score of 1, 2, 3, 4, or 5.

Refer to the **PEP Tables**, Attachment B of this notice, as appropriate, to ensure that the score given to a factor corresponds to the descriptor that best fits the worksite. Determine scores for each of the six elements as follows:

- The score for the *Management Leadership and Employee Participation* element shall be whichever is the lowest of the following:
- The score for the *Management Leadership* factor, or
- The score for the *Employee Participation* factor, or
- The average score for all four factors.
- For the sixth element, *Training*, just determine the level 1-5 that best fits the worksite and note it in the appropriate box on the PEP.

For each of the other four elements, *average* the scores for the factors. If the employer declines to provide pertinent information regarding one or more factors or elements, a score of 1 shall be recorded for the factor or element.

If the element or factor does not apply to the worksite being inspected, a notation of "Not Applicable" shall be made in the space provided. This shall be represented by "N/A" or, in IMIS applications, "0." This shall not affect the score.

Overall Score. An "Overall Score" for the worksite will be recorded on the PEP. This will be the average of the six individual scores for elements, rounded to the nearest whole number (1, 2, 3, 4, or 5). Round up from one-half (.5) or greater; round down from less than one-half (.5).

EXAMPLE: A PEP's element scores are:

$$\begin{array}{r}
 2.5 \\
 2.7 \quad \underline{14.8} \quad = 2.467 \quad = 2 \text{ PEP} \\
 \phantom{\underline{14.8}} \text{Score} \\
 2.3 \quad 6 \\
 3.0 \\
 2.3 \\
 \underline{+2.0} \\
 14.8
 \end{array}$$



PEP Program Evaluation Profile		Management Leadership and Employee Participation				Workplace Analysis			Accident and Record Analysis		Hazard Prevention and Control			Emergency Response		Safety and Health Training			
		Employer:	Inspection No.:	Date:	CSHO ID:	Management Leadership	Employee Participation	Implementation	Contractor Safety	Survey and Hazard Analysis	Inspection	Reporting	Accident Investigation	Data Analysis	Hazard Control	Maintenance	Medical Program	Emergency Preparedness	First Aid
Outstanding	5																		
Superior	4																		
Basic	3																		
Developmental	2																		
Absent or Ineffective	1																		
Score for element																			
Overall Score:																			

OSHA-195 (3/96)

Attachment B—The PEP Tables

- The text in each block provides a description of the program element or factor that corresponds to the level of program that the employer has implemented in the workplace.
- To avoid duplicative language, each level should be understood as containing all positive factors included in the level below it. Similarly, each element score should be understood as containing all positive factors of the element scores below it. That is, a 3 is at least as good as a 2; a 4 is at least as good as a 3, and so on.
- The descriptors are intended as brief illustrations of a workplace at a particular level. In exercising their professional judgment, compliance officers should proceed with the understanding that the descriptor that “best fits” will not necessarily match the workplace exactly or in literal detail.



Management Leadership and Employee Participation	
Management Leadership	
Visible management leadership provides the motivating force for an effective safety and health program. [1989 Voluntary Safety and Health Program Management Guidelines, (b)(1) and (c)(1)]	
1	Management demonstrates no policy, goals, objectives, or interest in safety and health issues at this worksite.
2	Management sets and communicates safety and health policy and goals, but remains detached from all other safety and health efforts.
3	Management follows all rules and gives visible support to the safety and health efforts of others.
4	Management participates in significant aspects of the site's safety and health program, such as site inspections, incident reviews, and program reviews. Incentive programs that discourage reporting of accidents, symptoms, injuries, or hazards are absent. Other incentive programs may be present.
5	Site safety and health issues are regularly included on agendas of management operations meetings. Management clearly demonstrates—by involvement, support, and example—the primary importance of safety and health for everyone on the worksite. Performance is consistent and sustained or has improved over time.
Employee Participation	
Employee participation provides the means through which workers identify hazards, recommend and monitor abatement, and otherwise participate in their own protection. [Guidelines, (b)(1) and (c)(1).]	
1	Worker participation in workplace safety and health concerns is not encouraged. Incentive programs are present which have the effect of discouraging reporting of incidents, injuries, potential hazards, or symptoms. Employees/employee representatives are not involved in the safety and health program.
2	Workers and their representatives can participate freely in safety and health activities at the worksite without fear of reprisal. Procedures are in place for communication between employer and workers on safety and health matters. Worker rights under the Occupational Safety and Health Act to refuse or stop work that they reasonably believe involves imminent danger are understood by workers and honored by management. Workers are paid while performing safety activities.
3	Workers and their representatives are involved in the safety and health program, involved in inspection of work area, and are permitted to observe monitoring and receive results. Workers' and representatives' right of access to information is understood by workers and recognized by management. A documented procedure is in place for raising complaints of hazards or discrimination and receiving timely employer responses.
4	Workers and their representatives participate in workplace analysis, inspections and investigations, and development of control strategies throughout facility, and have necessary training and education to participate in such activities. Workers and their representatives have access to all pertinent health and safety information, including safety reports and audits. Workers are informed of their right to refuse job assignments that pose serious hazards to themselves pending management response.
5	Workers and their representatives participate fully in development of the safety and health program and conduct of training and education. Workers participate in audits, program reviews conducted by management or third parties, and collection of samples for monitoring purposes, and have necessary training and education to participate in such activities. Employer encourages and authorizes employees to stop activities that present potentially serious safety and health hazards.
Implementation	
Implementation means tools, provided by management, that include: [Guidelines, (b)(1) and (c)(1)]	
<ul style="list-style-type: none"> - Budget - Information - Personnel - Assigned responsibility 	
<ul style="list-style-type: none"> - Adequate expertise and authority - Means to hold responsible persons accountable (line accountability) - Program review procedures. 	
1	Tools to implement a safety and health program are inadequate or missing.
2	Some tools to implement a safety and health program are adequate and effectively used; others are ineffective or inadequate. Management assigns responsibility for implementing a site safety and health program to identified person(s). Management's designated representative has authority to direct abatement of hazards that can be corrected without major capital expenditure.
3	Tools to implement a safety and health program are adequate, but are not all effectively used. Management representative has some expertise in hazard recognition and applicable OSHA requirements. Management keeps or has access to applicable OSHA standards at the facility, and seeks appropriate guidance information for interpretation of OSHA standards. Management representative has authority to order/purchase safety and health equipment.
4	All tools to implement a safety and health program are more than adequate and effectively used. Written safety procedures, policies, and interpretations are updated based on reviews of the safety and health program. Safety and health expenditures, including training costs and personnel, are identified in the facility budget. Hazard abatement is an element in management performance evaluation.
5	All tools necessary to implement a good safety and health program are more than adequate and effectively used. Management safety and health representative has expertise appropriate to facility size and process, and has access to professional advice when needed. Safety and health budgets and funding procedures are reviewed periodically for adequacy.
Contractor Safety	
Contractor safety: An effective safety and health program protects all personnel on the worksite, including the employees of contractors and subcontractors. It is the responsibility of management to address contractor safety. [Guidelines, (b)(1) and (c)(1)]	
1	Management makes no provision to include contractors within the scope of the worksite's safety and health program.
2	Management policy requires contractor to conform to OSHA regulations and other legal requirements.
3	Management designates a representative to monitor contractor safety and health practices, and that individual has authority to stop contractor practices that expose host or contractor employees to hazards. Management informs contractor and employees of hazards present at the facility.



Management Leadership and Employee Participation	
4	Management investigates a contractor's safety and health record as one of the bidding criteria.
5	The site's safety and health program ensures protection of everyone employed at the worksite, i.e., regular full-time employees, contractors, temporary and part-time employees.
Workplace Analysis	
Survey and Hazard Analysis	
Survey and Hazard Analysis: An effective, proactive safety and health program will seek to identify and analyze all hazards. In large or complex workplaces, components of such analysis are the comprehensive survey and analyses of job hazards and changes in conditions. <i>[Guidelines, (c)(2)(i)]</i>	
1	No system or requirement exists for hazard review of planned/changed/new operations. There is no evidence of a comprehensive survey for safety or health hazards or for routine job hazard analysis.
2	Surveys for violations of standards are conducted by knowledgeable person(s), but only in response to accidents or complaints. The employer has identified principal OSHA standards that apply to the worksite.
3	Process, task, and environmental surveys are conducted by knowledgeable person(s) and updated as needed and as required by applicable standards. Current hazard analyses are written (where appropriate) for all high-hazard jobs and processes; analyses are communicated to and understood by affected employees. Hazard analyses are conducted for jobs/tasks/workstations where injury or illnesses have been recorded.
4	Methodical surveys are conducted periodically and drive appropriate corrective action. Initial surveys are conducted by a qualified professional. Current hazard analyses are documented for all work areas and are communicated and available to all the workforce; knowledgeable persons review all planned/changed/new facilities, processes, materials, or equipment.
5	Regular surveys including documented comprehensive workplace hazard evaluations are conducted by certified safety and health professional or professional engineer, etc. Corrective action is documented and hazard inventories are updated. Hazard analysis is integrated into the design, development, implementation, and changing of all processes and work practices.
Inspection: To identify new or previously missed hazards and failures in hazard controls, an effective safety and health program will include regular site inspections. <i>[Guidelines, (c)(2)(ii)]</i>	
1	No routine physical inspection of the workplace and equipment is conducted.
2	Supervisors dedicate time to observing work practices and other safety and health conditions in work areas where they have responsibility.
3	Competent personnel conduct inspections with appropriate involvement of employees. Items in need of correction are documented. Inspections include compliance with relevant OSHA standards. Time periods for correction are set.
4	Inspections are conducted by specifically trained employees, and all items are corrected promptly and appropriately. Workplace inspections are planned, with key observations or check points defined and results documented. Persons conducting inspections have specific training in hazard identification applicable to the facility. Corrections are documented through follow-up inspections. Results are available to workers.
5	Inspections are planned and overseen by certified safety or health professionals. Statistically valid random audits of compliance with all elements of the safety and health program are conducted. Observations are analyzed to evaluate progress.
Hazard Reporting	
A reliable Hazard Reporting System enables employees, without fear of reprisal, to notify management of conditions that appear hazardous and to receive timely and appropriate responses. <i>[Guidelines, (c)(2)(iii)]</i>	
1	No formal hazard reporting system exists, or employees are reluctant to report hazards.
2	Employees are instructed to report hazards to management. Supervisors are instructed and are aware of a procedure for evaluating and responding to such reports. Employees use the system with no risk of reprisals.
3	A formal system for hazard reporting exists. Employee reports of hazards are documented, corrective action is scheduled, and records maintained.
4	Employees are periodically instructed in hazard identification and reporting procedures. Management conducts surveys of employee observations of hazards to ensure that the system is working. Results are documented.
5	Management responds to reports of hazards in writing within specified time frames. The workforce readily identifies and self-corrects hazards; they are supported by management when they do so.
Accident and Record Analysis	
Accident Investigation	
Accident Investigation: An effective program will provide for investigation of accidents and "near miss" incidents, so that their causes, and the means for their prevention, are identified. <i>[Guidelines, (c)(2)(iv)]</i>	
1	No investigation of accidents, injuries, near misses, or other incidents is conducted.
2	Some investigation of incidents takes place, but root cause may not be identified, and correction may be inconsistent. Supervisors prepare injury reports for lost time cases.
3	OSHA-101 is completed for all recordable incidents. Reports are generally prepared with cause identification and corrective measures prescribed.
4	OSHA-recordable incidents are always investigated, and effective prevention is implemented. Reports and recommendations are available to employees. Quality and completeness of investigations are systematically reviewed by trained safety personnel.
5	All loss-producing accidents and "near-misses" are investigated for root causes by teams or individuals that include trained safety personnel and employees.



Management Leadership and Employee Participation	
Accident and Record Analysis	
Management Leadership and Employee Participation	
Data Analysis: An effective program will analyze injury and illness records for indications of sources and locations of hazards, and jobs that experience higher numbers of injuries. By analyzing injury and illness trends over time, patterns with common causes can be identified and prevented. <i>[Guidelines, (c)(2)(v)]</i>	
1	Little or no analysis of injury/illness records; records (OSHA 200/101, exposure monitoring) are not kept.
2	Data is collected and analyzed, but not widely used for prevention. OSHA-101 is completed for all recordable cases. Exposure records and analyses are organized and are available to safety personnel.
3	Injury/illness logs and exposure records are kept correctly, are audited by facility personnel, and are essentially accurate and complete. Rates are calculated so as to identify high risk areas and jobs. Workers compensation claim records are analyzed and the results used in the program. Significant analytical findings are used for prevention.
4	Employer can identify the frequent and most severe problem areas, the high risk areas and job classifications, and any exposures responsible for OSHA recordable cases. Data are fully analyzed and effectively communicated to employees. Illness/injury data are audited and certified by a responsible person.
5	All levels of management and the workforce are aware of results of data analyses and resulting preventive activity. External audits of accuracy of injury and illness data, including review of all available data sources are conducted. Scientific analysis of health information, including non-occupational databases is included where appropriate in the program.
Hazard Prevention and Control	
Hazard Control	
Hazard Control: Workforce exposure to all current and potential hazards should be prevented or controlled by using engineering controls (wherever feasible and appropriate), work practices and administrative controls, and personal protective equipment (PPE). <i>[Guidelines, (c)(3)(i)]</i>	
1	Hazard control is seriously lacking or absent from the facility.
2	Hazard controls are generally in place, but effectiveness and completeness vary. Serious hazards may still exist. Employer has achieved general compliance with applicable OSHA standards regarding hazards with a significant probability of causing serious physical harm. Hazards that have caused past injuries in the facility have been corrected.
3	Appropriate controls (engineering, work practice, administrative controls, and PPE) are in place for significant hazards. Some serious hazards may exist. Employer is generally in compliance with voluntary standards, industry practices, and manufacturers' and suppliers' safety recommendations. Documented reviews of needs for machine guarding, energy lockout, ergonomics, materials handling, bloodborne pathogens, confined space, hazard communication, and other generally applicable standards have been conducted. The overall program tolerates occasional deviations.
4	Hazard controls are fully in place, and are known and supported by the workforce. Few serious hazards exist. The employer requires strict and complete compliance with all OSHA, consensus, and industry standards and recommendations. All deviations are identified and causes determined.
5	Hazard controls are fully in place and continually improved upon based on workplace experience and general knowledge. Documented reviews of needs are conducted by certified health and safety professionals or professional engineers, etc.
Maintenance	
Maintenance: An effective safety and health program will provide for <i>facility and equipment maintenance</i> , so that hazardous breakdowns are prevented. <i>[Guidelines, (c)(3)(ii)]</i>	
1	No preventive maintenance program is in place; breakdown maintenance is the rule.
2	There is a preventive maintenance schedule, but it does not cover everything and may be allowed to slide or performance is not documented. Safety devices on machinery and equipment are generally checked before each production shift.
3	A preventive maintenance schedule is implemented for areas where it is most needed; it is followed under normal circumstances. Manufacturers' and industry recommendations and consensus standards for maintenance frequency are complied with. Breakdown repairs for safety related items are expedited. Safety device checks are documented. Ventilation system function is observed periodically.
4	The employer has effectively implemented a preventive maintenance schedule that applies to all equipment. Facility experience is used to improve safety-related preventative maintenance scheduling.
5	There is a comprehensive safety and preventive maintenance program that maximizes equipment reliability.
Medical Program	
Medical Program: An effective safety and health program will include a suitable medical program where it is appropriate for the size and nature of the workplace and its hazards. <i>[Guidelines, (c)(3)(iv)]</i>	
1	Employer is unaware of, or unresponsive to medical needs. Required medical surveillance, monitoring, and reporting are absent or inadequate.
2	Required medical surveillance, monitoring, removal, and reporting responsibilities for applicable standards are assigned and carried out, but results may be incomplete or inadequate.
3	Medical surveillance, removal, monitoring, and reporting comply with applicable standards. Employees report early signs/symptoms of job-related injury or illness and receive appropriate treatment.
4	Health care providers provide follow-up on employee treatment protocols and are involved in hazard identification and control in the workplace. Medical surveillance addresses conditions not covered by specific standards. Employee concerns about medical treatment are documented and responded to.



Management Leadership and Employee Participation	
5	Health care providers are on-site for all production shifts and are involved in hazard identification and training. Health care providers periodically observe the work areas and activities and are fully involved in hazard identification and training.
Emergency Response	
Emergency Preparedness	
Emergency Preparedness: There should be appropriate planning, training, drills, and equipment for response to emergencies. <i>Note:</i> In some facilities the employer plan is to evacuate and call the fire department. In such cases, only applicable items listed below should be considered. <i>[Guidelines, (c)(3)(iii) and (iv)]</i>	
1	Little or no effective effort to prepare for emergencies.
2	Emergency response plans for fire, chemical, and weather emergencies as required by Title 29 CFR 1910.38, 1910.120, or 1926.35 are present. Training is conducted as required by the applicable standard. Some deficiencies may exist.
3	Emergency response plans have been prepared by persons with specific training. Appropriate alarm systems are present. Employees are trained in emergency procedures. The emergency response extends to spills and incidents in routine production. Adequate supply of spill control and PPE appropriate to hazards on site is available.
4	Evacuation drills are conducted no less than annually. The plan is reviewed by a qualified safety and health professional.
5	Designated emergency response team with adequate training is on-site. All potential emergencies have been identified. Plan is reviewed by the local fire department. Plan and performance are reevaluated at least annually and after each significant incident. Procedures for terminating an emergency response condition are clearly defined.
First Aid	
First aid/emergency care should be readily available to minimize harm if an injury or illness occurs. <i>[Guidelines, (c)(3)(iii) and (iv)]</i>	
1	Neither on-site nor nearby community aid (e.g., emergency room) can be ensured.
2	Either on-site or nearby community aid is available on every shift.
3	Personnel with appropriate first aid skills commensurate with likely hazards in the workplace and as required by OSHA standards (e.g., 1910.151, 1926.23) are available. Management documents and evaluates response time on a continuing basis.
4	Personnel with <i>certified</i> first aid skills are always available on-site; their level of training is appropriate to the hazards of the work being done. Adequacy of first aid is formally reviewed after significant incidents.
5	Personnel trained in advanced first aid and/or emergency medical care are always available on-site. In larger facilities a health care provider is on-site for each production shift.
Safety and Health Training	
Training	
Safety and health training should cover the safety and health responsibilities of all personnel who work at the site or affect its operations. It is most effective when incorporated into other training about performance requirements and job practices. It should include all subjects and areas necessary to address the hazards at the site. <i>[Guidelines, (b)(4) and (c)(4)]</i>	
1	Facility depends on experience and peer training to meet needs. Managers/supervisors demonstrate little or no involvement in safety and health training responsibilities.
2	Some orientation training is given to new hires. Some safety training materials (e.g., pamphlets, posters, videotapes) are available or are used periodically at safety meetings, but there is little or no documentation of training or assessment of worker knowledge in this area. Managers generally demonstrate awareness of safety and health responsibilities, but have limited training themselves or involvement in the site's training program.
3	Training includes OSHA rights and access to information. Training required by applicable standards is provided to all site employees. Supervisors and managers attend training in all subjects provided to employees under their direction. Employees can generally demonstrate the skills/knowledge necessary to perform their jobs safely. Records of training are kept and training is evaluated to ensure that it is effective.
4	Knowledgeable persons conduct safety and health training that is scheduled, assessed, and documented, and addresses all necessary technical topics. Employees are trained to recognize hazards, violations of OSHA standards, and facility practices. Employees are trained to report violations to management. All site employees—including supervisors and managers—can generally demonstrate preparedness for participation in the overall safety and health program. There are easily retrievable scheduling and recordkeeping systems.
5	Knowledgeable persons conduct safety and health training that is scheduled, assessed, and documented. Training covers all necessary topics and situations, and includes all persons working at the site (hourly employees, supervisors, managers, contractors, part-time, and temporary employees). Employees participate in creating site-specific training methods and materials. Employees are trained to recognize inadequate responses to reported program violations. Retrievable recordkeeping system provides for appropriate retraining, makeup training, and modifications to training as the result of evaluations.



Attachment 2
Clause 52.223-3
Hazardous Material Identification and Material
Safety Data



In accordance with Clause I.4 of the RFP, SGT has performed an initial analysis of hazardous materials that may be delivered on the MSES II/A contract. Types of materials likely to be delivered under MSES II/A are listed below. We will update this list throughout the period of performance of the MSES II/A contract as we respond to task assignments.

HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA
(52.223-3) (JAN 1997)—ALTERNATE I (JUL 1995)

(a) "Hazardous material," as used in this clause, includes any material defined as hazardous under the latest version of Federal Standard No. 313 (including revisions adopted during the term of the contract).

(b) The offeror must list any hazardous material, as defined by paragraph (a) of this clause, to be delivered under this contract. The hazardous material shall be properly identified and include any applicable identification number, such as National Stock Number or Special Item Number. This information shall also be included on the Material Safety Data Sheet submitted under this contract.

Material

SGT anticipates that products delivered under MSES II/A may contain the following types of hazardous materials: propellants, lubricants, coatings, and cryogenics.

Identification No.

(c) This list must be updated during performance of the contract whenever the Contractor determines that any other material to be delivered under this contract is hazardous.

(d) The apparently successful offeror agrees to submit, for each item as required prior to award, a Material Safety Data Sheet, meeting the requirements of Title 29 CFR 1910.1200 (g) and the latest version of Federal Standard No. 313, for all hazardous material identified in paragraph (b) of this clause. Data shall be submitted in accordance with Federal Standard No. 313, whether or not the apparently successful offeror is the actual manufacturer of these items. Failure to submit the Material Safety Data Sheet prior to award may result in the apparently successful offer being considered nonresponsible and ineligible for award.



(e) If, after award, there is a change in the composition of the item(s) or a revision to Federal Standard No. 313, which render incomplete or inaccurate the data submitted under paragraph (d) of this clause, the Contractor shall promptly notify the Contacting Officer and resubmit the data.

(f) Neither the requirements of this clause nor any act or failure to act by the Government shall relieve the Contractor of any responsibility or liability for the safety of Government, Contractor, or subcontractor personnel or property.

(g) Nothing contained in this clause shall relieve the Contractor from complying with applicable federal, state, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.

(h) The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

(1) To use, duplicate, and disclose any data to which this clause is applicable. The purposes of this right are to—

(i) Apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous material;

(ii) Obtain medical treatment for those affected by the material; and

(iii) Have others use, duplicate, and disclose the data for the Government for these purposes.

(2) To use, duplicate, and disclose data furnished under this clause, in accordance with subparagraph (h) (1) of this clause, in precedence over any other clause of this contract providing for rights in data.

(3) The Government is not precluded from using similar or identical data acquired from other sources:

(i) Except as provided in paragraph (i) 2., the Contractor shall prepare and submit a sufficient number of Material Safety Data Sheets (MSDSs), meeting the requirements of Title 29 CFR 1910.1200 (g) and the latest version for Federal Standard No 313, for all hazardous material identified in paragraph (b) of this clause.

1. For items shipped to consignees, the contractor shall include a copy of the MSDSs with the packing list or other suitable shipping document that accompanies each shipment. Alternatively, the Contractor is permitted to transmit MSDSs to



consignees in advance of receipt of shipments by consignees, if authorized by the Contracting Officer.

2. For items shipped to consignees identified by mailing address as agency depots, distribution center or customer supply center, the Contractor shall provide one copy of the MSDs in or on each shipping container. If affixed to the outside of each container, the MSDs must be placed in a weather resistant envelope.

(End of clause)



During proposal preparation, SGT conducted safety inspections of its Teammates' facilities, including review of MSDSs. The following table is an example of the hazardous materials inventory at one of the sites inspected. Sample MSDSs were verified.

During transition we will coordinate with our COTR and on-site GSFC lab/facility managers to verify MSDSs for all on-site hazardous materials.

Sample Hazardous Materials

Description	COMMON NAME	M-CARD # OR DWG	Manufacturer
ADH. EPOXY SILVER FILLED		53311JG	ABLESTIK
ADHESIVE	C-7 RESIN	CFM	ARMSTRONG EPOXY
ADHESIVE EPOXY,HYSOL	EA 9394	53841BW	LOCTITE CORP
ADHESIVE FILER	CAB-O-SIL,M-5	52514AU	CABOT
ADHESIVE/EPOXY	ADHESIVE/EPOXY	53311LX	LASER APLICATIONS
ANTISTATIC MAT AND TABLE CLEANER	ANTISTATIC MAT AND TABLE CLEANER	53513DY	TECHSPRAY
ARATHANE	ARATHANE 5753A	53825FU,Part A	HUNTSMAN
ARATHANE	ARATHANE 5753B	53825FU,Part B	HUNTSMAN
ARMSTRONG ACTIVATOR	ACTIVATOR W	CFM	ARMSTRONG EPOXY
BLACK INK KIT	INK, MARKING	35111GU B-3 CATALYST	ENTHONE
BLACK INK KIT	INK, MARKING	35111GU M-O-NC INK	ENTHONE
BLACK INK KIT	INK, EPOXY RESIN	53321CR B-3CATALYST	ENTHONE
BLACK INK KIT	INK, EPOXY RESIN	53321CR M-O-N BLACK INK	ENTHONE
BORON NITRATE POWDER	PSHP325	52305AU	SAINT GOBAIN
CATALYST B3	CATALYST B-3	51230ES	ENTHONE
CATALYST 9	CATALYST 9	54601CN	EMERSOM & Cuming
CHEM STRIP JELL	N/A	FROM CUSTOMER	AMBION
CLEANER	SPECTRA #2 056-3		DAYCON PROD
CLEANER ZEROCHARGE	MAT AND TABLE TOP CLEANER	53513DY	TECHSPRAY
CV SEALANT RTV	CV SEALANT RTV	45793FR	DOW CORNING
ECCOSHIELD SVR	ECCOSHIELD SVR	45551FS	EMERSON & CUMING
EPOXY	Epo Tek H63	53321DU	EPOXY TECHNOLOGY
EPOXY ADHESIVE	SCOTCHWELD (ADHESIVE EPOXY)	53320LG, Part B	3M ELECTRONICS
EYE GLASS CLEANER	Sight Savers brand Anti-Fog Liquid Without Silicone	53516QC	BAUSCH & LOMB
EYESALINE	EYESALINE	76700BM	FENDELL
GASKET MATERIAL	CO-THERM	N/A	FABRI-TECH
GASKET THERMAL	GASKET THERMAL	N/A	FABRI-TECH
GREASE	N/A		STATE CHEMICAL MFG
GREASE	N/A		MOBIL
HAND LOTION	ANTI STATIC LOTION	53511EV	TECHSPRAY
HAND LOTION ZERO CHARGE	HAND LOTION ZERO CHARGE	53511EV	TECHSPRAY
HARDENER,EPOXY	VERSAMID 140	54601AN	MILLER-STEPHENSON
INSULATING MATERIAL	CO-THERM	N/A	FABRI-TECH
IRIDITE KIT,14-2	IRIDITE KIT 14-2 BR Kit	53531KA	SEILER HUGHES
ISOPROPANOL 99%	Isopropanol 99%	51100CN	EXXONMOBIL
KAPTON TAPE, 1/2" WIDE	KAPTON TAPE 1/2" WIDE	K102	ROBERT McKEOWN
LAMINATION SHEET	ADHESIVE SILICONE SHEET 38"X10 YD X .015"	53846PH	ARLON INC



Description	COMMON NAME	M-CARD # OR DWG	Manufacturer
LOCTITE TAKPAK	LOCTITE	53314QY	LOCKTITE
LUBRICANT	N/A	CUSTOMER DWG	CASTROL
LUBRICANT,LOCTITE 767	N/A		LOCTITE CORP
LUBRICANT,SYN. ALL SEASON SELECT	LUBRICANT,SYNTHETIC, ALL SEASON SELECT	SUPPLIER	INGERSOLL RAND
MEK	Methyl Ethyl Ketone	51050AD	CELANESE
METAL CLEANER	DIP CLEAN METAL CLEANER	53422HH	ERASER
OIL,SYNTHESIZED,HIGH TEMP	OIL,SYNTHESIZED,HIGH TEMP	SUPPLIER	FUCHS,LUBRITECH
PRIME COAT	2260 Prime Coat	53846HB	DOW CORNING
PRIMER SILICONE RUBBER	1200 RTV Prime Coat, Red	53846CV	DOW CORNING
PUMP FLUID,TYPE GP	PUMP FLUID,TYPE GP,VARIAN OIL	SUPPLIER	VARIAN OIL
RESIN,EPOXY	EPON Resin 828	53841AF-OZ	MILLER-STEPHENSON
ROSIN FLUX RMA	Rosin Soldering Flux, Type RMA	53301AS	KESTER
RTV SILICON THERMAL	N/A	45793CH	NUSIL TECH
SAPONIFIER	ALPHA	53516XA	ALPHA
SCALE STRIPPER	K2165 Scale Strip	FROM AMECOM	ALPHA METALS
SILICONE THERMALLY COND		45793NH	NUSIL TECH
SILVER EPOXY	Tra-Duct 2902 Hardener	53320RY	TRA-CON
SOLDER BARS, TIN	285 Core Flux Cored Solder		KESTER/AVENET
SOLDER BARS, TIN	SOLDER INGOTS SOLDER BAR	17640DN	KESTER
SOLDER MASK	P.C. FLEX MASK	53535EW	CONTRONIC DEVICES
SOLDER OXIDE POWDER	N/A		ELECTROVERT
SOLDER PASTE	Solder Paste	17645FM	HENKEL
SOLDER PASTE		17645DP	EFD INC
SOLDER WIRE	SOLDER WIRE	17630BR	ALPHA METALS
SOLDER WIRE	SOLDER WIRE	17630BR	ALPHA METALS
SOLDER WIRE	SOLDER WIRE	17630BR	ALPHA METALS
SOLDER WIRE	SOLDER WIRE	17630BR	ALPHA METALS
SOLDER WIRE	SOLDER WIRE	17630BR	ALPHA METALS
SOLDER WIRE	SOLDER WIRE	17630BR	ALPHA METALS
SOLDER WIRE	SOLDER WIRE	17630BR	ALPHA METALS
SOLDER-015 DIA		17630BR	KESTER SOLDER
SOLDER-020 DIA		17630BR	ALPHA METALS
SOLDER-HI-TEMP,015 DIA	285 Rosin Flux Cored Solder		KESTER
STYCAST epoxy	Stycast 2850FT Black	53841XV	EMERSOM & Cuming
SYNTHETIC CHAIN OIL	N/A		ELECTROVERT
TEST SOLUTION	K75-1 Omega Meter Solution	54410RJ	ALPHA METALS
THERMAL PAD	CO-THERM	N/A	FABRI-TECH
TITANIUM DIOXIDE	Titanium Dioxide	52522BN	J.T.BAKER
TITANIUM DIOXIDE PIGMENT	T315-500		FISHER SCIENTIFIC
TOLUENE		51500CJ	J.T.BAKER
URALANE	Uralane 5750A	53320SK, PartAB	Huntsman
URALANE	Uralane 5750B	53320SK, Part B	Huntsman
WHITE INK	M-9-N White	35216BE	ENTHONE
	ETHYLENE GLYCOL		NESLAB INSTRUMENTS



Attachment 3

Facility Inspection Items



Date Evaluated: _____

Evaluator: _____

FACILITY INSPECTION ITEMS

1. AISLES AND PASSAGEWAYS

- A. Where mechanical handling equipment is used, sufficient safe clearance shall be allowed for aisles at loading docks, through doorways, and whenever turns or passage must be made.
- B. Aisles and passageways shall be kept clear and in good repair with no obstructions across or in aisles that could create hazards.
- C. Permanent aisles and passageways shall be appropriately marked.

2. CHAINS, CABLES, ROPES, HOOKS, ETC.

- A. Chains, cables, ropes, slings, etc. shall be inspected daily, and defective gear shall be removed and repaired or replaced.
- B. Hoist chains and hoist ropes shall be free from kinks or twists and shall not be wrapped around the load.
- C. All U-bolt wire rope clips or hoist ropes shall be installed so that the U-bolt is in contact with the dead end (short or nonload carrying end) of the rope. Clips shall be installed in accordance with the clip manufacturer's recommendation. All nuts or newly installed clips shall be retightened after 1 hour of use.

3. CHIP GUARDS

- Protective shields and barriers shall be provided, in operations involving cleaning with compressed air, to protect personnel against flying chips or other such hazards.

4. COMPRESSED AIR, USE OF

- Compressed air used for cleaning purposes shall not exceed 30 psi when the nozzle end is obstructed or dead-ended, and then only with effective chip guarding and personal protective equipment.

5. CRANES AND HOISTS (OVERHEAD AND GANTRY)

- A. All functional operating mechanisms, air, and hydraulic systems, chains, rope slings, hooks, and other lifting equipment shall be visually inspected daily.
- B. Complete inspection of the crane shall be performed at intervals depending on its activity, severity of service, and environment.



- C. Overhead cranes shall have stops at the limit of the travel of the trolley. Bridge trucks shall have rail sweeps.
- D. The rated load of the crane shall be plainly marked on each side of the crane. If the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block, and this marking shall be clearly legible from the ground floor.

6. DRILL PRESSES

- The V-belt of all drill presses, including usual front and rear pulleys, shall be guarded to protect the operator from contact or breakage.

7. ELECTRICAL

- A. Power cords shall be connected directly into a receptacle (do not use extension cords).
- B. Route power cords in a manner that will not create a tripping hazard.
- C. Power cords that have been spliced or are frayed or cracked shall not be used.
- D. All electrical equipment shall be marked to show the manufacturer's name, trademark, or other descriptive marking that identifies who is responsible for the product.
- E. All fixed equipment shall be properly grounded.

8. EMERGENCY FLUSHING, EYES AND BODY

- Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

9. EXITS

- A. Every building designed for human occupancy shall be provided with exits sufficient to permit the prompt escape for occupants in case of emergency.
- B. In hazardous areas, or where employees may be endangered by the blocking of any single means of egress due to fire or smoke, there shall be at least two means of egress remote from each other.
- C. Exits and the way of approach and travel from exits shall be maintained so that they are unobstructed and are accessible at all times.
- D. All exits shall discharge directly to the street or other open space that gives safe access to a public way.
- E. Exit doors serving more than 50 people, or at high hazard areas, shall swing in the direction of travel.



- F. Exits shall be marked by readily visible, suitably illuminated exit signs. Exit signs shall be distinctive in color and provide contrast with surroundings. The word "EXIT" shall be of plainly legible letters, not less than 6 inches high.

10. EYE AND FACE PROTECTION

- Protective eye and face equipment shall be required where there is a reasonable probability of injury that can be prevented by such equipment.

11. FAN BLADES

- When the periphery of the blades of a fan is less than 7 feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than one half inch in their least dimension. The use of fabric nets with one half inch maximum opening to modify existing substandard guards is acceptable.

12. FIRE PROTECTION

- A. Portable fire extinguishers suitable to the conditions and hazards involved shall be provided and maintained in an effective operating condition.
- B. Portable fire extinguishers shall be conspicuously located and mounted where they will be readily accessible. Extinguishers shall not be obstructed or obscured from view.

13. FLOORS, GENERAL CONDITION

- A. All floor surfaces shall be kept clean, dry, and free from protruding nails, splinters, loose boards, holes, or projections.
- B. Where wet processes are used, drainage shall be maintained, and false floors, platforms, mats, or other dry standing places should be provided where practicable.

14. FLOOR OPENINGS, HATCHWAYS, OPEN SIDES, ETC.

- A. Floor openings shall be guarded by a standard railing on all exposed sides, or be protected by a suitable cover.
- B. Open-sided floors, platforms, etc., 4 feet or more above the adjacent floor or ground level shall be guarded by a standard railing on all open sides, except where there is an entrance to a ramp, stairway, or fixed ladder.

15. FOOT PROTECTION

- Foot protection equipment shall be worn when there is reasonable probability that injury can be prevented by such equipment.

**16. HEAD PROTECTION**

- Head protection equipment shall be worn when there is reasonable probability that injury can be prevented by such equipment.

17. HANDTOOLS

- A. The contractor shall be responsible for the safe condition of tools and equipment that may be furnished by employees.
- B. All handtools shall be kept in safe condition. Handles of tools shall be kept tight on the tool, and wooden handles shall be free of splinters or cracks. Wedges, chisels, etc., shall be free of mushroomed heads. Wrenches shall not be used when sprung to the point that lapping occurs.
- C. The frames of portable electric tools and equipment, except when using approved double insulated constructions, shall be properly grounded.
- D. Electric power tools and equipment showing worn, deteriorated, or inadequate insulation or other parts shall be removed from service and repaired or replaced.

18. HOUSEKEEPING

- All places of employment, passageways, storerooms, and service rooms shall be kept clean and orderly and in a sanitary condition.

19. MACHINE GUARDING

- One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operations, in-going nip points, rotating parts, and flying chips or sparks.

20. MACHINERY, FIXED

- Machines designed for affixed location shall be securely anchored to prevent walking or moving or designed in such a manner that they will not move in normal operation.

21. MATS, INSULATING

- Where motors or controllers operating at more than 150 volts to ground are guarded against accidental contact only by location, and where adjustment or other attendance may be necessary during operations, suitable insulating mats or other platforms shall be provided.

**22. PERSONAL PROTECTIVE EQUIPMENT**

- Proper personal protective equipment, including shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition where there is a hazard from processes or environment that may cause injury or illness to the employees.

23. RAILINGS

- A. A standard railing shall consist of top rail, intermediate rail and posts and shall have a vertical height of 42 inches from upper surface of top rail to floor, platform, etc.
- B. A railing for open-sided floors, platforms, and runways shall have a toeboard, whenever, beneath the open side, persons can pass, there is moving machinery, or there is equipment with which falling materials could cause a hazard.
- C. Railings shall be of such constructions that the complete structure shall be capable of withstanding a load of at least 200 pounds in any direction on any point on the top rail.
- D. A stair railing shall be of construction similar to a standard railing, but the vertical height shall be not more than 34 inches or less than 30 inches from upper surface of top rail to surface of tread inline with face of riser or forward edge of tread.

24. STAIRS, FIXED INDUSTRIAL

- A. Every flight of stairs having four or more risers shall be provided with a standard railing on all open sides. Handrails shall be provided on at least one side of closed stairways, preferably on the right side descending.
- B. Stairs shall be constructed so that rise height and tread width is uniform throughout.
- C. Fixed stairways shall have a minimum width of 22 inches.

25. STATIONARY ELECTRICAL DEVICES

- All stationary electrically powered equipment, tools, and devices, located within reach of a person who can make contact with any grounded surface or object, shall be grounded.

26. STORAGE

- A. All storage shall be stacked, blocked, interlocked, and limited in height so that it is secure against sliding or collapse.



- B. Storage areas shall be kept free from accumulation of materials that constitute hazards or pest harborage. Vegetation control will be exercised when necessary.
- C. Where mechanical handling equipment is used, sufficient safe clearance shall be allowed for aisles, at loading docks, through doorways, etc.

27. TOEBOARDS

- A. Railings protecting floor openings, platforms, scaffolds, etc. shall be equipped with toeboards whenever, beneath the open side, persons can pass, there is moving machinery, or there is equipment with which falling material could cause a hazard.
- B. A standard toeboard shall be at least 4 inches in height and may be of any substantial material, either solid or open, with openings not to exceed 1 inch in greatest dimension.

28. TOXIC VAPORS, GASES, MISTS, AND DUSTS

- A. Exposure to toxic vapors, gases, mists, or dusts at a concentration above the Threshold Limit Values, contained or referred to in Safety and Health Standards, shall be avoided.
- B. To achieve compliance with paragraph (A), administrative or engineering controls must first be determined and implemented whenever feasible. When such controls are not feasible to achieve full compliance, protective equipment or any other protective measures shall be used to keep the exposure of employees to air contaminants within the limits prescribed. Any equipment and/or technical measures used for this purpose must be approved for each particular use by a competent industrial hygienist or other technically qualified person.

29. TRIPPING HAZARDS

- During the inspection, be alert to the numerous tripping hazards that might exist within the computer laboratory and office areas. These would include such things as poorly placed electrical and telephone stacks, wires running across aisle areas, improperly stored equipment and materials, etc. Where hazards exist, appropriate action is to be taken to eliminate these conditions. The computer laboratory floor should be inspected for leveling, open holes, and missing tile.

30. MISCELLANEOUS HAZARDS

- All work spaces are smoke-free.



31. FIRE HAZARDS

- During the inspection of office, computer, and shop areas, particular emphasis should be placed on elimination of fire hazards. These include such items as excessive accumulation and air conditioning window units. Also included in this category of hazards would be improper storage of combustible items. It is expected that major improvements will be made in all areas to eliminate these hazards.

When fire extinguishers are not available and fire hazards exist, assistance from the GSFC Health and Safety Engineering Office should be requested.

32. HAZARDS FROM FALLING OBJECTS

- A number of employee injuries are caused by falling objects. To minimize the risk of such injuries, the tops of all storage cabinets should be cleared of any stored material. Shelving and cabinets should be checked to ensure that no overloading conditions exist. Injuries of this sort will also occur when equipment is pulled from bench tops as a result of employees tripping over wires improperly laid across walk areas. A thorough examination of computer areas is needed to spot potential hazards, particularly storage areas where paper, tapes, and other supplies are kept. Assistance can be provided by the GSFC Health and Safety Engineering Office.

33. SELDOM USED AND/OR EXCESS FURNITURE AND EQUIPMENT

- Although property inventories provide for the elimination of many items or surplus equipment and furniture, you should still be alert to the continuing need to dispose of equipment prior to and after inventories. Whenever seldom used or excess furniture and equipment are found, necessary action should be taken to store these items or declare them surplus.



Attachment 4
NASA FORM 1627



		NASA Mishap Report		MASTER FILE NO.	
Part A: Mishap Details					
NOTE: FILL IN ALL KNOWN UNSHADED BLOCKS WITHIN 24 HOURS.					
DETAILS					
1. DATE OF INCIDENT		2. TIME OF INCIDENT		3. GENERAL LOCATION (Building, Area, Facility, etc.)	
5. RESPONSIBLE ORGANIZATION		6. CONTRACT NUMBER		4. EXACT LOCATION (street, floor, room, etc.)	
7. ORG. FILE NUMBER		8. ORGANIZATION POINT OF CONTACT		9. MAIL CODE	
10. PHONE		11. MISSION AFFECTED, IF KNOWN			
12. PROGRAM IMPACT, IF KNOWN (Describe impact in terms of delay, cost adjustment, etc.)				13. INCIDENT DESCRIPTION (Do not use actual names, include in the description the sequence of events, extent of injury or property damage, cause, etc., if known.)	
IMPACT SUMMARY					
14. CHECK ALL OUTCOMES FROM THIS EVENT THAT ARE KNOWN FACTS (Do not check any box that indicates any future potential or outcome.)					
<input type="checkbox"/> FATALITY		<input type="checkbox"/> SERIOUS DAMAGE TO AIRCRAFT OR SPACE HARDWARE		<input type="checkbox"/> UNEXPECTED DAMAGE DUE TO TEST FAILURE	
<input type="checkbox"/> PERMANENT DISABILITY		<input type="checkbox"/> SERIOUS DAMAGE TO FLIGHT OR GROUND SUPPORT HARDWARE		<input type="checkbox"/> DAMAGE ESTIMATE OVER \$1,000,000	
<input type="checkbox"/> 3 OR MORE PEOPLE HOSPITALIZED		<input type="checkbox"/> UNEXPECTED DAMAGE DUE TO TEST FAILURE		<input type="checkbox"/> DAMAGE ESTIMATE BETWEEN \$250K AND \$1M	
<input type="checkbox"/> 1 OR 2 PEOPLE HOSPITALIZED		<input type="checkbox"/> DAMAGE ESTIMATE OVER \$1,000,000		<input type="checkbox"/> DAMAGE ESTIMATE BETWEEN \$25K AND \$250K	
<input type="checkbox"/> LOSS OF CONSCIOUSNESS		<input type="checkbox"/> DAMAGE ESTIMATE BETWEEN \$250K AND \$1M		<input type="checkbox"/> DAMAGE ESTIMATE BETWEEN \$1K AND \$25K	
<input type="checkbox"/> FULL LOST WORKDAY(S)		<input type="checkbox"/> DAMAGE ESTIMATE BETWEEN \$25K AND \$250K		<input type="checkbox"/> DAMAGE ESTIMATE UNDER \$1K	
<input type="checkbox"/> 3 OR MORE PEOPLE HOSPITALIZED		<input type="checkbox"/> DAMAGE ESTIMATE BETWEEN \$1K AND \$25K		<input type="checkbox"/> AFFECTED PRIMARY OBJECTIVE(S) OF MISSION	
<input type="checkbox"/> 1 OR 2 PEOPLE HOSPITALIZED		<input type="checkbox"/> DAMAGE ESTIMATE UNDER \$1K		<input type="checkbox"/> HIGH VISIBILITY (internal or external to NASA)	
<input type="checkbox"/> LOSS OF CONSCIOUSNESS		<input type="checkbox"/> AFFECTED PRIMARY OBJECTIVE(S) OF MISSION			
<input type="checkbox"/> FULL LOST WORKDAY(S)		<input type="checkbox"/> HIGH VISIBILITY (internal or external to NASA)			
<input type="checkbox"/> RESTRICTED WORKDAY(S)					
<input type="checkbox"/> MEDICATION OR MEDICAL TREATMENT ADMINISTERED					
<input type="checkbox"/> INJURY OR ILLNESS					
<input type="checkbox"/> SIGNIFICANT PROGRAM IMPACT					
<input type="checkbox"/> FIRST AID ONLY WAS ADMINISTERED					
<input type="checkbox"/> CLOSE CALL					
15. LEVEL OF POTENTIAL FOR THIS EVENT OR CLOSE CALL (Using reasonable judgment, check the boxes which you believe have a HIGH probability of occurring under similar conditions.)					
<input type="checkbox"/> FATALITY		<input type="checkbox"/> POTENTIAL DAMAGE ESTIMATE OVER \$250,000		<input type="checkbox"/> UNEXPECTED DAMAGE DUE TO TEST FAILURE	
<input type="checkbox"/> PERMANENT DISABILITY		<input type="checkbox"/> POTENTIAL DAMAGE ESTIMATE UNDER \$250,000		<input type="checkbox"/> AFFECT PRIMARY OBJECTIVE(S) OF MISSION	
<input type="checkbox"/> 3 OR MORE PEOPLE HOSPITALIZED		<input type="checkbox"/> SERIOUS DAMAGE TO AIRCRAFT OR SPACE HARDWARE		<input type="checkbox"/> SIGNIFICANT PROGRAM IMPACT	
<input type="checkbox"/> FULL LOST WORKDAY(S)		<input type="checkbox"/> SERIOUS DAMAGE TO FLIGHT OR GROUND SUPPORT HARDWARE		<input type="checkbox"/> HIGH VISIBILITY (internal or external to NASA)	
PERSON INVOLVED IN INJURY OR ILLNESS					
16. NAME (Last, First MI)		17. ORGANIZATION		18. CONTRACT NUMBER	
19. JOB TITLE/OCCUPATION		20. SUPERVISOR'S NAME (Full Name)		21. SUPERVISOR'S ORGANIZATION	
22. SUPERVISOR'S MAIL CODE		23. SUPERVISOR'S PHONE			
24. AGE		25. SEX		26. SHIFT WORKED	
<input type="checkbox"/> Male <input type="checkbox"/> Female		<input type="checkbox"/> 1st <input type="checkbox"/> 2nd <input type="checkbox"/> 3rd		27. CONTINUOUS DUTY HOURS	
28. YEARS OF EXPERIENCE		29. INJURY OR ILLNESS		30. FROM PRE-EXISTING	
<input type="checkbox"/> Under 1 <input type="checkbox"/> Under 5 <input type="checkbox"/> Under 10 <input type="checkbox"/> Over 10		<input type="checkbox"/> INJURY <input type="checkbox"/> ILLNESS		<input type="checkbox"/> YES <input type="checkbox"/> NO	
31. FATALITY? <input type="checkbox"/>		32. DATE OF DEATH		33. PERMANENT DISABILITY? <input type="checkbox"/>	
34. # OF FULL LOST WORKDAYS		35. # OF RESTRICTED WORKDAYS			
36. INJURY TYPE(S) (e.g., Abrasion, Burn, Concussion, Laceration, etc.)			37. AFFECTED BODY PART(S) OR BODY SYSTEM(S)		
38. BRIEF MEDICAL DIAGNOSIS					
39. MEDICAL TREATMENT ADMINISTERED					
<input type="checkbox"/> TREATMENT OF INFECTION		<input type="checkbox"/> APPLICATION OF SUTURES		<input type="checkbox"/> REMOVAL OF OBJECT IN WOUND	
<input type="checkbox"/> APPLICATION OF ANTISEPTIC		<input type="checkbox"/> USE OF BUTTERFLY ADHESIVE		<input type="checkbox"/> USE OF PRESCRIPTION MEDICATION	
<input type="checkbox"/> 2ND OR 3RD DEGREE BURN(S)		<input type="checkbox"/> REMOVAL OF FOREIGN OBJECT(S)		<input type="checkbox"/> HOT OR COLD SOAKING/COMPRESS THERAPY	
<input type="checkbox"/> CUT AWAY DEAD SKIN		<input type="checkbox"/> USE OF HEAT THERAPY		<input type="checkbox"/> USE OF WHIRLPOOL BATH THERAPY	
<input type="checkbox"/> POSITIVE X-RAY DIAGNOSIS		<input type="checkbox"/> ADMISSION TO HOSPITAL FOR MORE THAN OBSERVATION		<input type="checkbox"/> FIRST AID ONLY	
40. OTHER MEDICAL TREATMENT ADMINISTERED					
EQUIPMENT/PROPERTY DAMAGED					
41. CLASS OF EQUIPMENT/PROPERTY DAMAGED		42. ESTIMATED COST OF ALL DAMAGED ITEMS		43. # OF ITEMS DAMAGED	
<input type="checkbox"/> FLIGHT HARDWARE		<input type="checkbox"/> OVER \$1,000,000		---	
<input type="checkbox"/> GROUND SUPPORT EQUIPMENT		<input type="checkbox"/> BETWEEN \$250K AND \$1M			
<input type="checkbox"/> FACILITY		<input type="checkbox"/> BETWEEN \$25K AND \$250K			
<input type="checkbox"/> PRESSURE VESSEL		<input type="checkbox"/> BETWEEN \$1K AND \$25K			
<input type="checkbox"/> MOTOR VEHICLE		<input type="checkbox"/> UNDER \$1,000			
43. SPECIFIC ITEM(S) DAMAGED					
SUBMITTER					
44. SUBMITTED BY (Full Name)		45. ORGANIZATION		46. MAIL CODE	
47. PHONE		48. DATE		49. TIME	

NF 1627 MAR 2001 PREVIOUS EDITIONS ARE OBSOLETE.



		NASA Mishap Report		MASTER FILE NO.	
Part B: Causes and Corrective Action					
CAUSES					
50. WHAT WAS THE DIRECT CAUSE(S)		51. WHAT OBJECTS OR SUBSTANCES WERE INVOLVED		52. WHAT ACTIVITIES OR UNSAFE ACTS WERE IN PROGRESS	
INITIAL CORRECTIVE ACTION					
53. <u>INITIAL</u> ACTION TAKEN (Summarize all corrective action taken)					
54. DATE INITIATED	55. DATE COMPLETED	56. PERSON TAKING ACTION <i>(Full Name)</i>	57. ORGANIZATION	58. MAIL CODE	59. PHONE
PLANNED CORRECTIVE ACTION					
60. <u>PROPOSED</u> ACTION TO BE TAKEN (Summarize any future action to be taken.)					
61. EST. START DATE	62. EST. COMPL.	63. PERSON TAKING ACTION (Full Name)	64. ORGANIZATION	65. MAIL CODE	66. PHONE
67. <u>PROPOSED</u> ACTION TO BE TAKEN (Summarize any future action to be taken.)					
68. EST. START DATE	69. EST. COMPL.	70. PERSON TAKING ACTION (Full Name)	71. ORGANIZATION	72. MAIL CODE	73. PHONE

NF 1627 MAR 2001 PREVIOUS EDITIONS ARE OBSOLETE.



Instructions

Complete the initial incident report (unshaded portions) and submit to your local NASA Safety Office within 24 hours of the incident occurrence. Complete and submit the follow-up report (with shaded areas) within ten working days of the incident. Retain a copy for your own files.

Working With This Form

This electronic document is a form. It has fields where you can enter information. You can use the mouse or TAB key to move between fields. The TAB key moves to the next field and SHIFT-TAB moves backwards. Some fields control the types of data that you can enter.

You should fill in this form electronically and send it to your local NASA Safety Office by electronic mail.

DETAILS

1. DATE OF INCIDENT—Enter date of the incident in MM/DD/YYYY format. Example: 6/1/2001.
2. TIME OF INCIDENT—Enter time of the incident using 24-hour clock. Examples: 09:30 for 9:30 AM or 14:15 for 2:15 PM.
3. GENERAL LOCATION—Identify the building, area, or facility where the incident occurred.
4. EXACT LOCATION—Describe the exact location of the incident. Example: Third floor, far west corridor.
5. RESPONSIBLE ORGANIZATION—Enter complete name of organization that is reporting the incident.
6. CONTRACT NUMBER - When the organization is a contractor, enter the contract number.
7. ORGANIZATION FILE NUMBER—Assign file number using your organization's unique four-character code, the mishap number (sequential) using four digits, and the fiscal year using two digits. Example: EGB1-0001-89.
- 8 - 10. ORGANIZATION POINT OF CONTACT, MAIL CODE, PHONE—Identify the person to contact at the organization.
11. MISSION AFFECTED—Enter the name or number of the mission, program, or project affected by the mishap. Examples: STS-32; Delta 181.
12. PROGRAM IMPACT—Describe the effect on the mission, program, or project in terms of delay or significant cost adjustment. Example: Two-week launch delay.
13. INCIDENT DESCRIPTION—Describe the event including information about the extent of damage and/or injury, conditions that led to the mishap, and cause if known at this time. Specify location of facility where medical treatment was provided. DO NOT include names of persons.

IMPACT SUMMARY

14. ACTUAL OUTCOMES—Mark every checkbox that represents current facts about the incident.
15. LEVEL OF POTENTIAL—Mark every checkbox that represents likely outcomes for the incident.

PERSONNEL INVOLVED IN INJURY OR ILLNESS

(If more than one person was injured, then attach a NASA Mishap Report (NF 1627) with only this section completed for each additional person.)

16. NAME—Self-explanatory.
17. ORGANIZATION—Identify the organization of the person involved.
18. CONTRACT NUMBER—When the organization is a contractor, enter the contract number.
19. JOB TITLE/OCCUPATION—Describe the job position of the person involved.
Example: Technician
- 20-23. SUPERVISOR'S NAME, ORGANIZATION, MAIL CODE, & PHONE—Provide identifying information about the supervisor of the person involved.
24. AGE—(of the person involved) Self-explanatory.
25. SEX—Check as appropriate.
26. SHIFT WORKED—Check as appropriate.
27. CONTINUOUS DUTY HOURS—Self-explanatory.
28. YEARS OF EXPERIENCE—Check as appropriate.
29. INJURY OR ILLNESS—Check as appropriate.
30. FROM PRE-EXISTING—Check as appropriate.



- 31. FATALITY?—
- 32. DATE OF DEATH—
- 33. PERMANENT DISABILITY?
- 34. # OF FULL LOST WORKDAYS—
- 35. # OF RESTRICTED WORKDAYS—
- 36. INJURY TYPE(S)—Choose one or more items from the list. (See instructions below.)
- 37. AFFECTED BODY PART(S) or BODY SYSTEM(S)—Choose one or more items from the list. (See instructions below.)
- 38. BRIEF MEDICAL DIAGNOSIS—
- 39. MEDICAL TREATMENT ADMINISTERED—Mark every checkbox that represents treatment administered to the person involved. Mark the checkbox for "First Aid Only" if only First Aid treatment was administered to the individual.
- 40. MEDICAL TREATMENT ADMINISTERED—Describe any treatment not included in box #39.

EQUIPMENT/PROPERTY DAMAGE

- 41. CLASS OF EQUIPMENT/PROPERTY DAMAGED—Mark every checkbox that represents the type of damaged.
- 42. ESTIMATED COST OF ALL DAMAGED ITEMS—Mark one checkbox that represents the initially estimated cost of the damage. Provide Final Cost in follow-up report.
- 43. # OF ITEMS DAMAGED—
- 43. SPECIFIC ITEM(S) DAMAGED—Identify or describe the damaged items from box #41. Example: If the class indicated in box #41 is Flight Hardware, then the specific item could be "Orbiter/Avionics."

SUBMITTER

- 44-47. SUBMITTED BY, ORGANIZATION, MAIL CODE, & PHONE—Provide identifying information about the person filling in this form.
- 48-49. DATE & TIME—Enter the date and time when the form is filled in.

CAUSES

- 50. DIRECT CAUSE(S)—Choose one or more items from the list. (See instructions below.)
- 51. OBJECTS OR SUBSTANCES INVOLVED—Choose one or more items from the list. (See instructions below.)
- 52. ACTIVITIES OR UNSAFE ACTS IN PROGRESS—Choose one or more items from the list. (See instructions below.)

INITIAL CORRECTIVE ACTION

- 53. INITIAL ACTION TAKEN—
- 54. DATE INITIATED—
- 55. DATE COMPLETED—
- 56-59. PERSON TAKING ACTION, ORGANIZATION, MAIL CODE, & PHONE—Provide identifying information about the person taking the initial corrective action.

PLANNED CORRECTIVE ACTION

- 60. PLANNED ACTION TO BE TAKEN—
- 61. ESTIMATED START DATE—
- 62. ESTIMATED COMPLETION—
- 63-66. PERSON TAKING ACTION, ORGANIZATION, MAIL CODE, & PHONE—Provide identifying information about the person taking the planned corrective action.
- 67. PLANNED ACTION TO BE TAKEN—
- 68. ESTIMATED START DATE—
- 69. ESTIMATED COMPLETION—
- 70-73. PERSON TAKING ACTION, ORGANIZATION, MAIL CODE, & PHONE—Provide identifying information about the person taking the planned corrective action.

Choosing items from a list

The list appears when you move the insertion point to this field. If the field already has data, then clicking with the mouse might not display the list again. In this case, click in an earlier field and use the TAB key to move forward and display the list.



To choose an item from the list first highlight the item you want. You can use the arrow keys or the mouse to highlight the proper item. Then either press the ENTER key, click the Ok button, or double click the item.

The list of items you have chosen is displayed at the top of the window. You can add many items to the list. To remove any item, you must edit the list with the DELETE or BACKSPACE keys. You can edit the list in the list window or you can edit the field on the form.



Attachment 5
SGT Safety
Briefing Materials



NEW EMPLOYEE SAFETY BRIEFING

Purpose: To welcome new employees.

To acquaint them with safety rules/regulations.

To request their suggestions.

1. Welcome new employees:
 - a) Explain overall company priority and commitment to safety.
 - b) Tell how department or section safety is important.
 - c) Tell how supervisory personnel assist in on-the-job safety.
 - d) Explain how employee cooperation is essential to the project safety effort.
 - e) Brief and provide copy of SGT S&H Plan—include project specifics i.e., PAAC II.
 - f) Show “NASA/GSFC Safety, Environmental, and Security Awareness” Video.
2. SGT has found that accidents do not just happen, but are caused by:
 - a) Unsafe conditions and poor housekeeping.
 - b) Unsafe practices.
 - c) Personnel uninterested in the safety program.
3. Safety rules and regulations are for our protection:
 - a) Employee should know the rules before she/he starts on the job and must make every effort to follow them.
 - b) Rules include knowing locations and operation of fire protection equipment, basic first aid procedures, emergency reporting.
4. The following are some of the major safety precautions each employee should observe:
 - a) Never use a machine until instructed in its operation.
 - b) Use all protective devices connected with the operation of machines (e.g., guards, guides, etc.)
 - c) Police your work area and keep it clean.
 - d) Prevent fires and fire hazards, particularly from smoking.
 - e) Use any protective clothing and/or equipment required in the performance of your job (e.g., Safety belts, hats; eyeglasses; hand and foot protectors).
 - f) Knowledge of first aid procedures (where to get it).
5. Employee suggestions are welcome as our safety program cannot work without your whole-hearted cooperation. Suggestions can be submitted to any member of the Safety Committee.



CHECKLIST OF OFFICE HAZARDS

Tripping and Falling Hazards

Unsafe Practices

- a. Running
b. Tilting chairs, etc.
c. Swivel chair adjustment
d. Stairways
Running
Crowding
Not using handrails
e. Unsafe use of ladders
Rolling and trolley type
f. Broken glass

Unsafe Conditions

- a. Floors
Water, oil, soap, etc.
Highly polished surfaces
Torn or loose coverings
Ragged or splintered
b. Stairways
Poorly lighted
Slippery treads
Inadequate hand rails
c. Differences in floor elevation
d. Projecting outlets
Power
Telephone
e. Extension cords on floor
f. Unsafe ladders
g. Building entrances

Falling Objects

Unsafe Practices

- a. Overloading file cabinets
b. Over-crowding desktops
c. Card files on desks
d. Dropping scissors, pens, etc.

Collision Hazards

Unsafe Practices

- a. Running
In aisles and corridors
Through stairway doors
b. Using revolving doors
Too high speed
Crowding
c. Reading while walking

Unsafe Conditions

- a. Two way traffic
Not separated
b. Transparent, unlettered
Doors

- c. Solid swinging doors
d. Partly open doors
e. Self-closing doors
f. Aisle obstructions
Riser plugs-radiator
Valves pencil sharpeners, etc.
Extra-long file cabinets
Open desk and file drawers
g. Broken glass desk tops
h. Defective metal waste baskets

Fire Hazards

Unsafe Practices

- a. Matches in desk drawers
b. Discarding cigarette stubs
c. Burnt matches in waste paper basket
d. Fire extinguishers
Not identified by number
Poor inspection schedule
e. Insufficient fire drills

Unsafe Conditions

- a. Insecure file cabinets
b. Insecure lockers, shelves
c. Insecure ceiling fixtures
Lighting fixtures, etc.
Plaster
d. Waste paper on floors, etc.
e. Unsafe storage of flammables
f. Exposed oily rags, etc.
g. Fire extinguishers
Too few in number
Wrong type
Not well located
h. Defective fire hose



Miscellaneous Hazards

Unsafe Practices

- a. No rest periods _____
- b. Horseplay _____
- c. Insufficient first-aid service _____
- d. Extension cords _____
 - Placed on steam pipes _____
 - Supported by metal hooks _____
- e. Off-the-job safety _____
- f. No inspection _____
- g. Lack of education _____

Unsafe Conditions

- a. Working space _____
 - Inadequate individual space _____
 - Desks, tables, poorly arranged _____
 - Aisles too narrow _____
- b. Poor illumination _____
- c. Unsuitable furniture _____
- d. Electric fans _____
 - Improperly installed _____
 - Inadequately guarded _____
- e. Poor housekeeping _____
- f. Poor ventilation _____
- g. Exposed steam pipes _____
- h. Exits not well marked _____
- i. Unsafe floors _____



Attachment 6
Sample Safety & Health
Curriculum



The SGT Team brings significant experience in safety training related to MSES II/A functional requirements and will apply this insight throughout contract execution, sharing best practice across our Team. Below is an example of a safety training curriculum managed by Ball Aerospace.

APPENDIX A

MSES II/A

MISSION ASSURANCE PLAN

RFP NNG05096383R

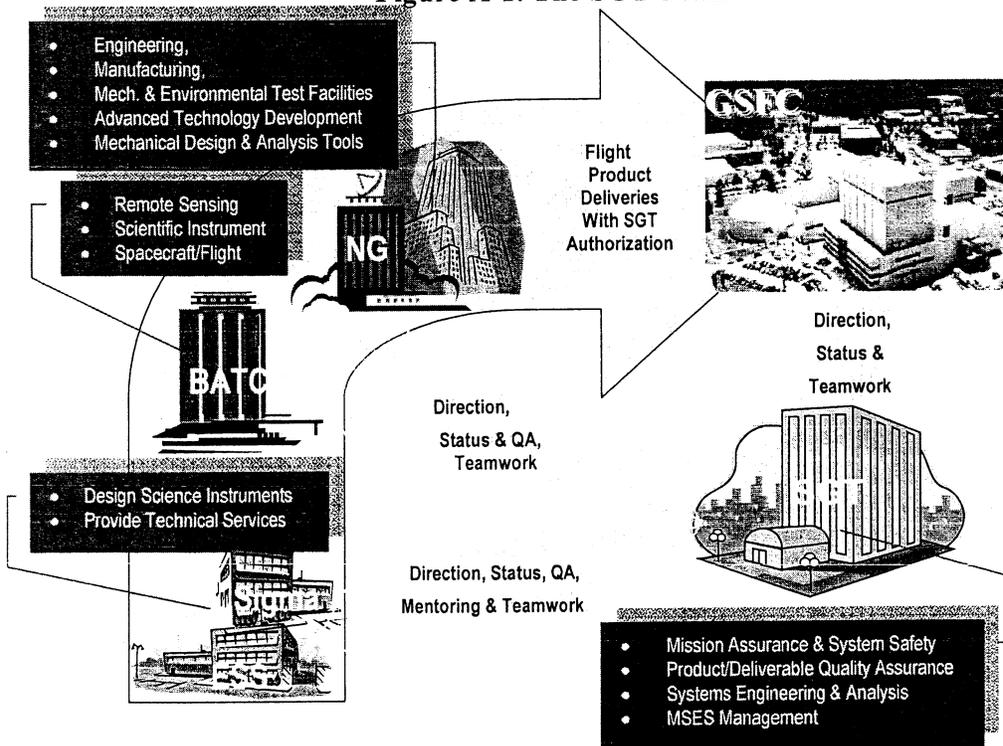
April 17, 2006



FOREWORD

In response to the RFP NNG05096383R, SGT has formed the optimal MSES team consisting of SGT, Inc (SGT); Northrop Grumman Corporation (NG); Ball Aerospace and Technologies Corporation (BATC); Edge Space Systems (ESS) and Sigma Space (Sigma). These organizations have an extensive history of providing outstanding technical services and products to the GSFC community. In particular their mission experience covers Hubble Space Telescope (HST), James Webb Space Telescope (JWST), Crew Exploration Vehicle (CEV), Ice, Cloud, and land Elevation Satellite (ICESat), Geostationary Operational Environmental Satellites (GOES), Polar Operational Environmental Satellite (POES), Lunar Reconnaissance Orbiter (LRO), Space Technology 5 (ST5), Micro-Pulse Lidar (MPL), and many others. SGT is the prime contractor and won the George M. Low Award (2005) in recognition of its commitment to quality and continuous improvements that demonstrate excellence and outstanding technical and managerial achievements in quality and performance on NASA-related contracts or subcontracts. SGT provides the overall management of MSES II/A Mission Assurance. Thus the SGT Team for MSES II/A will be able to adhere to this Mission Assurance Plan and meet the needs of GSFC's Mechanical Systems Division (MSD), Information Systems Division (ISD), Instrument Systems and Technology Division (ISTD), Electrical Engineering Division (EED), and Mission Engineering and Systems Analysis Division (MESA) as shown below in Figure 1.

Figure A-1. The SGT Team

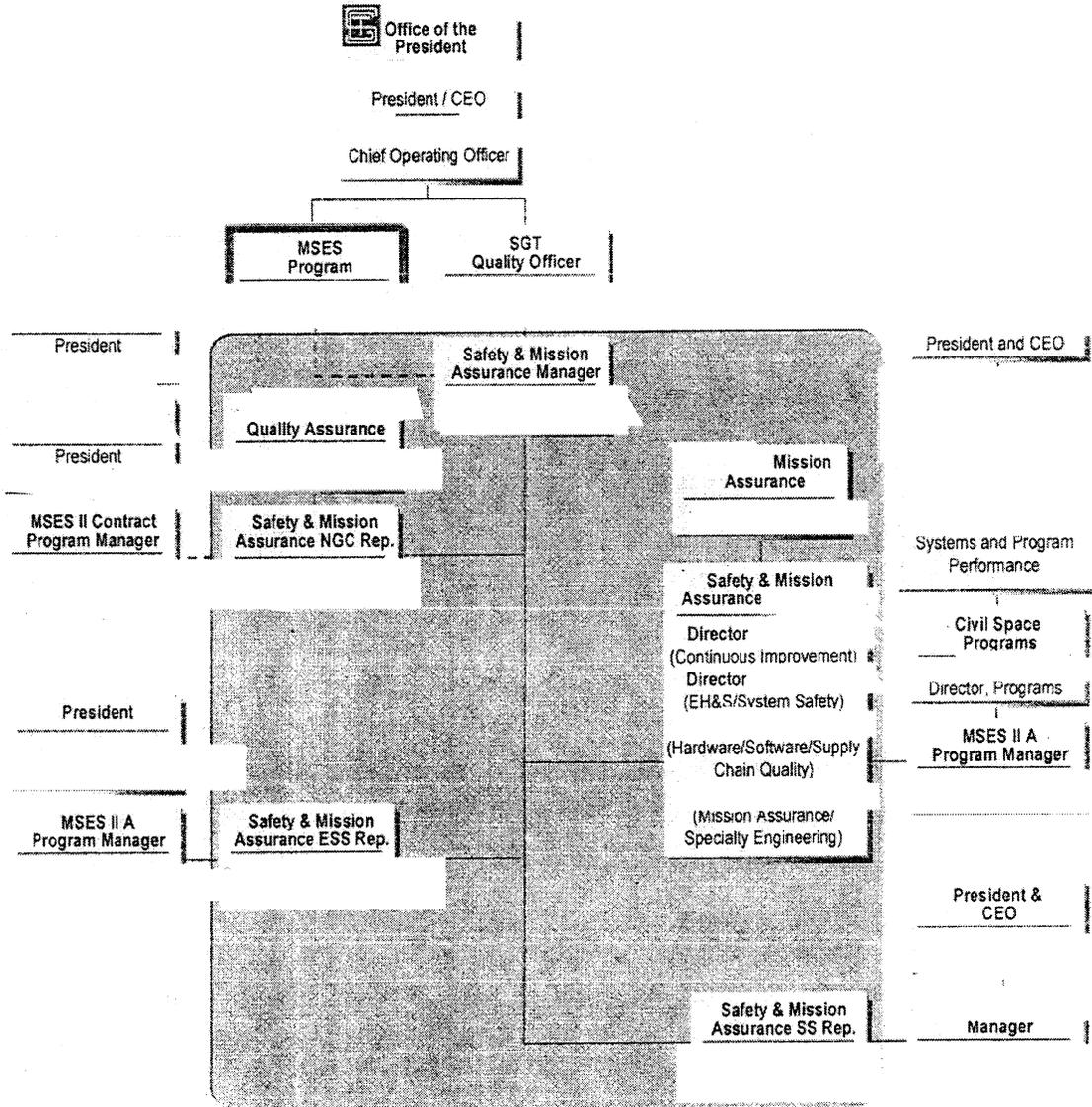


SGT Team responsibilities are clearly defined for SGT and each teammate.



Team members will implement this Mission Assurance Plan (MAP) through the creation or revision of procedures and practices in their respective organizations and Quality Management Systems as shown in Figure A-2 and in Attachment 1.

Figure A-2. SGT Team Mission Assurance Organization and Interfaces



This MAP was developed to address the full gamut of MSES II/A activities and guided by the GSFC policies and practices for safety and mission/flight product assurance as well as the MSES RFP NNG05096383R. As a result, the following specific requirements from the SOW are addressed by this MAP:



- Function 3, Section B, 1.c-d
- Function 3, Section B, 1.h-k
- Function 3, Section C, 1.c-d
- Function 3, Section C, 1.h-k
- Function 3, Section K
- Function 3, Section N
- Function 3, Section O
- Function 3, Section S
- Function3, Section U

Specific cross references between SOW requirements and the SGT Mission Assurance approach can be found in Table A-1.

To ensure a positive trend of mission assurance, each teammate has accepted the SGT quality objective of continuous quality system improvement (See Section 2.2). The SGT team will continue to enhance each of its Quality Management Systems (QMSs) with the requirements of GSFC's QMS, GPR-1280.1C (as found in the GSFC's Directives Management System (GDMS)) and this MAP, thus addressing RFP Clause E.6.

Table A-1. SOW to MAP Approach Cross Reference Table

SOW	Technical Approach (Techniques and Procedures)	Technical Difficulties	MAP Cross Reference
3N1a Institutional Fabrication Support	<ul style="list-style-type: none"> • Support manufacturing readiness reviews; review processes & certifications; review training certs; mandate/perform inspections of critical processes. • Support MRB activities; red tag/red stripe & segregate non-conforming materials, review waivers, deviations & MRB dispositions against mission assurance requirements. • Oversee inspection personnel, review/document inspection results. • Train test personnel in proper anomaly/ nonconformance operations & reporting procedures; document, inspect, disposition anomalies; participate in ERB's, MRB's. • Track non-conformance trends, support process improvement activities. 	<ul style="list-style-type: none"> • Establishing effective controls without inhibiting hardware development with excessive controls. 	<ul style="list-style-type: none"> • 2.0, 3.5, 3.4, 3.6, 7.0
3N1b Integration & Test Activities	<ul style="list-style-type: none"> • Perform Test Readiness Reviews prior to any testing; review test plans & procedures, identify critical/hazardous operations, mandate inspection/oversight requirements, inspect test equipment, verify certification/calibration; verify ESD/safety precautions. • Train test personnel in proper test anomaly/ nonconformance operations & reporting procedures; document, inspect, disposition test anomalies; participate in FRB's, ERB's MRB's. • Perform inspections on critical assembly steps; witness critical/hazardous activities. • Verify compliance to test procedures, MAP, GPGs, PGs, WIs, Safety Plans. • Review/approve test results, test reports; perform quality audits; Provide quality reports, failure reports, document unverified failures, quality statistics/metrics. 	<ul style="list-style-type: none"> • Quick turnaround of FRB, ERB or MRB actions to maintain development schedules. • Maintaining configuration when investigating an anomaly. 	<ul style="list-style-type: none"> • 3.5, 3.6, 3.7, 3.9, 10.6, 10.7 • 3.6, 4.1a-d, 4.3, 5.1e, 8.2
3N1c ESDI	<ul style="list-style-type: none"> • ESD training & plans per ANSI/ESD S20.20, ESD lab/workbench certification, ESD warning signs/markings • Use of wrist straps, ESD gowns, floor-mats, ESD protective packaging. 	<ul style="list-style-type: none"> • Certification & audit of ESD workstations. 	<ul style="list-style-type: none"> • 9.5, 9.6
3N2a Incoming Inspection	<ul style="list-style-type: none"> • Perform receiving & inspection of flight hardware; verify shipment per S&H procedures, verify shock sensors, ESD precautions, dust covers; verify & document flatness, mass, dimensions, drill patterns/hole locations, venting, drawing revision & general conformance against procurement spec. • Review all certs & qual data, lot/date code data, test results, non-conformance reports. • Document non-conformances, disposition hardware to MRB hold or flight stores. • Review/approve shipping & handling procedures, shipping container design. • Ensure procedures for foreign particle contamination, nitrogen purge, contamination monitoring, cleanliness/cleaning, ESD are observed & followed. 	<ul style="list-style-type: none"> • Thorough & complete documentation of anomalies, investigation plans, & resolutions. 	<ul style="list-style-type: none"> • 3.3, 3.4, 3.5, 9.5, 12.0



SOW	Technical Approach (Techniques and Procedures)	Technical Difficulties	MAP Cross Reference
3N2b Problem Reporting & Audits	<ul style="list-style-type: none"> Document non-conformances, train inspectors in non-conformance procedures, review non-conformance history by vendor, by process; Approve disposition of hardware; Document using COTS tools (e.g. Razor). Work with System Assurance Manager to document in appropriate GSFC system (e.g. Spacecraft Orbital Anomaly reporting System (SOARS); Nonconformance Reporting/Corrective Action System (NRCAS); Problem Reporting/Problem Failure Reporting (PR/PFR) System). Perform critical process inspections, pre-lid/pre-closure inspections, source inspections, pre-ship reviews, process audits, site/facility surveys. 	<ul style="list-style-type: none"> Scheduling inspections & audits so they do not impact delivery schedules. 	<ul style="list-style-type: none"> 2.0, 3.4, 3.7
3N3a Review of Deliverables	<ul style="list-style-type: none"> Confirm design analysis supports mission success criteria including Probability of Success, MTBF, single point failure/redundancy requirements, reliability; Review system risks / mitigation plans, single point/Criticality 1 failure modes, limited life items, mate-demate logs. Review/disposition all non-conformances, failures, unverified failures, waivers, deviations. Review manufacturing, critical/hazardous operation, test, & S&H plans, processes, procedures, flows. Review manufacturing cert logs, test logs, S&H logs for process compliance & non-conformances. Define safe margin for limited life items to ensure they support mission life requirements; ensure manufacturing, test, inspection processes do not exceed margins, thereby reducing ability to meet mission requirements; review mate/de-mate logs, power cycle logs, on/off logs, document cumulative affects on limited life items. Ensure analysis use proper mission requirements, environments, stress/fatigue levels. 	<ul style="list-style-type: none"> Timely review of documentation to ensure meeting scheduled deliveries. Maintaining documentation accuracy & keeping up-to-date during the life cycle. 	<ul style="list-style-type: none"> 3.2, 3.5, 3.6, 4.2.1d, 9.1
3N3b Electronics Pkgng/Procs Doc Reviews	<ul style="list-style-type: none"> Review critical processes, identify hidden/unverifiable processes, review PWB coupon analysis results. Perform source inspections, pre-lid/pre-closure inspections. Perform vendor/supplier assurance audits, review processes, determine compliance with NASA workmanship & mission assurance requirements, develop process waivers/deviations/inspection & oversight plans, review/approve process certification plans, review process certifications & training records, document all results/concerns/non-conformances. 	<ul style="list-style-type: none"> Performing technical peer reviews as well as quality reviews on analysis. 	<ul style="list-style-type: none"> 3.4, 3.5, 9.2
3N3c Flight HW	<ul style="list-style-type: none"> Review/approve all procurement specs, ensure proper flow down of mission assurance requirements, document mandatory inspections, define mandatory certification/documentation/records. 	<ul style="list-style-type: none"> Trade off evaluating all possible failure modes & effects in an entire design versus evaluating only effects that propagate outside the box. 	<ul style="list-style-type: none"> 3.1, 3.3, 10.3
3N4a Manufacturing	<ul style="list-style-type: none"> Ensure certification/calibration of all equipment & tools to be used; impound/red-tag any out of calibration item Ensure certification of all manuf. Test & insp. processes & procedures are up to date Perform Manufacturing Readiness assessment; Review critical processes, assembly / work instructions; review quality & manufacturing procedure certifications; Review technician training/certification logs. 	<ul style="list-style-type: none"> Minor manufacturing process changes can result in later failures. 	<ul style="list-style-type: none"> 3.6, 3.8, 3.9, 3.10.1a, 7.0, 9.0
3N4b Test & Inspection	<ul style="list-style-type: none"> Audit manufacturing process & QA procedures for compliance to project Mission Assurance Requirements Participate in reviews of proposed process changes that affect MSES II/A hardware. Identify mandatory inspection points; Perform in-flow inspections. Review CCB, MRB, & FRB processes & implementation; Participate in the processes when MSES II/A hardware is involved; Help expedite decisions by interfacing with appropriate technical experts. 	<ul style="list-style-type: none"> Process, tool, & test equipment certification/calibration 	<ul style="list-style-type: none"> 1.2, 2.1, 3.1, 4.0, 3.9, 9.0, 10.3
3N4c Test Equip. Repair & Calibration	<ul style="list-style-type: none"> Review third party Metrology processes & procedures to ensure compliant with ISO/IEC 17025; this include in-house capabilities of vendors or process/capabilities of subcontract metrology labs. Ensure on-site procedures are compliant with GPG 8730.1. All equipment must have current calibration tags & serial/identification numbers & calibration dates must be recorded on all procedures/work instructions at the time of use. 	<ul style="list-style-type: none"> Handled by specifications. 	<ul style="list-style-type: none"> 3.8



SOW	Technical Approach (Techniques and Procedures)	Technical Difficulties	MAP Cross Reference
30 Systems Safety	<ul style="list-style-type: none"> • Develop safety plans compliant with EWR 127-1 for ELV's & NHB1700.7B/KHB1700.7B for shuttle. • Develop safety plans to consider the transition between facility I&T & Launch Complex. • Participate in phased safety review process to establish development checkpoints for safety compliance. • <u>ELV safety analyses</u>: Cover all lifecycle modes for GSE & Operating procedures. • <u>Shuttle safety analysis</u>: Perform Payload Hazard Assessments, develop Safety Data Package, & monitor hardware development for problems to anticipate changes & update analyses. • <u>ELV Safety Data Pack</u>: Use Accident Risk Assessment Report. Follow industrial safety methodology/requirements for launch complex ground flow. • <u>Shuttle Flight Safety Data Package</u>: Use JSC Form 1230A, Guidelines book, & electronic data submittal. • Publish responsibility list for safety verification items including accountability for all red flag items & spacecraft arming item (Remove safety shields, deployment chocks, RF hats, contamination covers, grounding wires, battery charge) (Install safety plus, arming plug, close out cover for test/purge ports). • <u>Perform ELV Reviews</u>: Participate in Ground Operations Working Group, launch vehicle TIM's, ground flow planning. • Coordinate technical/project support; hold dry runs; clarify minutes & action items after review. • Perform ELV software safety verification; seek to mitigate the requirement; (e.g., use separation switch enable to keep deployment functions safe from inadvertent S/W deployment in ground flow). • <u>Shuttle</u>: Use independent hardware in lieu of S/W inhibits; safe command handling; proper test/validation. • <u>CEV</u>: Ensure proper flow down/implementation of safety requirements for HSF. • Review/approve/audit safety plans for hazardous flight & non-flight hardware & operations including: lasers, hi-voltage, pyrotechnic, propulsion & pressurized vessel, fuel/hazardous chemicals, overhead/handling operations, deployables, RF, confined space. • Train ground personnel for stored energy safety hazards (pyro, springs, batteries, other armed devices, pressurized tanks, RF) for after s/c is armed/ready for launch. • Ensure all personnel are trained properly for hazardous operations. 	<ul style="list-style-type: none"> • Fault tolerant approach vs. design for minimum risk. • Mitigating excessive/unclear verification work for the payload organization. • Addition of hardware inhibits vs. cost of independent software V&V required for safety verification of software inhibits. 	<ul style="list-style-type: none"> • 4.0



CONTENTS

Section	Page
1. PLAN OVERVIEW	A-1
1.1 Mission Assurance Planning	A-1
1.2 Mission Assurance Management	A-1
2. QUALITY MANAGEMENT SYSTEM	A-4
2.1 SGT Team QMS Background	A-4
2.2 Continuous Improvement Metrics.....	A-5
3. PRODUCT ASSURANCE PROGRAM	A-5
3.1 Requirements Management	A-5
3.2 Design Control Practices.....	A-7
3.3 Purchased Item Controls	A-7
3.4 Inspections	A-8
3.5 Non-conforming Material Control.....	A-8
3.6 Performance Testing	A-9
3.7 Failure and Anomaly Reporting and Analysis.....	A-9
3.8 Laboratory/Facility Management.....	A-10
3.9 Configuration Management	A-10
3.10 Tailored Product Assurance Cases.....	A-11
4. SYSTEM SAFETY PROGRAM	A-14
4.1 Safety Requirements Documents	A-14
4.2 Safety Requirements Implementation	A-15
4.3 Safety Constraints	A-16
5. RELIABILITY AND MAINTAINABILITY PROGRAM	A-16
5.1 Reliability Analyses	A-16
5.2 Maintainability	A-17
6. RISK MANAGEMENT	A-18
6.1 Risk Management Process	A-18
6.2 Risk Management Techniques	A-19
7. TECHNICAL REVIEWS	A-21
8. SYSTEM VERIFICATION AND VALIDATION	A-23
8.1 Validation.....	A-23
8.2 Verification	A-23
9. WORKMANSHIP STANDARDS	A-24
9.1 Flight Standards	A-24
9.2 Printed Wiring Boards	A-25
9.3 Mechanical Systems	A-25
9.4 Ground Support Systems	A-26
9.5 Handling and ESD Protection	A-26
9.6 Electrostatic Discharge Controls	A-26



CONTENTS (Continued)

Section	Page
10. PARTS AND PROCESSES	A-26
10.1 PMPCB Responsibilities	A-26
10.2 EEE Parts Selection	A-27
10.3 Procurement Controls	A-27
10.4 PMP Traceability	A-27
10.5 GIDEP Alerts	A-28
10.6 Part Failures	A-28
11. MATERIALS AND PROCESSES	A-28
11.1 Material and Process Qualification	A-28
11.2 Material Failures	A-29
12. CONTAMINATION CONTROL	A-29
ATTACHMENT 1. MISSION ASSURANCE PROCESS MATRIX	A-30
ATTACHMENT 2. GLOSSARY	A-33

TABLES

Tables	Page
A-1 SOW to Map Cross Reference Table	A-iv
A-2 SGT MSES II/A QMS Status	A-5
A-3 Examples of Risk	A-19

FIGURES

Figures	Page
A-1 SGT Team	A-ii
A-2 SGT Team Mission Assurance Organization and Interfaces	A-iii
A-3 NASA Project Life Cycle	A-2/3
A-4 Mission Assurance Elements	A-4
A-5 Risk Classification And Relationships	A-19
A-6 Risk Analysis Scales	A-21

**APPENDIX A. MSES II/A MISSION ASSURANCE PLAN****1. PLAN OVERVIEW**

This plan documents our understanding and approach of the Mission Assurance requirements contained in the MSES II/A SOW and the provisions contained within referenced documents. SGT as the prime contractor will provide the overall management of Mission Assurance in accordance with this plan and GSFC ANSI/ISO/ASQ Q9001-2000 while interfacing with MSES II/A Team members and the GSFC. These steps ensure the necessary flow down of individual task requirements throughout a project's life cycle, as shown in Figure A-3. This Mission Assurance Plan covers all activities defined in a project life cycle throughout the duration of the MSES II/A contract.

As you will see throughout this document, SGT has fully integrated all ISO and CMM process initiatives under its Corporate Quality Management System (QMS). This approach ensures optimum coordination between these Quality initiatives.

1.1 MISSION ASSURANCE PLANNING. In accordance with the SGT Team's QMS process, planning begins the mission assurance management process by setting forth expectations in the project Mission Assurance Plan (MAP). Thus, this plan has been prepared and will become part of the SGT QMS at the project, MSES II/A, level (CMMI Level 2). It is structured to comply with Systems Safety and Mission Assurance Program Development (300-PG-7120.2.1C) for tailoring to the needs of GSFC Projects and the GSFC Rules for Design, Development, Verification and Operation of Flight Systems (300-PG-7120.2.2E & GSFC-STD-1000). This plan provides the methods, techniques, and management structure that implements our MSES II/A Mission Assurance Program to assure a compliant management and verification system. This plan, other NASA and MIL specifications, or product-unique requirements will be referenced within each task as applicable for implementation. These provisions will be delegated to Team members and subcontractors and incorporated into work authorizations or procurement documents.

1.2 MISSION ASSURANCE MANAGEMENT. The Safety and Mission Assurance Manager (SMAM) is responsible for implementing the elements of mission assurance that are shown in Figure A-4. Management oversight is in place through assurance audits at a frequency commensurate with experience and performance of each teammate and contract-level quarterly reviews. Quarterly reviews will include mission assurance concerns and highlights from each Team Member's facility. The GSFC Mission Assurance Representative will be invited to participate in each review. The representative will be provided with meeting minutes and audit data or other associated output upon request. Each Team Member's Quality organization will provide direct, unimpeded access to upper management, prompt resolution of differences, and closed-loop corrective action and feedback of information.



Figure A-4. Mission Assurance Elements



MSES II A-4 MA Elements

2. QUALITY MANAGEMENT SYSTEM

SGT will provide top-level mission assurance management oversight. Team members will implement the Mission Assurance Plan through their respective Quality Management Systems. Attachment 1 to this plan provides a cross-reference of the established quality assurance procedures of each major teammate to each mission assurance element. Within each system, key mission assurance personnel will be selected to execute the respective QMSs based upon past relevant experience and required capabilities. Certifications, specialized training, and periodic retraining are part of the selection process.



rate metrics, the result of formal reviews, benchmarking within our industry, external quality boards (i.e., GSFC contractor Excellence Panel or NASA Low Award Panel), and lessons learned from all areas of our company, our teammates companies, and customers. These indicators are then used to guide our DMAIC – Define, Measure, Analyze, Improve, Control - structured method to improve processes.

2.2 CONTINUOUS IMPROVEMENT METRICS. The SGT Team is committed to continuously improve the effectiveness of our Quality Management System and the processes needed to deliver products to customers. SGT's quality policy is communicated throughout the organization. SGT strives to ensure that the policy is understood by all employees. A series of process performance measurement and management evaluations are used to continuously monitor the scope of operations and the organization's ability to perform within prescribed acceptable limits. To ensure a positive trend of continuous improvement, SGT establishes quality objectives, and measures performance trends using management review, internal (trained auditors) and external (RAB-approved auditing organizations) audit results, analysis of data, and a rigorous corrective and preventive action process. A key metric used by SGT to measure the effectiveness and applicability of our QMS is customer feedback via task evaluations (award fee scores) and customer interface meetings.

Note: SGT will provide its protégés with management guidance (i.e., ISO/CMMI certification leadership) and engineering/technical success assistance via a highly vigilant mentor Quality Management oversight, per 1819.72.

3. PRODUCT ASSURANCE PROGRAM

Mission Assurance is directly dependent on supporting mission products and constituent parts. Therefore it is required by this plan that each SGT teammate maintains product assurance by employing the following (See Attachment 1):

- Requirements Management,
- Design Control Practices,
- Purchased Item Controls,
- Inspections,
- Non-Conforming Material Controls,
- Performance Testing,
- Failure and Anomaly Reporting and Analysis,
- Laboratory/Facility Management, and
- Configuration Management.

3.1 REQUIREMENTS MANAGEMENT. The SGT Team, in coordination with NASA, will maintain a requirements management program tailored for each Project. The requirements management program as defined in NPR 7120.5C, GPR 7120.4, and SP-6105 will:

- Ensure that all requirements are identified, captured, and agreed upon.





3.2 DESIGN CONTROL PRACTICES. Design assurance factors are incorporated into each Team Member's process starting at the initial concept and continuing through design maturity and release for fabrication. It is based on the requirements generated and maintained by their requirements management process and GPRs 8070.4, 8700.10, and 8700.2E. Reliability, Test, Parts Engineering, and Quality Assurance provide inputs and guidance during the development phase to ensure that mission and specific program parameters are assessed and incorporated. A brief description of this process and interface is as follows:

- a. Reliability – Maintainability and Servicing Provisions
 - Identify redundancy, part limitations, and alternatives.
 - Identify analysis requirements and techniques.
 - Use analyses and verification guidelines.
- b. Test – Testability
 - Establish test parameters, procedures, and equipment.
 - Identify hazardous conditions and personnel safety constraints.
- c. Parts – Utilization of Standard vs. Nonstandard EEE Parts
 - Establish traceability controls and procurement guidelines.
 - Identify long lead items, program schedule constraints, and workarounds.
- d. Quality
 - Perform documentation/drawing reviews.
 - Verify/enter mission assurance and program-unique requirements.
 - Identify special inspection techniques and acceptance criteria.
- e. Materials
 - Verify material/process selection per program standards.
 - Establish material test programs and demonstrations.
 - Identify special handling, cleanliness, and processing constraints.

3.3 PURCHASED ITEM CONTROLS. All Team members will conform to the requirements of this plan. The requirements may be implemented by use of the Team members' internal procedures if they are equivalent in content and results. Quality assurance personnel will perform reviews of each procurement document to ensure the proper programmatic flow-down provisions have been included.

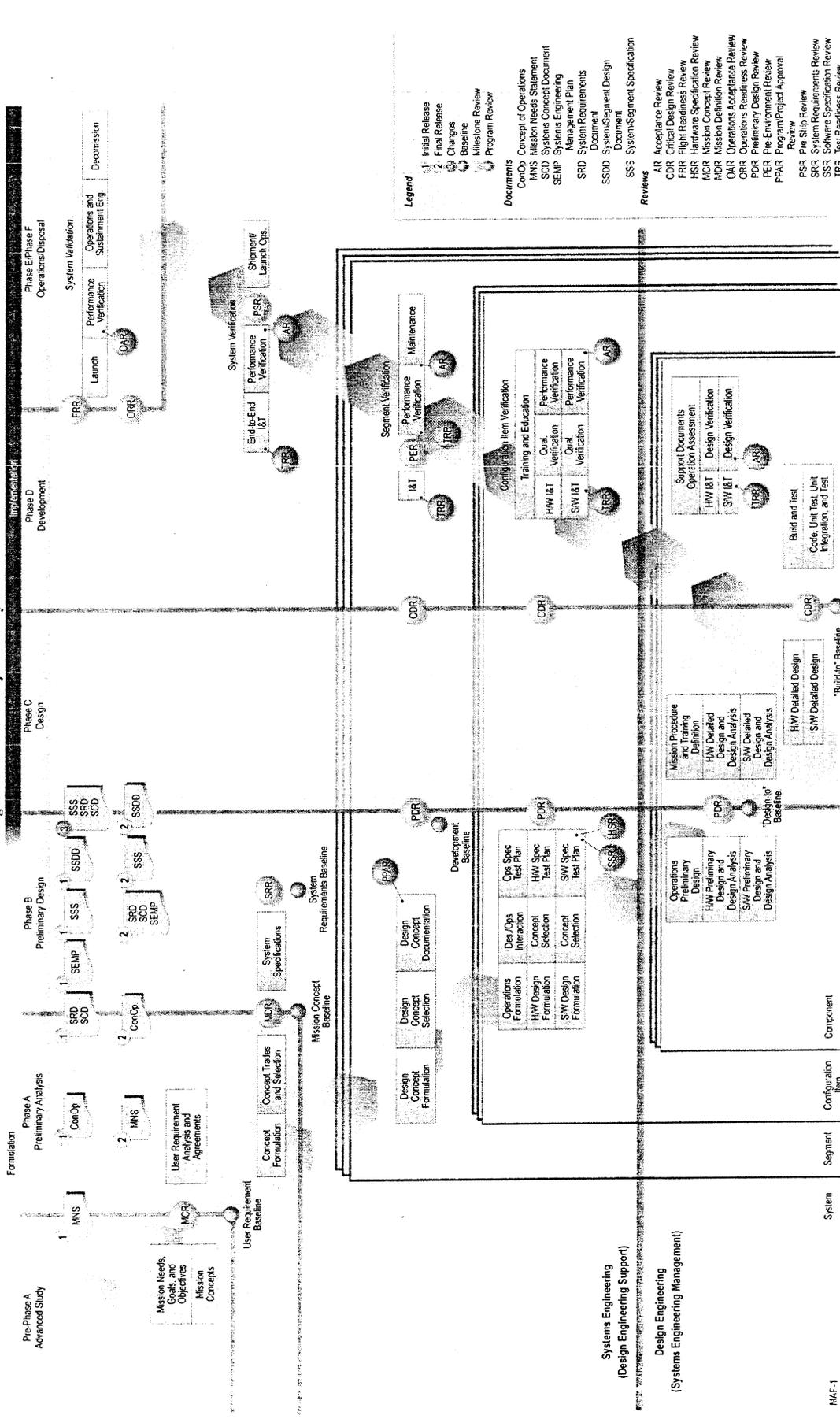
Subcontractors, suppliers, and vendors are required to have a demonstrated Quality Assurance System that will provide acceptable products. In the event a subcontractor, supplier, or vendor is unknown or does not have a history for providing quality products, a capability survey will be conducted to determine acceptability prior to initiating procurement. Receiving inspection should be performed using the guidance of GPR 4520.2E, and their results will be tabulated for each supplier and used to maintain a system for periodically rating performance characteristics. Supplier ratings will be used during the selection process to select only those suppliers that maintain



NGT Team

Providing High Quality and Minimizing Cost

Figure A-3. NASA Project Life Cycle



MAE-1

ONE OF SEVERAL SHEETS OF THIS SHEET IS SHOWN IN THE FIGURE ON THE PAGE OF THIS PROGRAM.

MAE-1



acceptable ratings. Suppliers that do not maintain acceptable ratings will be required to provide corrective measures or will be removed as procurement sources.

3.4 INSPECTIONS. Each Team Member and subcontractor involved in providing MSES II/A products is required to maintain an inspection system, as defined in GPR 5330.1E, commencing upon receipt of products and continuing through end-item delivery. The system will provide early detection of unacceptable conditions and enable prompt resolution/corrective measures to achieve an acceptable condition.

Receiving inspection consists of mechanical measurements, raw material identification, sampling techniques, physical testing, performance verification, and data/document content validation. EEE parts, critical mechanical parts, process materials, raw stock, and other critical items will be entered into the appropriate traceability systems and logs. Specific processing procedures are established to assure quality levels of each lot or batch received.

In-process inspections will be performed at predetermined mandatory inspection points within the product flow, as defined in the MSES II/A Quality Assurance Manual. It will be developed in accordance with CMMI practices at the start of the project. Each inspection will establish the processing that has occurred since the previous inspection. Special processes such as adhesive bonding, coatings, welding, and cleanliness controls will be applied and verified as specified within engineering drawings and process specifications. Assembly processes will be documented, fully accounting for each operation that occurs, to maintain operator and material traceability. Acceptance criteria used during in-process inspections such as engineering drawings, workmanship standards, process specifications, and ESD processing/handling specifications, will be under formal configuration control maintained within the SMA Office.

3.5 NON-CONFORMING MATERIAL CONTROLS. Materials determined to be nonconforming to specified requirements will be immediately identified and segregated for disposition as recommended by GPR 5340.21. Each Team member currently maintains a closed-loop Material Review Board (MRB) procedure for disposition of nonconforming material and establishing corrective actions to prevent future reoccurrence of like conditions. We assume that GSFC will grant MRB privilege to each Team member, as applicable, upon program approval of documented procedures to be followed. The MSES II/A MRB will be established by selection of cognizant engineering and quality assurance personnel. Other disciplines, such as parts engineering, reliability, safety, production, and program management, may be included to provide additional expertise during the evaluation and disposition of non-conformances.

Non-conformances will be initially submitted to preliminary review and dispositioned as follows:

- *Scrap*: where the item can not be used for its intended purpose and rework/repair options are not economically feasible.
- *Rework to print*: where the item must be additionally processed to meet all requirements and conform to applicable standards and drawings.
- *Return to Vendor (RTV)*: where the item requires return to the supplier for rework or replacement with conforming product.
- *Repair*: where the item may be brought to acceptable condition using a previously approved standard repair process.
- *MRB*: where the item is referred to MRB when the previous dispositions do not apply.



Non-conformances that are referred to the MRB normally include critical and major conditions. In addition to scrap, rework, repair, or RTV, the MRB may make the following additional dispositions:

- *Non-Standard Repair (NSR)*: where item is repaired by non-standard techniques developed and approved by the full MRB.
- *Use As Is (UAI)*: where item's condition or performance will not adversely affect the products application.
- *Waiver*: waiver request is made when for programmatic reasons an item's non-compliance to requirements is determined to be mitigatable. Submitted waiver request will be tracked as risks by risk management.

3.6 PERFORMANCE TESTING. A series of acceptance tests are required on each end item to verify design and functional conformance. Testing may begin with functional verifications of assemblies and continue through performance and environmental exposure at the component or box level. Hardware is then integrated and tested at the subsystem and spacecraft level. Testing includes the spacecraft level environmental test program as well as end-to-end testing of all segments of the mission. System engineering will be responsible for review of component level test plans and development of the subsystem, spacecraft, and mission integration plans, test plans, and validation plans. These plans will include the test configurations, operational modes, test equipment, requirements for verification, performance characteristics to be attained, pass/fail criteria, test parameters, environmental parameters, test facilities, test flow, and necessary procedures.

Each test will be conducted as specified in program-approved, formally released acceptance or system test procedures which clearly define operational methodology, support equipment, processing constraints, and acceptance criteria. Pre-test and post-test reviews will be conducted prior to test initiation, and following completion of test sequences, using the following guidelines:

- a. Pre-test reviews or Test Readiness Reviews (TRRs) determine the test article's readiness for test and assess the availability of personnel to complete the test cycle, availability of facilities, procedural documentation, and environmental and special test equipment.
- b. Post-test reviews or Acceptance Reviews (ARs) provide assurance the test was completed in the prescribed manner, performance requirements have been properly verified, deviations or failures are properly documented, resultant data is complete and retrievable, and any post-test equipment operations such as cleaning and controlled storage/handling constraints are completed.

3.7 FAILURE AND ANOMALY REPORTING AND ANALYSIS.



3.8 LABORATORY/FACILITY MANAGEMENT. Each Team Member will maintain a Calibration, Certification, and Recall system compliant with the requirements of GPG 8730.1 and ISO 17025, "General Requirements for the Competence of Testing and Calibration Laboratories." Traceable standards and documented results are required to maintain a historical record of each equipment item processed through periodic calibration and subsequent adjustments. Scheduling of test equipment recalls may be modified to account for adjustment frequency or detection of excessive deviations.

In the event equipment undergoing calibration exhibits out-of-tolerance conditions or other errors, an immediate "alert" will be provided to each previous user indicating the out-of-tolerance condition and its potential effects. The user will determine if retest or re-evaluation of the test results is required. When the verification of flight hardware or equipment that interfaces with flight hardware is affected, a failure report will be initiated and submitted to the failure review board for disposition and resolution.

Special test equipment that will have functional or physical interface with the flight equipment will be formally documented and controlled. All engineering drawings and associated supporting data will be controlled within the CM system. Upon completion of fabrication, special test equipment will be validated for use and formally certified by independent test for release processing. Upon certification the test equipment shall be "sealed" or otherwise controlled to prevent configuration changes post-certification.

3.9 CONFIGURATION MANAGEMENT. Each Team Member will maintain a Configuration Management system compliant with the NPR 1441.1, NASA Records Retention Schedules and GPR-1410.2, Configuration Management. Each configuration management system is capable of managing documentation and data configurations and product configurations when required by designated contractual responsibilities. This management will consist of (a) identification of the configuration of a data or product over time; (b) systematically controlling and recording changes to the configuration of the data or product through Configuration Change Boards (CCBs), Engineering Review Boards (ERBs) and peer reviews; (c) maintaining the integrity and traceability of the configuration of the data or products throughout its life; and (d) preserve the records of the data or product configuration throughout a project's life cycle, as shown in Figure A-3. The specific process used to perform this management by each teammate may be tailored or enhanced based on corporate or product processing concerns but must remain compliant with NPR1441.1 and GPR 1410.2. Compliance will be scrutinized through QA and SMA audits. The findings from individual audits are reported to all affected parties and to project management for corrective action.



3.10 TAILORED PRODUCT ASSURANCE CASES. As with any complex program special cases arise that require tailoring of the general approach. For product assurance this is true for: software & ground data system development (See Sections 3.10.1 & 3.10.2).

3.10.1 Software Product Assurance When projects require software development, SGT Team members shall implement a project-specific Software Management Plan (SMP) which has more software specific assurance guidance to extend this MAP to fit that circumstance and to be consistent with 303-PG-7120.2.1B. The SMP includes planning of management, assurance, and development for all software lifecycle phases including sustaining engineering. The SMP is the top-level document that complements other documents, for example, Software Quality Assurance (SQA) Plan, Software Configuration Management (SCM) Plan, Software Development Plan (SDP), Software Test Plan (STP), and Risk Management (RM) Plan. Small projects may choose to incorporate their SQA, SCM, SDP, STP and RM, as well as technical reviews and other plans and processes as part of their SMP. The SQA and SCM Plans are discussed in this section. RM and Technical Reviews are discussed in Sections 6 and 7 of this MAP, respectively.

3.10.1.1 Software Quality Assurance. The Software Quality Assurance (SQA) function is responsible for:

- Ensuring that the project follows its documented processes.
- Identifying artifacts that demonstrate compliance with established plans, standards, and procedures.
- Identifying opportunities for software process improvement within and across the projects.
- Providing software safety in accordance with NSS 1740.13 the NASA Software Safety Standard.

The SQA Plan establishes the SQA activities performed throughout the life cycle of a software project. SQA personnel develop the SQA Plan and perform the tasks specified in the Plan. A single individual provides the primary interface with the Project Software Lead, the Program Manager, the customer's SQA organization, and any subcontractors' SQA organization. Activities performed by SQA personnel include the following:

a. Audits of Software Activities. SQA personnel perform audits of software processes in order to verify the project's compliance with plans, standards, and procedures. Checklists are developed prior to the activity audit using the relevant activity documents. The checklists are distributed to the audit participants prior to the audit. The results of the audits are documented in Software Quality Assurance Reports and in the checklists.

Examples of processes that generally are audited include the following: Requirements Management, Planning and Tracking, Configuration Management, Quality Assurance, Software Development, and Testing. Examples of products that are audited are the SMP, Software Design Document, Software Code, and Software Test Report. Formal reviews (refer to Section 7, Technical Reviews) may be needed to evaluate major software components. For smaller projects, peer reviews will serve the same purpose.

b. Software Development Process Audits. The specific software engineering activities that are evaluated include but are not limited to the following:

- Software development methods,
- Requirements traceability,
- Design and coding standards,



- Software development folders, and
- Software configuration management.

c. Evaluation of Software Documentation. To ensure compliance with provisions of the contract and governing standards, each deliverable software document undergoes review by appropriate management, engineering, and quality assurance personnel. SQAs will evaluate each document against the quality evaluation criteria defined and against any checklists used on the project.

d. SQA Reports. The Software Quality Assurance Report (SQAR) is designed to communicate SQA participation in quality-related activities. All SQA evaluation activities, including audits, reviews, and inspections are documented via the SQAR. Although the format of the report varies somewhat from activity to activity, each report consistently provides the following information:

- A unique SQAR number,
- Identification and/or description of event or activity,
- Date of event or activity,
- Description of problems identified,
- Corrective action,
- Persons responsible for that action,
- Resolution dates if required, and
- Evidence of tracking the corrective action through resolution if required.

The findings from individual quality assurance activities are reported to all affected parties and to project management. Audit results and other SQA-related data are maintained by the SQA organization. These records are subject to audit and review and are kept in a manner that allows easy access for such purposes.

SQA personnel report the results of audits to project management and provide process improvement recommendations. Action items are documented in a tracking system where they are monitored until closed. Problems identified in the products or processes evaluated are documented and handled according to the Software Corrective Action Process and Problem/Change Report sections of the SMP.

3.10.1.2 Software Configuration Management. The goals of SCM are the following:

- Manage the evolution of the software product to make the entire software life cycle process both visible and traceable.
- Ensure that correct high quality software products are produced.

The SCM Plan identifies the software, documents, datasets, and other work products that need to be maintained under configuration control. Software is maintained, built, integrated, delivered, and changed under strict configuration control. Software changes will be handled as outlined in the Problem/Change Report sections of the SMP. For changes to the software that may impact schedule and cost, or that may affect end-product functionality or performance, decisions will be made by a CCB consisting of the various stakeholders. Summary statistics on outstanding change requests will be provided to the project management periodically.

SCM personnel have primary responsibility for developing the SCM plan and performing the tasks as specified in the Plan. They establish and maintain developmental configuration base-



lines and serve as the interface among the software development personnel, CM, and SQA representatives. Responsibilities include the following:

- a. Configuration Identification. Assign or obtain unique identifications for project-related developmental software configuration items, including documentation, builds, program configuration items, and Program Trouble Reports.
- b. Software Libraries. Establish and maintain software libraries for storage and controlled access to software elements and associated documentation (deliverable and non-deliverable). This includes referenced technical data, documentation developed as part of the software development, forms, procedures, and status accounting records for the project.
- c. Change Control. Perform Change Control for the project in accordance with SCM process. Serve as coordinator and recorder for the SCCB.
- d. Status Accounting. Establish and maintain configuration status accounting records (i.e., baseline reporting, release documentation, etc.) in the Project Assets Library (PAL).
- e. Audits of Product Baselines. Audit configuration baselines to ensure that baselines conform to the definitions provided for them by the SCCB.
- f. Release and Distribution of Software Work Products. Perform developmental baseline builds at the direction of the SCCB.

3.10.2 Ground Data System Product Assurance When efforts affect ground systems, SGT Team members apply this MAP to fit that circumstance as follows:

- a. Section 2, Quality Management System; Section 6, Risk Management; Section 7, Technical Reviews; and Section 8, System Verification and Validation, are completely applicable to GDS efforts.
- b. Section 3, Product Assurance subsections 3.1, Requirements Management; 3.2, Design Control; 3.3, Purchased Item Control; 3.4, Inspections; and 3.5, Non-conforming Material Control are fully applicable while Section 3.10.1, Software Product Assurance, is tailored to add the following requirement: If using existing software (GFE, COTS, other purchased) on GDS, the developer will ensure that the software meets appropriate requirements. Any significant modification to the existing software will be in accordance with the developer's QMS. Section 3.9, Configuration Management, is tailored such that CM is capable of identifying the ground data system configuration elements associated with the processing of any dataset by the system (i.e., hardware, software, algorithms, documents, datasets, and other work products).
- c. Section 4, Systems Safety Program, is tailored for GDS components that are software and are deemed safety critical. These components must be implemented in accordance with NASA-STD-8719.13, NASA Software Safety Standard. For any GDS components identified as safety critical, the developer will conduct a safety program in compliance with the NASA Safety Manual, NPG-STD-8715.3.
- d. Section 5, Reliability and Maintaining Program, is tailored to add the following: The developer is required to certify that the GDS is installed and ready for use prior to being turned over to operations for acceptance test. Specific GDS maintainability assurance requirements include GDS developer to define, measure, and control maintainability status in all life cycle phases, as shown in Figure A-3. Also the developer will calculate maintainability predictions for GDS and its components.



e. Section 10 and 11, Parts and Materials Processes; Section 12, Contamination Control; and Section 9, Workmanship Standards, especially Electrostatic Discharge Controls, are flight-hardware specific and may only have limited applicability to GDS.

4. SYSTEM SAFETY PROGRAM

NASA's system safety values follow:

- People are the most critical element of the safety program.
- All mishaps are preventable.
- Management is responsible for preventing mishaps.
- All operating exposures that could result in mishaps can be controlled.
- Safety is a condition of employment.
- Employees must be trained to work safely.
- Management must audit workplace performance to assess safety program success.
- Safety deficiencies must be reported and corrected promptly.
- Off-the-job safety is an important part of the overall safety program.
- Safety is good business and good government.

In accordance with the above values, safety is an integral part of mission assurance. As such the management of the safety program is the responsibility of the SMAM. The SMAM will assign safety personnel who will support individual task assignments, perform analyses, and prepare deliverable documentation, including safety data packages and hazard reports. The system safety program will be implemented on flight systems, ground systems, software implementation and design, and support services, as applicable within individual tasks. See Attachment 1 for established safety program procedures. A major consideration of the safety program is to identify and control potential hazards during design, fabrication, integration, test, transportation and handling, launch processing, post-launch operations, and End-of-Life (EOL) disposal. The safety program will remain in effect for the duration of this contract.

4.1 SAFETY REQUIREMENTS DOCUMENTS. Safety requirements will be extracted from the following documents, as required for individual tasks (the latest revision will be used unless otherwise specified):

a. STS Missions

- NSTS 1700.7B
- NSTS ISS 18798
- NSTS ISS 13830
- KHB 1700.7
- JSC 26943 and 07700
- 2.45 SPW S-100/KHB 1700.7B
- KHB 1710.2
- NSTS 14046
- NHB 1700.1 and 1700.7

b. ELV Missions



- EWR 127-1/AFSPCMAN 91-710
- KHB 1710.2
- NHB 1700.1
- c. WFF Missions
 - RMS-93
- d. GSFC Onsite Operations
 - NASA Policy Directive (NPD) 8700.1, NASA Policy for Safety and Mission Success
 - NPD 8710.2, NASA Safety and Health Program Policy
 - NASA NPR 8715.3, NASA Safety Manual
 - GHB 1700.1, Goddard Space Flight Center, Health and Safety Program
 - GPR 1700.1 Occupational Safety Program at Goddard Space Flight Center
 - GPR 1700.5 Control of Hazardous Energy
 - GPR 1860.1A, Ionizing Radiation Protection
 - GPR 1860.2A, Laser Radiation Protection
 - GPR 1860.3, Radio Frequency Radiation Safety
 - GPR 1860.4, Ultraviolet and High Intensity Light Radiation Protection
 - 5405-48-98, Mechanical Systems Center Safety Manual
 - GPR 8715.1A, Processing of NASA Safety Reporting System Incident Reports
 - GPR 8621.2 A, Processing Mishap and Close Call Reports
 - GPR 8621.2 B, Mishap and Close Call Investigation
 - 302-PG-7120.2.1B Systems Safety Support to GSFC Missions and Other Organizations

4.2 SAFETY REQUIREMENTS IMPLEMENTATION. The SMAM will review all task statements of work to identify safety issues. The SMAM will assign the relevant resources to ensure that the task's safety issues are addressed and review the Task Plan to verify that the appropriate safety resources have been provided. The SMAM will periodically review each task to ensure that the safety needs of the task are being met and the appropriate safety documentation is being prepared, Section 4.2.1. Safety personnel will identify and mitigate any potential safety hazards or conditions by providing operational constraints and/or design recommendations throughout the life cycle of the project. All safety issues will be tracked throughout the mission. All trends in safety data will be analyzed and, as necessary, corrective action identified and recommended to the task lead.

4.2.1 System Safety Documentation. System safety efforts will culminate in the following documents, as required for individual tasks:

- a. Formal Deliverables
 - System Safety Program Plan per EWR127-1/AFSPCMAN 91-710 and MIL-STD-882,
 - Hazard Reports per 300-PG-7120.2.2E and JSC 26943,
 - Safety Data Packages per NSTS 1700.7 and KHB 1700.7,
 - Missile Pre-Launch Safety Packages (MSPSPs) documenting a detailed description of hazardous and safety critical ground support and flight hardware equipment, systems,



and materials and their interfaces used in the launch of launch vehicles and payloads per EWR127-1/AFSPCMAN 91-710,

- Safety Assessment Reports per 300-PG-7120.2.2E, and
- NSTS Flight and Ground Safety Review Packages per NSTS/ISS 13830.

b. Work Products

- Safety Verification Logs,
- Ground and Transportation Operations Procedures,
- Safety Variance Reports,
- Safety Corrective Action Plans, and
- Mishap Reports (if required).

4.3 SAFETY CONSTRAINTS. Test procedures, operations documents, and inspection verification documents will provide specific personnel and equipment safety constraints when applicable to the activity. Check lists, test data sheets, and inspection verification records will be used to assure total compliance with each listed requirement. Launch site safety requirements incorporated in integration and test documentation for use at the launch site will be coordinated with the NASA facility safety engineering representative.

5. RELIABILITY AND MAINTAINABILITY PROGRAM

5.1 RELIABILITY ANALYSES. Reliability analyses are used to ensure the design meets parametric requirements, meets EOL requirements, has superior reliability, and a high probability of success. These analyses begin early in the design phase and are updated as the design matures. The results of these analyses are presented in preliminary format at Preliminary Design Review (PDR) and in final format at Critical Design Review (CDR). Subcontractors providing



functional assemblies are subjected to the same analysis requirements as in-house designs. The requirements for those subcontractor analyses are invoked in procurement documents and evaluated by reliability personnel throughout the design process and prior to delivery. The following are examples of the types of analyses to be performed.

a. Failure Modes Effects Analysis. Failure Modes Effects Analysis (FMEA) is performed on a functional level at the unit's interface level to identify critical items, categorize failure mode severity levels, and identify alternate modes of operation, single point failures, and degraded modes of operation. The Critical Item List (CIL) provides a list of critical items which require special attention of design, operations, and test personnel during development, handling, and use of the item.

b. Fault Tree Analysis. Fault Tree Analysis (FTA) is used to determine the combinations of possible occurrences in a system which can result in an undesirable outcome. These analyses identify possible system reliability or safety problems at design time, assess system reliability or safety during operation, improve understanding of the system, identify components that may need testing or more rigorous scrutiny, and identify root causes of equipment failures.

c. Parts Stress Analysis. Parts stress analysis is performed on a circuit design to ensure that the parts in that design are used in a manner consistent with the part design parameters. Parameters such as temperature (junction, case), voltage, power, and current are evaluated for each part in its application to ensure circuit operation under all operational conditions. The analysis is initiated during circuit design and the parts selection process to help verify that proper application and de-rating parameters are in accordance with the established program environmental and reliability requirements.

d. Worst Case Analysis. Worst case analysis is performed to verify that the variations in part parameter values due to effects such as temperature, aging, radiation, or duty cycle over the life of the mission can be tolerated without causing the design to be out of tolerance or not meet its requirements at mission EOL. The analysis can consider all parameters set at worst case environmental stresses for the operation or parameter being evaluated as a conservative approach or can apply statistical analysis such as Root Sum Square (RSS) methods to more accurately assess the variation in these parameters.

e. Test Data Analysis. Systems Engineering (SE) and Quality Assurance (QA) will verify the collection of significant performance data during testing. Each test procedure will be designed to establish baseline performance of the test article and the repeatability of critical performance for all performance modes, including exposure to program environmental conditions. Trend analysis will remain ongoing during the full environmental and performance test cycle to identify and characterize any detected parametric shifts or performance degradation. Upon conclusion of the test program, engineering will review the complete data output, trend data, material review actions, and anomaly and failure reports for patterns that could impact mission or program requirements.

5.2 MAINTAINABILITY. Maintainability analyses are performed as part of the reliability program to the extent required by the end item's application or specific maintenance requirements. When required, appropriate data will be cataloged and used to support demonstrations and walkthroughs of maintenance conditions or techniques. Most earth and space science missions will not have maintainability requirements other than shelf life until launch and portability of the ground system, including data analysis tools. Other programs, such as the Hubble Space



Telescope maintenance missions and manned missions, will have a large maintainability program.

6. RISK MANAGEMENT PROGRAM

The recognition and assessment of uncertainties (risks) and their consequences allows an effort to implement uncertainty control to avoid possible schedule delays, cost overruns, performance problems, adverse environmental impacts, or other undesired consequences and thereby helps to promote mission success. The SGT Team will apply Continuous Risk Management (CRM) to identify, document, analyze, plan for the management of, track, and control risks as part of mission assurance. Our CRM approach, compliant with NPR 8000.4 and GPR 7120.4A, is tailored to the MSES II/A contract, and our management personnel are trained in CRM principles and their application on the contract.

6.1 RISK MANAGEMENT PROCESS. The SGT Team will evaluate each Request for Task Plan (RTP) for programmatic risk, including safety, technical, cost, schedule, security, export control, and damage to environment, per the risk management processes shown in Attachment 1. For those identified, the assigned Group Lead or Task Lead will analyze them and develop a plan to mitigate them. The risk(s) and the mitigation plan(s) will be documented in the Task Plan. Once the plan is approved and a Task Order (TO) is issued, the Task Lead will assign a risk owner who becomes responsible for tracking the results of the risk management plan, inputting data into the Risk Management Database, and, when necessary, advising the Task Lead that the plan requires modification or a backup plan should be implemented.

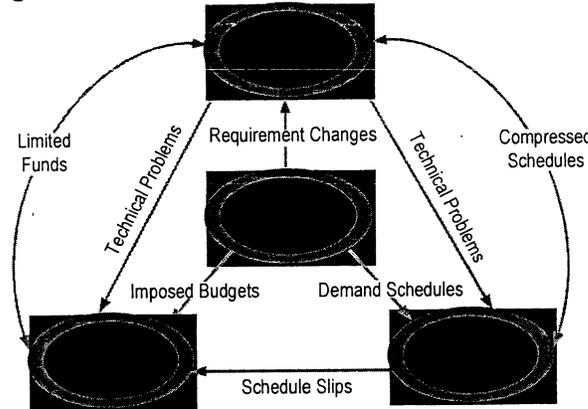
For software, hardware, and new technology development TOs, the task team will prepare a formal Risk Management Plan (RMP) that includes:

- Overview of risk management process.
- Organization, roles, and responsibilities.
- Process details and related procedures, methods, tools, and metrics.
- Schedule, milestones, and allocation of resources for risk management activities.
- Documentation of risk information:
 - Format and data elements that will comprise project risk list.
 - Where and how risk list is maintained and controlled (e.g., Risk Management Database).

In all cases as a task progresses, task team members will remain alert for new risks. If one is identified, the Task Lead will classify it in accordance with the RMP and Figure A-5 and assign a risk owner who analyzes it and develops a plan to manage it. Once the plan is approved, the risk owner will implement it, track the results, input data into the database, and keep the Task Lead advised of the risk's status. Risk owners are responsible for monitoring and reporting on the status of their respective risk until the risks are retired or until the associated TOs are completed.



Figure A-5. Risk Classification and Relationships



6.2 RISK MANAGEMENT TECHNIQUES. The SGT Team will use the standard CRM process of identification, analysis, and planning to manage MSES II/A programmatic risks. Table 3 shows examples of potential risks. The following paragraphs describe the techniques applied in each phase of the process.

Table A-3. Examples of Risk

Risk Type (Risk Area)	Identification Example	Analysis	Mitigation & Tracking
Safety (Technical)	Spacecraft structural components may fail during launch sequence, leading to catastrophic mission failure.	Stress analysis of structural components to verify margins of safety.	Implement fracture control plan; ensure flight pedigree of all structural components & fasteners; perform structural qualification testing & post-test inspection.
Technical (Technical)	Backplane support structure of segmented-mirror assembly may not be stable enough during hot-to-cold thermal transition to allow observatory to meet image quality requirements.	STOP analysis of structure & Telescope optical elements.	Perform material testing; fabricate Backplane Stability Test Article & test stability to cryo temperatures.
Cost (Cost)	The cost of developing a new, mission-critical technology may have been initially underestimated, leading to inadequate allocation of budget.	Review of historical cost data; Review original estimate; performance predictions of alternative-technology solutions.	Early identification of issue to customer; perform a new bottoms-up estimate; look at alternative technical solutions; apply management reserve to reduce risk.
Schedule (Schedule)	Deleting early procurement of a long-lead spare Beryllium mirror as a cost-saving measure puts telescope delivery date at risk if existing mirror is damaged.	Analysis of mirror vendor supply chain & processes indicates creation of mirror blank is schedule intensive but processing of mirror is cost intensive.	Minimize exposure of mirror to handling; fabricate mirror protection fixturing to protect front surface; procure second Beryllium mirror blank as in-process spare.
Security (Programmatic)	Ground transportation of classified DoD payload to airport exposes hardware to uncontrolled public traffic environment.	Event tree analysis; analysis of transportation routes & traffic patterns.	Dry-run of transport activities; solicit state police escort; intentional uncertainty in shipping date.
Export Control (Programmatic)	Unauthorized export of technical data to representatives of foreign government mission partner during technical interchange meetings.	Prime contractor has export license but a key subcontractor—who must attend meetings—does not.	Provide ITAR training to subcontractor personnel; issue "gag order" for interchange meetings—requiring subcontractor to ask questions & respond through a prime representative.
Environmental (Technical/Programmatic)	Personnel involved in use of organic solvents such as xylene, pentane, benzene for hardware cleaning might inadvertently release into public sewer system.	Efficacy analysis of alternative, more environmentally friendly solvents & cleaning procedures; direct observation of cleaning process.	Require documented initial/refresher training in safe solvent handling; organize cleaning station to prevent liquid access to drain; post warning signs at solvent storage cabinets & at cleaning station.

Early identification and mitigation of risks leads to effective risk management.

6.2.1 Identification. SGT Team personnel will use a variety of sources to identify risk. These sources include the following:

- Expertise and experience of Team members,
- Previous analyses, lessons learned, and historical data,
- System safety and reliability analysis, e.g., hazard analysis, FTA, and FMEA,



- Simulations, test data, and models,
- Evaluation of resources and schedule, review and analysis of required or available resources, and continued monitoring of schedule milestones and risk mitigation/planned action milestones,
- Evaluation of suppliers,
- Evaluation of external factors that affect project risk, e.g., computer security assessments, physical security assessments, human factors performance assessments, and environmental assessments, and
- Technology maturity.

6.2.2 Analysis. Once a risk is identified, a risk owner will be assigned and will analyze the risk using one or more of the following methods:

- Individual or group expert judgment.
- Comparison to analogous systems.
- Statistical analysis of historical data.
- Uncertainty analysis of cost, performance, and schedule projections.
- Probabilistic Risk Assessment (PRA) - is a comprehensive, structured, and logical analysis method aimed at identifying systemic risk scenarios which can emerge as a result of the combined occurrence of multiple high-probability, low-probability and/or nearly benign events.
- Event Tree Analysis (ETA) - uses event trees (quantitative graphics that display relationships among events and subsequent responses), which allows the systematic quantification of risk through Boolean logic solutions.
- Fault Tree Analysis (FTA) - is the process of creating a hierarchical structure of a system's faults/events cause-effect relationships and evaluating it to produce a probability of a particular system fault/event via Boolean logic.
- Failure Modes and Effects Analysis (FMEA) – is the process by which each potential failure mode in a “system”, is analyzed to determine its effect on the system and to classify it according to its severity and detectability

To conclude the analysis, the risk owner will estimate the risk's likelihood of occurrence and the potential consequence if it occurs. A risk exposure level will be assigned using the scales shown in Figure A-6. The owner will also define the timeframe in which action must be taken to avoid the risk and determine when the risk will be retired.

6.2.3 Planning/Management. After analyzing the risk, the risk owner will determine the appropriate approach to manage the risk. Four options are available.

a. **Mitigate.** Risk mitigation consists of eliminating the risk or reducing its likelihood and/or consequence. It can be accomplished through engineering, schedule, or budgetary changes to designs, processes, or procedures or through alternate paths and approaches.

b. **Accept.** If the decision is that no further action is appropriate, such as cost outweighs the benefit, no additional resources are expended to manage the risk. It is treated as a problem that is continually monitored and status identified along with other non-risk related problems. When a risk is accepted, the individual responsible for accepting it includes a signed formal acceptance, complete with rationale for its acceptance, with the TO records. Additionally, acceptance of a high (red) risk requires a documented contingency plan to be implemented if it occurs.



Figure A-6. Risk Analysis Scales

c. Research. When additional planning information is needed to determine the approach to resolving risks, a research plan is developed. This can include the collection and evaluation of additional information on which to base future decisions or, to reduce the uncertainty surrounding risk estimates.

d. Monitor. This includes deciding not to take immediate action, but to track, survey, or watch the trends and behavior of risk indicators over time.

7. TECHNICAL REVIEWS

Per SP-6105 reviews provide an excellent means for controlling the technical progress of the project. Therefore SGT and its team members will implement a comprehensive program of technical reviews

to facilitate mission assurance (See Attachment 1). Each review will be tailored to meet the program requirements and cover all aspects of mission hardware, mission software and software applications, test phases, and operations activity for which SGT is responsible. SGT will establish a team for each review with membership consisting of design and assurance disciplines, GSFC monitoring personnel, and other program or independent personnel whose expertise would enhance the review process. The SGT Team will conduct or provide inputs for each review, as specified in GPRs 1060.2C, 8700.4F, and 8700.6A. This assures that the design review information is presented in sufficient detail to afford understanding of hardware and software functions as well as assembly, test, and operational characteristics. Additional inputs, typically provided as inputs to the design review process, are reliability analyses, PMP engineering data, safety, and risk management activities. Prior to each review, SGT Team members will develop and organize material for oral presentation. Copies of presentation materials will be provided at the individual reviews or in advance as determined by the review chairman. SGT will also support any splinter or follow-up meetings that result from the review and monitor the list of action items for completion. Upon completion of the reviews, a set of minutes will be prepared highlighting the review's conduct, resulting conclusions, and action items and recommendations. Typical reviews that may be performed include the following:

Likelihood of Occurrence Scale							
Level	Rating	Criteria					
5	Very High	Criteria Occurrence is almost certain (80-100% change), and may not be controlled by following existing processes, procedures and plans					
4		Risk Impact Consequence Scale					
3		Level	Technical Factor	Cost Factor	Schedule Factor		
5		5	Technical goals cannot be achieved. Loss of critical function or major objective and/or safety cannot be assured.	Cost over-run ≥ 10%.	Unachievable key or major program/project milestone. Slip in delivery of major system or sub-system beyond 6 months		
4		4	Significant degradation in technical performance-inability to meet performance requirements within established constraints and/or	5% > Cost overrun < 10%.	4- to 6-month delay of deliverables from milestone schedules.		
3		3	Likelihood of Occurrence Level	Risk Exposure Level			
2		5	GREEN	YELLOW	RED	RED	RED
1		4	GREEN	YELLOW	YELLOW	RED	RED
		3	GREEN	GREEN	YELLOW	YELLOW	RED
		2	GREEN	GREEN	GREEN	YELLOW	YELLOW
		1	GREEN	GREEN	GREEN	GREEN	GREEN
		Level	1	2	3	4	5
			Impact of Risk				



- a. System Requirements Review (SRR). Usually conducted prior to initiation of formal design to evaluate design approach, hardware and software application, the operational concept, and system level requirements.
- b. System Safety Review (SSR). A recurring review is performed to provide identification of safety hazards so that appropriate measures may be identified and implemented to eliminate, reduce, or control risk.
- c. Software Specification Review (SoSR). Performed at the beginning of the preliminary design to ensure that the software specification is sufficiently mature to support preliminary design efforts. The following items are performed as part of the review, verification that software requirements have been allocated to a CSCI and are traceable to the software specification, verification that a complete set of requirements are developed and allocated to each CSCI, and verification that the software requirements are clear and understandable.
- d. Preliminary Design Review (PDR). Conducted to evaluate and provide a thorough review of programmatic and technical requirements. Program/operational constraints, risk factors, and safety provisions are documented for action.
- e. Critical Design Review (CDR). Performed to provide final hardware and software design prior to beginning of flight item fabrication and software coding. Validates all required reliability analyses, developmental testing, test plans, mass and thermal budgets, program issues, assembly/inspection flow, safety concerns, and other factors that may affect final design and flight item fabrication.
- f. Test Readiness Review (TRR). Performed to determine a test article's readiness for test, assessing the availability of personnel to complete the test cycle, availability of facilities, procedural documentation, and environmental and special test equipment.
- g. Acceptance Review (AR). Used to provide assurance that a test or battery of tests was completed in the prescribed manner, performance requirements have been properly verified, deviations or failures are properly documented, resultant data is complete and retrievable, and any post-test equipment operations such as cleaning and controlled storage/handling constraints are completed.
- h. Mission Operations Review (MOR). Conducted place prior to integration and test of the flight system and ground data system to determine equipment status, interfaces, test, and mission planning.
- i. Pre-Environmental Review (PER). Conducted prior to starting the environmental test of the flight equipment to verify readiness of facilities, personnel, and procedures, and identify any constraints for resolution.
- j. Pre-Ship Review (PSR). Required prior to shipment of flight hardware to verify completion of required processing and supporting documentation. Review "open" items for closure or subsequent action required.

Additional reviews related to Flight Operations Reviews (FOR) and Launch Readiness Review (LRR) will be supported by the SGT Team by oral and documentation presentations when requested or when applicable within individual task assignments.

8. SYSTEM VERIFICATION AND VALIDATION

The SGT Team, in coordination with NASA, will perform verification and validation activities in addition to those done under requirements management - Section 3.1, to ensure that the system



performs its intended function(s) in its intended environment to foster mission assurance. See Attachment 1 for established verification and validation procedures. If required by specific TOs, a System Verification and Validation Plan will be produced. The plan will encompass qualification, proto-qualification, and acceptance efforts from the design phase through development, integration, pre-launch, operational, and disposal activities. The plan will identify and define the verification and validation requirements, resources, schedule, test procedures, simulation requirements, and evaluation criteria. All verification and validation test planning will be completed by CDR.

Test reports will be generated for all verification and validation test and evaluation activities. At specified points during and at completion of verification and validation, the results of testing, demonstrations, inspections, and simulations will be analyzed and compared to the expected results and evaluation criteria to determine the degree to which the system meets requirements.

8.1 VALIDATION. The purpose of validation is to ensure the right system is built. System validation, as defined in GPR 8700.3B, will begin as early as practicable in a project lifecycle and continue through system operation. Validation is used to determine that the mission and system objectives can and will be achieved. Prior to starting system validation, the system validation procedures and a validation matrix, cross referencing the validation requirements to the verification and validation plan and/or validation procedures, will be produced. The necessary resources such as test fixtures, tools, software, ground support equipment, and facilities are certified or validated. Validation efforts may include structured scenario testing and demonstrations for operational, maintenance, training, and support activity test and evaluation.

8.2 VERIFICATION. Verification is performed to ensure the system is built correctly. All requirements will be verified per GSFC-STD-1000 at the lowest level possible (component, subsystem, then system). Verification methods, such as examination, analysis, demonstration, similarity, test, will be selected and documented in the verification and validation plan or a separate verification requirements matrix. A few examples of system verification activities are measurement of component dimensions, software unit or Computer Software Configuration Item (CSCI) testing, pre-ship and post-ship functional testing, and system mass properties determination.

The SGT Team will implement a verification program to prove the design of flight hardware, software, and Ground Support Equipment (GSE). The program will consist of a series of reviews, analyses, and functional and environmental acceptance testing. Documentation for each plan will consist of test plans and test procedures as well as matrix listings of required environmental exposures and sequences. The actual verification process begins at the initiation of design concepts with inputs from reliability and other assurance disciplines to establish the unique program and mission guidelines for incorporation into the design process. As the design matures, assurance personnel will perform a series of drawing reviews to verify incorporation of internal standards and program criteria prior to formal documentation release. Reliability, safety, and maintainability analyses are provided in preliminary format at PDR. Formal presentation of the final analyses and associated plans is accomplished at CDR. The five methods of verifying system performance are described below.

a. Verification by Analysis. This method consists of those activities used to verify conformance to requirements based upon calculations, modeling, or detailed examination. Where appropriate, analysis will be used to generate analytical solutions required to evaluate algorithms and associated functions. Verification by analysis may be used when it can be determined that



rigorous and accurate analysis is possible, that testing is not feasible or cost-effective, that verification by similarity is not applicable, or that verification by inspection is not adequate.

b. Verification by Demonstration. Demonstration is the verification of observable functionality for specific requirements resulting from the execution of all or portions of the system. The system will be exercised in either the operational or simulated environment in which designated stimuli produce known and predictable results. The observable result(s) will have been pre-evaluated and approved by the respective responsible engineer to determine compliance with the requirements.

c. Verification by Inspection. Inspection is a physical verification of the satisfaction of certain types of system design and performance requirements. It includes direct examination and comparison of basic materials such as software listings and tables or boxes, connectors, and display.

d. Verification by Similarity. Using this method, verification is accepted based on the verification process of an identical unit that has been verified to equivalent or more stringent standards. This may be used for requirements that are not testable under normal conditions or that require test capabilities that are not readily available.

e. Verification by Test. This method consists of operating all or portions of the system in order to collect the necessary data required to verify specific requirements against their parametric performance requirements. Specific parametric values, including environmental parameters, are used to exercise the component or system to allow the performance requirements to be verified under variable conditions. Pass or fail criteria are applied to the various outputs to determine compliance to the requirement.

The test verification program begins with functional testing of the component and continues through system performance and environmental testing supported by appropriate analyses. Anomalies detected during testing will be fully documented within the failure reporting system and processed by the failure review board for resolution and determination of design deficiencies. Performance and environmental test procedures will contain the necessary prerequisites for procedural, facility, personnel constraints and provisions for recording results and acceptable performance limits.

9. WORKMANSHIP STANDARDS

Workmanship standards used for fabrication of flight and critical ground support equipment will be in full compliance with NASA/GSFC specifications normally contractually imposed for space systems so as to assure mission success. Operator performance will be continuously monitored by on-site quality assurance personnel and reviewed by the SMAM and when indicated by results, additional training or recertification will be conducted.

Operations and quality assurance personnel will be certified by formal training programs specific to the disciplines involved by their work assignments.

9.1 FLIGHT STANDARDS. Flight workmanship standards are applicable to all operations conducted on spaceflight interfacing hardware from construction through integration and test. Workmanship standards will conform to the following:

- NASA-STD-8739.1, Conformal Coating and Staking,
- NASA-STD-8739.2, Soldering, Surface Mount Technology,
- NASA-STD-8739.3, Soldering, Manual (Hand),



- NASA-STD-8739.4, Crimping, Wiring, and Harnessing,
- NASA-STD-8739.5, Fiber Optics, and
- GSFC-STD-7000, General Environmental Verification Standard (GEVS) For GSFC Flight Programs and Projects.

9.2 PRINTED WIRING BOARDS. Printed wiring boards will be designed and fabricated using IPC and GSFC standards. Integrity and quality of each lot or batch of individual boards will be determined by performing the in-process and final coupon testing required within the standards specified for Class 3 products. Test results, data, representative coupons, and samples will be in the end-item data package stored in the project's PAL. Coupon evaluation will be accomplished by a laboratory or manufacturer acceptable to the GSFC. Standards for printed wiring boards are 500-PG-8700.2.2B, GSFC/S312-P-003, and IPC standards, which include the following:

- Printed Wiring Board Design
 - IPC-2221,
 - IPC-2222,
 - IPC-2223, and
 - IPC D-275.
- Printed Wiring Board Manufacture
 - IPC A-600,
 - IPC-6011,
 - IPC-6012,
 - IPC-6013, and
 - IPC-6018.

9.3 MECHANICAL SYSTEMS. Mechanical system will be designed and fabricated using NASA/Military/Industry/GSFC standards. Integrity and quality of each system will be determined by performing the in-process and final assembly testing. Test results, data, engineering models, and end-item a data package will be stored in the project's PAL. Standards for mechanical flight systems are the following:

- MIL-HDBK-470, Designing and Developing Maintainable Products and Systems,
- MIL-STD-1540, Structural Design and Test Factors of Safety for Spaceflight Hardware ,
- NASA-STD-5017, Design and Development Requirements for Mechanisms,
- NASA-STD-5001, Structural Design and Test Factors of Safety for Spaceflight Hardware,
- NASA-HDBK-5016, Fracture Control Handbook for Spaceflight Composite Structures,
- 500-PG-8700.2.4D, Mechanical Design and Development Guidelines,
- 500-PG-8700.2.5A, GSFC Engineering Drawing Standards,
- 542-PG-8700.2.1B, Mechanical Systems Analysis Guidelines, and
- ANSI/AIAA S-080, Space Systems – Metallic Pressure Vessels, Pressurized Structures, and Pressure components.



9.4 GROUND SUPPORT SYSTEMS. Ground systems workmanship standards (non-flight) will be documented in a manner similar to flight standards in that they will be formally released and maintained current. As a minimum, printed wiring boards will be fabricated in accordance with applicable IPC class 2 standards. Assemblies and wiring will be fabricated to meet the Class 2 requirements of J-STD-001 and IPC-A-610. Conflicts will be resolved by using the requirements of J-STD-001.

9.5 HANDLING AND ESD PROTECTION. Processing of hardware will be accomplished using procedures and techniques that are designed to afford maximum protection at all times. ESD protective enclosures will be used to house hardware beginning at receiving inspection, continuing through storage, during all phases of fabrication, and handling during testing. ESD-grounded work stations are required, without exception, and require periodic certification and maintenance. Cleanliness of the flight hardware and interfacing ground system will be maintained by using clean rooms, controlled work areas, and personnel protective clothing. Cleaning techniques and materials will be documented in special process specifications which have prior approval for compatibility with the flight hardware.

9.6 ELECTROSTATIC DISCHARGE CONTROLS. All flight hardware and critical ground support equipment will be processed observing electrostatic discharge prevention procedures and facilities. Personnel involved in manufacturing and test of spaceflight hardware and support equipment interfacing with spaceflight hardware will be certified competent by formal training and periodic updates as new technology develops. Certified ESD workstations, personnel protection such as wrist straps and antistatic smocks, relative humidity control, and conductive surfaces will be used within the manufacturing and test facilities. The contamination control program will be based on and meet the requirements of specification ANSI/ESD S20.20 and GPR 8730.6, including personnel training programs and facility design/maintenance. Flight electronic hardware will be packaged in approved ESD containers when not being actively processed during manufacturer inspection or test.

10. PARTS AND PROCESSES

Since mission success eventually depends directly on the use of suitable parts and those parts functioning properly. The SGT Team's SMA personnel will participate as a member of Parts, Materials, and Processes (PMP) Control Boards (PMPCB) to represent the interests of specific TOs and, as appropriate, establish a PMPCB for offsite product development. In the latter case, the SMAM will serve as the board chairman and in that capacity will establish the operational philosophy and meeting agendas/output. PMP program requirements will normally be included within individual TOs as they are assigned. In the absence of those requirements, the PMPCB chairman will interface with the GSFC to establish the necessary guidelines based on established parts practices shown in Attachment 1.

10.1 PMPCB RESPONSIBILITIES. The PMPCB will operate under a basic set of responsibilities set forth by GSFC. Meetings, decisions, action items, and areas of disagreement will be documented in published minutes within 5 working days of each occurrence. Established responsibilities for the PMPCB include the following:

- Establish and document formal procedures.
- Maintain the approved PMP list.
- Provide design guidelines for selection and use of approved PMP.
- Ensure proper derating of EEE parts.



- Verify adequate design margin of mechanical parts.
- Establish DPA policies and procedures; disposition DPA problems and anomalies.
- Review DPA results, MRB actions, failure analyses, and other PMP concerns.
- Identify long lead items and related procurement problems.
- Evaluate/approve laboratories performing analysis and or screening operations.

10.2 EEE PARTS SELECTION. Parts will be selected and processed in accordance with established requirements contained in EEE-INST-002 (replacing 311-INST-001), Instructions for EEE Parts Selection, Screening and Qualification and the NASA Parts Selection List (NPSL). The appropriate parts quality level defined in EEE-INST-002 will be determined by the individual task assignments based on mission application, system redundancy, or other critical factors determined by the PMPCB. Parts selected from the GSFC PPL, MIL-STD-975, NASA Standard Electrical, Electronic, and Electromechanical Parts List and the NASA Parts Selection List (Level 1 and 2) are considered suitable for grade 2 applications. However, it is the responsibility of the PMPCB to identify exceptions due to failure history, application risk, mission environment, or other conditions which may preclude use. Custom devices such as multichip modules, stacked memories, and ASICs will be subjected to individual design reviews and monitored by the PMPCB during development, procurement, and application. The design reviews will as a minimum address derating of elements, reliability analyses, assembly techniques and materials, and thermal management. All parts will be selected to meet their radiation hardness levels in the predicted mission environment. Selection criteria for the radiation environment will consist of two separate effects, those of total ionizing dose and single event effects.

10.3 PROCUREMENT CONTROLS. The SMAM or designee will review for suitability prior to approval each purchase order to assure conformance to the applicable TO guidelines, program requirements, and mission assurance rules. High reliability, hermetically sealed part requirements will be made from QPL/QML or other approved manufacturers where possible. When parts are procured to the manufacturer specifications, the attribute screening data package will also be procured. Problems that are encountered during procurement will be documented and resolved by the PMPCB. Suppliers, vendors, laboratories, and manufacturers are subject to initial capability surveys and periodic audit to ensure compliance to requirements specified within the procurement order.

10.4 PMP TRACEABILITY. Traceability will be maintained for all parts, materials, and special process components to allow for rapid identification of those actual items incorporated within the flight hardware and critical ground support equipment during fabrication and assembly operations. At the onset of fabrication and assembly operations, each item is assigned a specific flow document that contains provisions for logging required traceability entries. As lower level subassemblies are installed into next higher levels, the traceability listings are incorporated into an "equipment log" at the component or "black box" level. Traceability methods proposed for use include the following:

- EEE Parts. The manufacturer, lot date code, purchase order, and serialization when provided will be recorded.
- Printed Circuit Boards. Part number, serial number, lot date (batch) code, and manufacturer.
- Mechanical Parts, Hardware, and Materials. Purchase order number, lot/batch number, expiration date when applicable.



10.5 GIDEP ALERTS. SGT Team members participate in the GIDEP industry sharing program. All GIDEP alerts are reviewed to determine their effect on hardware currently being processed by Team members, subcontractors, and suppliers. The PMPCB will review and disposition all GIDEP alerts related to EEE parts applications and will also issue alerts resulting from defective or unacceptable EEE parts processed. In addition, any NASA alerts and advisories provided will be reviewed and dispositioned. Alert applicability, impact, and corrective actions will be documented and maintained within the project files.

10.6 PART FAILURES. Under the direction of a previously established FRB, malfunctioning parts or materials are removed and analyzed to establish the exact failure mode by a systematic layer-by-layer examination of internal properties and composition to the extent necessary. Electronic circuits and mechanical components are subjected to analysis to determine if actual/potential overstress requires additional repair or replacement action. The PMPCB will be made aware of all part and material failures and will provide corrective actions to be taken for lot, batch, or application problems. Depending on the corrective action, MRB approval may also be necessary. All failure reports and analyses will be maintained within the program files and made available for approval and review at all times.

11. MATERIALS AND PROCESSES

To anticipate material-related problems during development and operation, the SGT Team’s SE and SMA personnel will consider potential problem areas such as radiation effects, thermal cycling, stress corrosion cracking, galvanic corrosion, hydrogen embrittlement, lubricants, contamination of cooled surfaces, composite materials, atomic oxygen, vacuum outgassing, toxic outgassing, flammability, fracture toughness, and the properties required by each material usage and application to assure mission success per the established materials processes shown in Attachment 1. Material selection criteria based upon launch application areas follows:

Launch Type	Payload Location	Flammability and Toxic Outgassing	Vacuum Outgassing	Stress Corrosion Cracking
STS	Orbiter Crew Compartment	NASA-STD-6001	No Requirement	MSFC-SPEC-522
STS	Cargo Bay	NSTS 1700.7 Paragraph 209	TML <1.00% CVCM <0.10%	MSFC-SPEC-522
ELV	All	EWR 127-1 Section 3.4.1.2	TML <1.00% CVCM <0.10%	MSFC-SPEC-522

Materials that have a limited useable shelf life will be identified with a start and expiration date. Storage of shelf-life materials will be accomplished in accordance with the manufacturer’s recommended environments and conditions. Materials such as rubber seals, tape, uncured polymers, lubricated bearings and paints are also considered to be shelf-life items. The use of materials whose date code has expired requires retesting to demonstrate that the material’s properties have not degraded or have been compromised for their intended use. Approval for use of expired materials will be obtained by disposition by the PMPCB and subsequent waiver action.

Material outgassing properties will be evaluated using ASTM E595 and NASA RP 1124 as a guide and individual material outgassing data will be established based on each component’s operating guidelines.

11.1 MATERIAL AND PROCESS QUALIFICATION. Materials and processes previously qualified for spaceflight application will be selected when possible. In judging the acceptability of previously approved materials and processes, each will be individually evaluated for

- Successful use in a prior, but recent space program in which the application environment conditions of use and test were at least as severe as those presently required.



- The part or material design and construction are the same as the previously qualified part/material.
- The part or material is manufactured by the same facility to the same baseline as the previously qualified part or material, and the application does not result in critical stresses or mechanical strain (such as due to thermal mismatch) greater than the previously qualified part or material.

Materials and processes that do not meet the qualification criteria will be processed on GSFC Material Usage Agreements (MUAs) including justification, qualification and test program, and applicable analyses for approval.

11.2 MATERIAL FAILURES. Under the direction of a previously established FRB, malfunctioning materials are removed and analyzed to establish the exact failure mode by a systematic layer-by-layer examination of internal properties and composition to the extent necessary.

12. CONTAMINATION CONTROL

As part mission assurance a contamination control program will be established by each team-mate (See Attachment 1) to meet the sensitivity, allowance, and budget levels as specified in the individual task assignments or task related facilities and 546-PG-87002.2, Contamination Design, Analysis, Test and Hardware Implementation guidelines and Requirements, and NPR 8020.12C, Planetary Protection Provisions for Robotic Extraterrestrial Missions. Appropriate plans and procedures will be provided to describe the program when required. Assembly and test facilities will incorporate the use of controlled access areas, visibly clean workstations, and clean rooms to ensure contamination levels are not exceeded. Personnel involved with fabrication, assembly, handling, and integration of the flight hardware will be required to wear smocks or other clean room garments when working around or in its vicinity; test facilities and test personnel will also be required to observe the same cleanliness standards used during assembly.

All hardware will be subject to thermal vacuum bakeout. The parameters of the bakeout such as temperature, duration, and pressure will be individualized dependent upon materials used, the fabrication environment, and the established contamination allowance will be defined per GSFC-STD-7000.

ATTACHMENT I. MISSION ASSURANCE PROCESS

Mission Assurance Element	SCT, Inc. Processes/Procedures
Configuration Management	MSP 5.0 - Document and Data Control Procedures
Software Product Assurance	MSI 9.8 - Software Product Development
Ground Data System Assurance	MSI 9.8 - Software Product Development
System Safety	Various per Customer Requirements
Reliability and Maintainability	MSI 9.4 - Systems Engineering for GSFC Missions
Risk Management	MSI 9.4.9 - Risk Management
Technical Reviews	MSP 1.0 - Management Review Procedures
System Verification and Validation	MSI 9.7 - System Verification Procedures

Mission Assurance Element	SGT, Inc. Processes/Procedures
Handling and ESD Protection	External Control per Customer Requirements
Electrostatic Discharge Controls	External Control per Customer Requirements
EEE Parts Selection	External Control per Customer Requirements
Procurement Controls	MSP 6.0 - Purchasing Procedures
PMP Traceability	MSP 8.0 - Product Identification and Traceability Procedures
GDPEP Alerts	External Control per Customer Requirements MSP 16.0 - Corrective and Preventive Action Procedures
Part Failures	MSP 16.0 - Corrective and Preventive Action Procedures External Control per Customer Requirements
Material and Process Qualification	External Control per Customer Requirements
Material Failures	MSP 16.0 - Corrective and Preventive Action Procedures External Control per Customer Requirements
Contamination Control	External Control per Customer Requirements



ATTACHMENT 2. GLOSSARY TO APPENDIX A, MISSION ASSURANCE PLAN

Acronym	Definition
AR	Acceptance Review
CCB	Configuration Control Board
CDR	Critical Design Review
CIL	Critical Item List
CM	Configuration Management
COTS	Commercial Off the Shelf
CRM	Continuous Risk Management
CSCI	Computer Software Configuration Item
DPA	Destructive Physical Analysis
EEE	Electrical, Electronic, and Electromechanical
EOL	End of Life
ESD	Electrostatic Discharge
ETA	Event Tree Analysis
FMEA	Failure Modes Effects Analysis
FOR	Flight Operations Review
FRB	Failure Review Board
FTA	Fault Tree Analysis
GDS	Ground Data System
GEVS	General Environmental Verification Standards
GFE	Government Furnished Equipment
GIDEP	Government-Industry Data Exchange Program
GSE	Ground Support Equipment
IPC	Institute for Interconnecting and Packaging of Electronic Circuits
LRR	Launch Readiness Review
MA&S	Mission Assurance and Safety
MAP	Mission Assurance Plan
MOR	Mission Operations Review
MRB	Material Review Board
MUA	Material Usage Agreement
NPSL	NASA Parts Selection List
PAL	Program Asset Library
PDR	Preliminary Design Review
PER	Pre-Environmental Review
PMP	Parts, Materials, and Processes
PMPCB	PMP Control Board
PPL	Preferred Parts List
PRA	Probabilistic Risk Assessment
PSR	Pre-Ship Review
QA	Quality Assurance
QML	Qualified Manufacturers' List
QMS	Quality Management System
QPL	Qualified Products List
RAB	Registrar Accreditation Board
RM	Risk Management
RMP	Risk Management Plan
RSS	Root Sum Square
RTP	Request for Task Plan
SCCB	Software Configuration Control Board
SCM	Software Configuration Management
SDP	Software Development Plan
SE	System Engineer
SMA	Safety and Mission Assurance
SMAM	Safety and Mission Assurance Manager
SMP	Software Management Plan
SoSR	Software Specification Review
SQA	Software Quality Assurance
SQAR	Software Quality Assurance Report
SRR	System Requirements Review
SSR	System Safety Review
STP	Software Test Plan
TO	Task Order
TRR	Test Readiness Review

Attachment I
NNG07CA21C
March 06

List of Installation-Accountable Government Property (IAGP)

In accordance with G. 14, List of Installation-Accountable Property and Services (1852.245-77), the following is also provided as IAGP:

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
1	Personal Computers, Monitors, and Printers	1 Lot Per Employee
2	Standard Software Programs (i.e, Microsoft Office, Windows, Eudora, etc.)	1 Lot Per Employee

[End of Listing]

PERSONAL IDENTITY VERIFICATION (PIV) CARD ISSUANCE PROCEDURES

PIV Card Issuance Procedures in accordance with FAR clause 52.204-9, Personal Identity Verification of Contractor Personnel. FIPS 201 Appendix A graphically displays the following procedure for the issuance of a PIV credential.

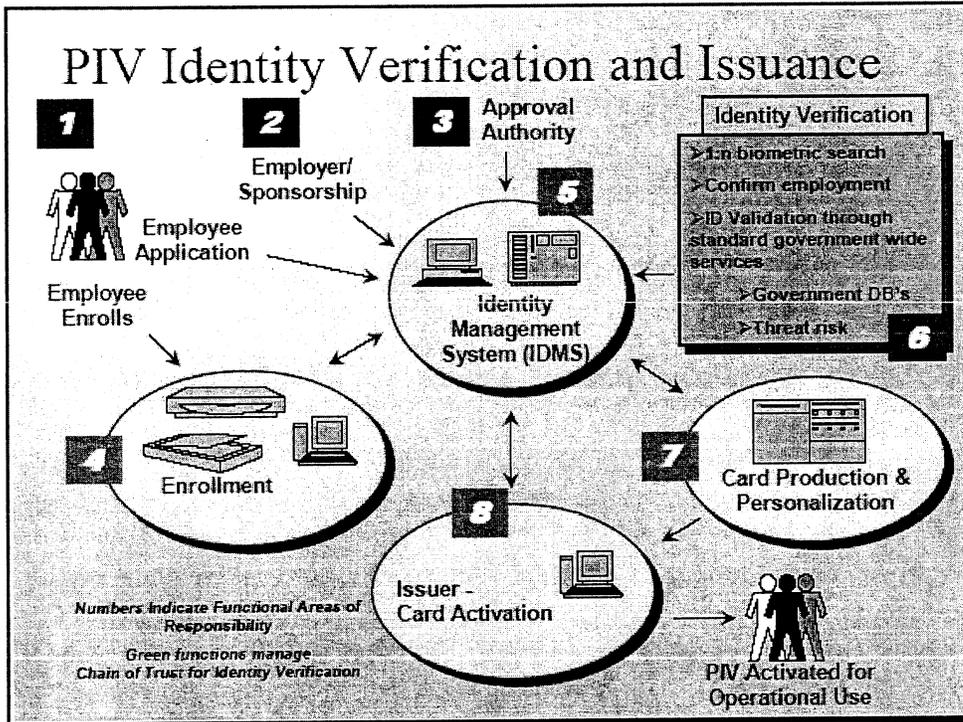


Figure A-1, FIPS 201, Appendix A

The following steps describe the procedures for the NASA Personal Identity Verification Card Issuance (PCI) of a PIV credential:

Step 1:

The Contractor's Corporate Security Officer (CSO), Program Manager (PM), or Facility Security Officer (FSO) submits a formal letter that provides a list of contract employees (applicant) names requesting access to the NASA Contracting Officer's Technical Representative (COTR). In the case of a foreign national applicant, approval through the NASA Foreign National Management System (NFMMS) must be obtained for the visit or assignment before any processing for a PIV credential can take place. Further, if the foreign national is not under a contract where a COTR has been officially designated, the foreign national will provide the information directly to their visit/assignment host, and the host sponsor will fulfill the duties of the COTR mentioned herein. In each case, the letter shall provide notification of the contract or foreign national employee's (hereafter the "applicant") full name (first, middle and last), social security number (SSN) or NASA Foreign National Management System Visitor Number if the foreign national does not have a SSN, and date of birth. If the contract employee has a current satisfactorily completed National Agency Check with Inquiries (NACI) or an equivalent or higher degree of background investigation, the letter shall indicate the type of investigation, the agency completing the

investigation, and date the investigation was completed. Also, the letter must specify the risk/sensitivity level associated with the position in which each applicant will be working (NPR 1600.1, §4.5 is germane) Further, the letter shall also acknowledge that contract employees may be denied access to NASA information or information systems based on an unsatisfactory background investigation/adjudication. .

After reviewing the letter for completeness and concurring with the risk/sensitivity levels, the COTR/host must forward the letter to the Center Chief of Security (CCS). The CCS shall review the OPM databases (e.g., DCII, PIP, et al.), and take appropriate steps to validate the applicant's investigation status. Requirements for a NACI or other investigation shall be initiated only if necessary.

Applicants who do not currently possess the required level of background investigation shall be directed to the e-QIP web site to complete the necessary background investigation forms online. The CCS shall provide to the COTR/host information and instructions on how to access the e-QIP for each contract or foreign national employee requiring access

Step 2:

Upon acceptance of the letter/background information, the applicant will be advised that in order to complete the investigative process, he or she must appear in-person before the authorized PIV registrar and submit two forms of identity source documents in original form. The identity source documents must come from the list of acceptable documents included in Form I-9, Employment Eligibility Verification, one which must be a Federal¹ or State issued picture identification. Fingerprints will be taken at this time. The applicant must appear **no later than** the entry on duty date.

When the applicant appears, the registrar will electronically scan the submitted documents; any document that appears invalid will be rejected by the registrar. The registrar will capture electronically both a facial image and fingerprints of the applicant. The information submitted by the applicant will be used to create or update the applicant identity record in the Identity Management System (IDMS).

Step 3:

Upon the applicant's completion of the investigative document, the CCS reviews the information, and resolves discrepancies with the applicant as necessary. When the applicant has appeared in person and completed fingerprints, the package is electronically submitted to initiate the NACI. The CCS includes a request for feedback on the NAC portion of the NACI at the time the request is submitted.

Step 4:

Prior to authorizing physical access of a contractor employee to a federally-controlled facility or access to a Federal information system, the CCS will a National Crime Information Center (NCIC) with an Interstate Identification Index check is/has been performed. In the case of a foreign national, a national check of the Bureau of Immigration and Customs Enforcement (BICE) database will be performed for each applicant. If this process yields negative

¹ A non-PIV government identification badge, including the NASA Photo Identification Badge, MAY NOT BE USED for the original issuance of a PIV vetted credential

information, the CCS will immediately notify the COTR/host of the determination regarding access made by the CCS.

Step 5:

Upon receipt of the completed NAC, the CCS will update IDMS from the NAC portion of the NACI and indicate the result of the suitability determination. If an unsatisfactory suitability determination is rendered, the COTR will advise the contractor that the employee is being denied physical access to all federally-controlled facilities and Federal information systems.

Based on a favorable NAC and NCIC/III or BICE check, the CCS will authorize the issuance of a PIV federal credential in the Physical Access Control System (PACS) database. The CCS, based on information provided by the COTR/host, will determine what physical access the applicant should be granted once the PIV issues the credential.

Step 6:

Using the information provided by the applicant during his or her in-person appearance, the PIV card production facility creates and instantiates the approved PIV card for the applicant with an activation date commensurate with the applicant's start date.

Step 7:

The applicant proceeds to the credential issuance facility to begin processing for receipt of his/her federal credential.

The applicant provides to the credential issuing operator proof of identity with documentation that meets the requirements of FIPS 201 (DHS Employment Eligibility Verification (Form I-9) documents. These documents **must** be the same documents submitted for registration.

The credential issuing operator will verify that the facial image, and optionally reference finger print, matches the enrollment data used to produce the card. Upon verification of identity, the operator will locate the employee's record in the PACS database, and modify the record to indicate the PIV card has been issued. The applicant will select a PIN for use with his or her new PIV card. Although root data is inaccessible to the operator, certain fields (hair color, eye color, et al.) may be modified to more accurately record the employee's information.

The applicant proceeds to a kiosk or other workstation to complete activation of the PIV card using the initial PIN entered at card issuance.

**ALTERNATIVE FOR APPLICANTS WHO DO NOT HAVE A COMPLETED AND
ADJUDICATED NAC AT THE TIME OF ENTRANCE ON DUTY**

Steps 1 through 4 shall be accomplished for all applicants in accordance with the process described above. If the applicant is unable to appear in person until the time of entry on duty, or does not, for any other reason, have a completed and adjudicated NAC portion of the NACI at the time of entrance on duty, the following interim procedures shall apply.

1. If the documents required to submit the NACI have not been completed prior to EOD, the applicant will be instructed to complete all remaining requirements for submission of the investigation request. This includes presentation of I-9 documents and completion of fingerprints, if not already accomplished. If the applicant fails to complete these activities as prescribed in NPR 1600.1 (Chapters 3 & 4), it may be considered as failure to meet the conditions required for physical access to a federally-controlled facility or access to a Federal information system, and result in denial of such access.
2. Based on favorable results of the NCIC, the applicant shall be issued a temporary NASA identification card for a period not-to-exceed six months. If at the end of the six month period the NAC results have not been returned, the agency will at that time make a determination if an additional extension will be granted for the temporary identification card.
3. Upon return of the completed NAC, the process will continue from Step 5.