

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, MD 20771



Reply to Attn of: 210.S

August 6, 2012

TO ALL PROSPECTIVE OFFERORS

Subject: Request for Proposal (RFP) NNG12441405R; Space-based Gravitational-wave Observatory (SGO) Telescope Concept Study

NASA Goddard Space Flight Center is pleased to provide you with its Request for Proposal (RFP) for the Telescope Concept Study in support of SGO.

This procurement will be a full and open competition under Federal Acquisition Regulation (FAR) Subpart 15.3, "Source Selection," and NASA FAR Supplement (NFS) Subpart 1815.3, "Source Selection."

The North American Industry Classification System (NAICS) code for this procurement is 541990 and \$14 million.

An electronic copy of the RFP is available on the World Wide Web at the following URL:

<http://prod.nais.nasa.gov/cgi-bin/eps/synopsis.cgi?acqid=152613>

The anticipated contract type is Firm Fixed Price (FFP).

Prospective offerors who intend to submit a foreign offer should review Federal Acquisition Regulation (FAR) Part 25, Foreign Acquisition at: <http://www.arnet.gov/far> and NASA FAR Supplement (NFS) Part 1825, Foreign Acquisition at: <http://www.hq.nasa.gov/office/procurement/regs/1825.htm>

Offers submitted in response to this proposal request are due no later than September 5, 2012 at 3:30 PM EST. Proposals received after this time will be treated as late in accordance with FAR 52.215-1, Instructions to Offers-Competitive Acquisitions. The proposal due date will not be extended based on routine issues or requests. Your proposal must be signed by an official authorized to bind the company and must contain a statement that the proposal is firm for at least 120 days from the date of initial submission.

Written comments and questions regarding the RFP shall be submitted in writing by mail or electronically to the individual listed below. NASA will respond to applicable comments and questions in writing by posting an electronic response at the same location as this solicitation.

Eboni Luck
NASA/Goddard Space Flight Center
Mail Code 210.8
Greenbelt, MD 20771
Phone: (301) 286-8509
Fax: (301) 286-1776
Eboni.Luck@nasa.gov

As of this date, the procurement is in an official "Black-out." The individual listed above is the sole point of contact concerning this solicitation. For identification purposes, all communications regarding this solicitation should include the above-referenced solicitation number.

Thank you for interest in the procurement.



Lakeshia M. Robinson
Contracting Officer

Enclosure: RFP NNG12441405R

SOLICITATION, OFFER AND AWARD			1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700) →		RATING	PAGE 1	OF PAGES 55
2. CONTRACT NUMBER TBD	3. SOLICITATION NUMBER NNG12441405R	4. TYPE OF SOLICITATION <input type="checkbox"/> SEALED BID (IFB) <input checked="" type="checkbox"/> NEGOTIATED (RFP)		5. DATE ISSUED 08/06/2012	6. REQUISITION/PURCHASE NO. 4200441405		
7. ISSUED BY NASA/Goddard Space Flight Center Code 210. 8/EBONI LUCK 8800 Greenbelt Road Greenbelt, MD 20771			CODE GSFC	8. ADDRESS OFFER TO (If other than Item 7) SEE L.2 - PROPOSAL MARKING AND DELIVERY			

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

SOLICITATION

9. Sealed offers in original and copies for furnishing the supplies or services in the Schedule will be received at the place specified in Item 8, or if handcarried, in the depository located in **SEE L.2 - PROPOSAL MARKING AND DELIVERY** until **3:30 pm EST** **SEPTEMBER 5, 2012.**

CAUTION — LATE Submissions, Modifications, and Withdrawals: See Section L, Provision No. 52.214-7 or 52.215-1. All offers are subject to all terms and conditions contained in this solicitation.

10. FOR INFORMATION CALL: →	A. NAME EBONI LUCK	B. TELEPHONE (NO COLLECT CALLS)			C. E-MAIL ADDRESS EBONI.LUCK@NASA.GOV
		AREA CODE 301	NUMBER 286-8509	EXT.	

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OFFER (Must be fully completed by offeror)

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

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

13. DISCOUNT FOR PROMPT PAYMENT (See Section I, Clause No. 52.232-B) →	10 CALENDAR DAYS %	20 CALENDAR DAYS %	30 CALENDAR DAYS %	CALENDAR DAYS %
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14. ACKNOWLEDGMENT OF AMENDMENTS (The offeror acknowledges receipt of amendments to the SOLICITATION for offerors and related documents numbered and dated):	AMENDMENT NO.	DATE	AMENDMENT NO.	DATE

15A. NAME AND ADDRESS OF OFFEROR	CODE	FACILITY	16. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or print)
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15B. TELEPHONE NUMBER AREA CODE NUMBER EXT.	<input type="checkbox"/> 15C. CHECK IF REMITTANCE ADDRESS IS DIFFERENT FROM ABOVE - ENTER SUCH ADDRESS IN SCHEDULE.	17. SIGNATURE	18. OFFER DATE
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AWARD (To be completed by Government)

19. ACCEPTED AS TO ITEMS NUMBERED	20. AMOUNT	21. ACCOUNTING AND APPROPRIATION	
22. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION: <input type="checkbox"/> 10 U.S.C. 2304(c) () <input type="checkbox"/> 41 U.S.C. 253(c) ()		23. SUBMIT INVOICES TO ADDRESS SHOWN IN (4 copies unless otherwise specified) →	ITEM
24. ADMINISTERED BY (If other than Item 7) CODE		25. PAYMENT WILL BE MADE BY CODE	
26. NAME OF CONTRACTING OFFICER (Type or print) Lakeshia M. Robinson	27. UNITED STATES OF AMERICA (Signature of Contracting Officer)		28. AWARD DATE

IMPORTANT -- Award will be made on this Form, or on Standard Form 26, or by other authorized official written notice.

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**SECTION B OF NNG12441405R
SUPPLIES OR SERVICES AND PRICES/COSTS**

B.1 DELIVERABLE REQUIREMENTS AND DELIVERY SCHEDULE

The Contractor shall provide all resources (except as may be expressly stated in the contract as furnished by the Government) necessary to deliver and/or perform the items below in accordance with the Description/Specifications/Statement of Work incorporated in Section J as attachment A.

<u>Deliverables</u>	<u>Schedule/Clause Ref.</u>	<u>Quantity</u>	<u>Delivery Date</u>
1. SOW Requirements	C.1 & J.1	See C.1 & J.1	As specified in C.1 & J.1
2. Kick-off Meeting at Vendor location	C.1	1	2 Weeks After Contract Award (ACA)
3. Interim Progress Report	C.1	See C.1	3 months after contract award
4. New Technology Reports	G.1	See G.1	As specified in G.1
5. Final Report at NASA/GSFC	C.1	See C.1	6 months after contract award plus 30 days

(End of Text)

B.2 FIRM FIXED PRICE (1852.216-78) (DEC 1988) (For Offeror Fill-In)

The total firm fixed price of this contract is TO BE PROPOSED.

(End of Clause)

**SECTION C OF NNG12441405R
DESCRIPTION/SPECIFICATIONS/WORK STATEMENT**

C.1 SCOPE OF WORK

The Contractor shall provide the personnel, materials and facilities, except as otherwise provided in the contract, necessary to provide the items described below and as described under Section J, Attachment A, entitled Telescope Concept Study dated June 29, 2012.

In addition, the Contractor shall provide the items specified under contract clause B.1.

(End of Clause)

**C.2 LIMITED RIGHTS DATA OR RESTRICTED COMPUTER SOFTWARE (GSFC 52.227-90)
(MAR 2008)**

In accordance with the delivery requirements of this contract, all software data rights shall be delivered in accordance with the Rights in Data – General clause, specified elsewhere in this contract, except for the following:

NONE

(End of Clause)

**SECTION D OF NNG12441405R
PACKAGING AND MARKING**

THERE ARE NO CLAUSES IN THIS SECTION

**SECTION E OF NNG12441405R
INSPECTION AND ACCEPTANCE**

E.1 SECTION E - CLAUSES INCORPORATED BY REFERENCE

- (52.246-4) INSPECTION OF SERVICES – FIXED PRICE (AUG 1996)
(52.246-16) RESPONSIBILITY FOR SUPPLIES (APR 1984)

E.2 ACCEPTANCE—LOCATION(S) (GSFC 52.246-93) (APRIL 2008)

The Contracting Officer or authorized representative will accomplish acceptance at the NASA/Goddard Space Flight Center, Greenbelt, MD 20771.

The Contracting Officer reserves the right to designate other Government agents as authorized representatives. The Contractor will be notified by a written notice or by a copy of the delegation letter if other agents are authorized.

If this is a fixed price type contract, acceptance shall be deemed to have occurred constructively--for the sole purpose of computing an interest penalty that might be due the Contractor under the Prompt Payment Act--on the 7th day after the Contractor has delivered the supplies or services in accordance with the terms and conditions of the contract. In the event that actual acceptance occurs within the constructive acceptance period, the determination of an interest penalty shall be based on the date of the actual acceptance.

(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 seven years after delivery of all items and/or completion of all services called for by the contract.

(End of Clause)

E.4 CLAUSES INCORPORATED BY REFERENCE – SECTION E

Clause(s) in E.1 at the beginning of this Section are incorporated by reference, with the same force and effect as if they were given in full text. Clauses incorporated by reference which require a fill-in by the Government include the text of the affected paragraph(s) only. This does not limit the clause to the affected paragraph(s). The Contractor is responsible for understanding and complying with the entire clause. The full text of the clause is available at the addresses contained in clause 52.252-2, Clauses Incorporated by Reference, of this contract.

(End of Clause)

**SECTION F OF NNG12441405R
DELIVERIES OR PERFORMANCE**

F.1 SECTION F - LISTING OF CLAUSES INCORPORATED BY REFERENCE

(52.242-15) STOP-WORK ORDER (AUG 1989)
(52.247-34) F.O.B. DESTINATION (NOV 1991)

(End of Clause)

F.2 SHIPPING INSTRUCTIONS--CENTRAL RECEIVING (GSFC 52.247-94) (JUN 2006)

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:

Technical Officer: Petar Arsenovic
Code: 551
Building: 5 Room: C310A
Contract No. TBD
Item(s) No. All Items

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

If this is a fixed price type contract, delivery--for purposes of the Prompt Payment Act--must be through the above shipping address unless another location has been authorized by the Contracting Officer. If delivery is made to other than Receiving, Building 16W, Code 279, and shipment to that other location has not been authorized by the Contracting Officer, a delivery for the purposes of the Prompt Payment Act has not occurred and no interest penalty under the Act shall result. Shipment to other than Receiving, Building 16W, Code 279, will be construed as contract noncompliance.

(End of Clause)

F.3 PERIOD OF PERFORMANCE

The period of performance of this contract is six months after award.

(End of Clause)

**SECTION F OF NNG12441405R
DELIVERIES OR PERFORMANCE**

F.4 CLAUSES INCORPORATED BY REFERENCE – SECTION F

Clause(s) in F.1 at the beginning of this Section are incorporated by reference, with the same force and effect as if they were given in full text. Clauses incorporated by reference which require a fill-in by the Government include the text of the affected paragraph(s) only. This does not limit the clause to the affected paragraph(s). The Contractor is responsible for understanding and complying with the entire clause. The full text of the clause is available at the addresses contained in clause 52.252-2, Clauses Incorporated by Reference, of this contract.

(End of Clause)

**SECTION G OF NNG12441405R
CONTRACT ADMINISTRATION DATA**

G.1 SECTION G - CLAUSES INCORPORATED BY REFERENCE

(1852.227-70) NEW TECHNOLOGY (MAY 2002)

G.2 INVOICES - SUBMISSION OF (GSFC 52.232-95) (AUG 2008)

Invoices shall be prepared in accordance with the Prompt Payment clause of this contract and submitted to the NASA Shared Services Center (NSSC), Financial Management Division (FMD) Accounts Payable, Bldg 1111, C. Road, Stennis Space Center, MS 39529, Email: NSSC-AccountsPayable@nasa.gov. For purposes of the Prompt Payment Act, the above office is considered to be the "Designated Billing Office" and the "Designated Payment Office".

(End of Clause)

G. 3 DESIGNATION OF NEW TECHNOLOGY REPRESENTATIVE AND PATENT AND REPRESENTATIVE AND PATENT AND REPRESENTATIVE (1852.204-76) (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	504	Goddard Space Flight Center Representative Greenbelt, MD 20771
Patent	140.1	Goddard Space Flight Center Representative 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)

**SECTION G OF NNG12441405R
CONTRACT ADMINISTRATION DATA**

G.4 RELEASE OF SENSITIVE INFORMATION (JUNE 2005) (1852.237-73)

(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 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 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

**SECTION G OF NNG12441405R
CONTRACT ADMINISTRATION DATA**

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 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)

G.5 CLAUSES INCORPORATED BY REFERENCE – SECTION G

Clause(s) in G.1 at the beginning of this Section are incorporated by reference, with the same force and effect as if they were given in full text. Clauses incorporated by reference which require a fill-in by the Government include the text of the affected paragraph(s) only. This does not limit the clause to the affected paragraph(s). The Contractor is responsible for understanding and complying with the entire clause. The full text of the clause is available at the addresses contained in clause 52.252-2, Clauses Incorporated by Reference, of this contract.

(End of Clause)

**SECTION H OF NNG12441405R
SPECIAL CONTRACT REQUIREMENTS**

H.1 SECTION H - CLAUSES INCORPORATED BY REFERENCE

(1852.223-72) SAFETY AND HEALTH (SHORT FORM) (APR 2002)

(1852.208-81) RESTRICTIONS ON PRINTING AND DUPLICATING (NOV 2004)

(End of By Reference Section)

H.2 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.3 REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFEROR

The completed provision 52.204-8, Annual Representations and Certifications, including any amended representation(s) made at paragraph (b) of the provision; and other representations, certifications and other statements contained in Section K completed and submitted as part of the offer dated TBD are hereby incorporated by reference in this resulting contract.

(End of Clause)

H.4 RIGHTS IN DATA (GSFC 52.227-99) (MAR 2008)

The default Data Rights clause under this contract is FAR 52.227-14 RIGHTS IN DATA-GENERAL as modified by NASA FAR Supplement 1852.227-14—Alternate II and Alternate III and GSFC 52.227-90. Any exceptions to this clause will be covered by FAR 52.227-17 RIGHTS IN DATA--SPECIAL WORKS as modified by NASA FAR Supplement 1852.227-17, and, if applicable, GSFC 52.227-93.

(End of Clause)

**SECTION H OF NNG12441405R
SPECIAL CONTRACT REQUIREMENTS**

H.5 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.

(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

**SECTION H OF NNG12441405R
SPECIAL CONTRACT REQUIREMENTS**

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.6 ADDITIONAL REPORTS OF WORK (1852.235-74) (FEB 2003)

In addition to the final report required under this contract, the Contractor shall submit the following report(s) to the Contracting Officer:

a) Interim progress report. The Contractor shall submit a summary of all work accomplished for the interim progress report. The report shall be in narrative form, brief, and informal. They shall include a quantitative description of progress, an indication of any current problems that may impede performance, proposed corrective action, and a discussion of the work to be performed until the end of the period of performance.

(b) Reserved.

(c) Submission dates. Interim progress report shall be delivered three months after contract award. The final report shall be submitted within 30 days after the completion of the effort under the contract.

(End of Clause)

H.7 CLAUSES INCORPORATED BY REFERENCE – SECTION H

Clause(s) in H.1 at the beginning of this Section are incorporated by reference, with the same force and effect as if they were given in full text. Clauses incorporated by reference which require a fill-in by the Government include the text of the affected paragraph(s) only. This does not limit the clause to the affected paragraph(s). The Contractor is responsible for understanding and complying with the entire clause. The full text of the clause is available at the addresses contained in clause 52.252-2, Clauses Incorporated by Reference, of this contract.

(End of Clause)

**SECTION I OF NNG12441405R
CONTRACT CLAUSES**

I.1 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>

A. FAR CLAUSES INCORPORATED BY REFERENCE

- (52.202-1) DEFINITIONS (JAN 2012)
- (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 (SEP 2006)
- (52.203-7) ANTI-KICKBACK PROCEDURES (OCT 2010)
- (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 (OCT 2010)
- (52.203-13) CONTRACTOR CODE OF BUSINESS ETHICS AND CONDUCT (APR 2010)
- (52.204-4) PRINTED OR COPIED DOUBLE-SIDED ON RECYCLED PAPER (MAY 2011)
- (52.204-7) CENTRAL CONTRACTOR REGISTRATION (FEB 2012)
- (52.204-10) REPORTING EXECUTIVE COMPENSATION AND FIRST-TIER SUBCONTRACT AWARDS (FEB 2012)
- (52.209-6) PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (DEC 2010)
- (52.209-10) PROHIBITION ON CONTRACTING WITH INVERTED DOMESTIC CORPORATIONS (MAY 2011)
- (52.211-5) MATERIAL REQUIREMENTS (AUG 2000)
- (52.215-2) AUDIT AND RECORDS--NEGOTIATION (OCT 2010)
- (52.215-8) ORDER OF PRECEDENCE--UNIFORM CONTRACT FORMAT (OCT 1997)
- (52.215-11) PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA--MODIFICATION (AUG 2011)

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- (52.215-13) SUBCONTRACTOR COST OR PRICING DATA--MODIFICATIONS (OCT 2010)
- (52.215-14) INTEGRITY OF UNIT PRICES (OCT 2010)
- (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 (JULY 2005)
- (52.215-19) NOTIFICATION OF OWNERSHIP CHANGES (OCT 1997)
- (52.219-8) UTILIZATION OF SMALL BUSINESS CONCERNS (JAN 2011)
- (52.219-28) POST-AWARD SMALL BUSINESS PROGRAM REPRESENTATION (APR 2012)
- (52.222-1) NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (FEB 1997)
- (52.222-19) CHILD LABOR--COOPERATION WITH AUTHORITIES AND REMEDIES (MAR 2012)
- (52.222-20) WALSH-HEALEY PUBLIC CONTRACTS ACT (DEC 1996)
- (52.222-21) PROHIBITION OF SEGREGATED FACILITIES (FEB 1999)
- (52.222-26) EQUAL OPPORTUNITY (MARCH 2007)
- (52.222-35) EQUAL OPPORTUNITY FOR VETERANS (SEP 2010)
- (52.222-36) AFFIRMATIVE ACTION FOR WORKERS WITH DISABILITIES (OCT 2010)
- (52.222-37) EMPLOYMENT REPORTS ON VETERANS (SEP 2010)
- (52.222-50) COMBATING TRAFFICKING IN PERSONS (FEB 2009)
- (52.223-6) DRUG FREE WORK PLACE (MAY 2001)
- (52.223-14) TOXIC CHEMICAL RELEASE REPORTING (AUG 2003)
- (52.223-18) ENCOURAGING CONTRACTOR POLICIES TO BAN TEXT MESSAGING WHILE DRIVING (AUG 2011)
- (52.225-1) BUY AMERICAN ACT--SUPPLIES (FEB 2009)
- (52.225-13) RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (JUN 2008)
- (52.225-25) PROHIBITION ON ENGAGING IN SANCTIONED ACTIVITIES RELATING TO IRAN – CERTIFICATION (MAR 2012)
- (52.227-1) AUTHORIZATION AND CONSENT (DEC 2007)
- (52.227-2) NOTICE AND ASSISTANCE REGARDING PATENT AND COPY-RIGHT INFRINGEMENT (DEC 2007)
- (52.227-16) ADDITIONAL DATA REQUIREMENTS (JUN 1987)
- (52.229-3) FEDERAL, STATE, AND LOCAL TAXES (APR 2003)
- (52.230-2) COST ACCOUNTING STANDARDS (OCT 2010)
- (52.230-6) ADMINISTRATION OF COST ACCOUNTING STANDARDS (JUN 2010)
- (52.232-1) PAYMENTS (APR 1984)
- (52.232-8) DISCOUNTS FOR PROMPT PAYMENT (FEB 2002)
- (52.232-9) LIMITATION ON WITHHOLDING OF PAYMENTS (APR 1984)
- (52.232-11) EXTRAS (APR 1984)
- (52.232-17) INTEREST (OCT 2010)
- (52.232-23) ASSIGNMENT OF CLAIMS (JAN 1986)
- (52.232-25) PROMPT PAYMENT (OCT 2008)
- (52.232-33) PAYMENT BY ELECTRONIC FUNDS TRANSFER -CENTRAL CONTRACTOR REGISTRATION (OCT 2003)
- (52.233-1) DISPUTES (JULY 2002)--ALTERNATE I (DEC 1991)

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CONTRACT CLAUSES**

- (52.233-3) PROTEST AFTER AWARD (AUG 1996)
- (52.233-4) APPLICABLE LAW FOR BREACH OF CONTRACT CLAIM (OCT 2004)
- (52.242-13) BANKRUPTCY (JUL 1995)
- (52.243-1) CHANGES--FIXED PRICE (AUG 1987)
- (52.244-2) SUBCONTRACTS (JUN 2007) {paragraph (d) is "None" and paragraph (j) is "None"
- (52.244-6) SUBCONTRACTS FOR COMMERCIAL ITEMS (DEC 2010)
- (52.246-25) LIMITATION OF LIABILITY--SERVICES (FEB 1997)
- (52.247-63) PREFERENCE FOR U.S.-FLAG AIR CARRIERS (JUN 2003)
- (52.248-1) VALUE ENGINEERING (OCT 2010)
- (52.249-2) TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED PRICE) (APR 2012)
- (52.249-8) DEFAULT (FIXED-PRICE SUPPLY AND SERVICE) (APR 1984)
- (52.252-6) AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)
- (52.253-1) COMPUTER GENERATED FORMS (JAN 1991)

B. NASA FAR SUPPLEMENT-CLAUSES INCORPORATED BY REFERENCE

- (1852.242-78) EMERGENCY MEDICAL SERVICES AND EVACUATION (APR 2001)

(End of By Reference Section)

I.2 OMBUDSMAN (1852.215-84) (NOV 2011)

(a) An ombudsman has been appointed to hear and facilitate the resolution of concerns from offerors, potential offerors, and contractors during the preaward and postaward phases of this acquisition. When requested, the ombudsman will maintain strict confidentiality as to the source of the concern. The existence of the ombudsman is not to diminish the authority of the contracting officer, the Source Evaluation Board, or the selection official. Further, the ombudsman does not participate in the evaluation of proposals, the source selection process, or the adjudication of formal contract disputes. Therefore, before consulting with an ombudsman, interested parties must first address their concerns, issues, disagreements, and/or recommendations to the contracting officer for resolution.

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CONTRACT CLAUSES**

(b) If resolution cannot be made by the contracting officer, interested parties may contact the installation ombudsman, whose name, address, telephone number, facsimile number, and e-mail address may be found at: http://prod.nais.nasa.gov/pub/pub_library/Omb.html. Concerns, issues, disagreements, and recommendations which cannot be resolved at the installation may be referred to the Agency ombudsman identified at the above URL. Please do not contact the ombudsman to request copies of the solicitation, verify offer due date, or clarify technical requirements. Such inquiries shall be directed to the Contracting Officer or as specified elsewhere in this document.

(End of Clause)

I. 3 RESTRICTION OF FUNDING ACTIVITY WITH CHINA (1852.225-71) (FEB 2012)

(a) Definition - "China" or "Chinese-owned company" means the People's Republic of China, any company owned by the People's Republic of China or any company incorporated under the laws of the People's Republic of China.

(b) Public Laws 112-10, Section 1340(a) and 112-55, Section 539, restrict NASA from contracting to participate, collaborate, coordinate bilaterally in any way with China or a Chinese-owned company using funds appropriated on or after April 25, 2011. Contracts for commercial and non developmental items are exempted from the prohibition because they constitute purchase of goods or services that would not involve participation, collaboration, or coordination between the parties.

(c) This contract may use restricted funding that was appropriated on or after April 25, 2011. The contractor shall not contract with China or Chinese-owned companies for any effort related to this contract except for acquisition of commercial and non-developmental items. If the contractor anticipates making an award to China or Chinese-owned companies, the contractor must contact the contracting officer to determine if funding on this contract can be used for that purpose.

(d) Subcontracts - The contractor shall include the substance of this clause in all subcontracts made hereunder.

(End of Clause)

I.4 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)

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I.5 RIGHTS IN DATA-GENERAL (52.227-14) (DEC 2007) as modified by NASA FAR Supplement 1852.227-14—ALTERNATE II (DEC 2007) AND ALTERNATE III (DEC 2007)

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

"Computer database" or "database means" a collection of recorded information in a form capable of, and for the purpose of, being stored in, processed, and operated on by a computer. The term does not include computer software.

"Computer software"-

(1) Means

(i) Computer programs that comprise a series of instructions, rules, routines, or statements, regardless of the media in which recorded, that allow or cause a computer to perform a specific operation or series of operations; and

(ii) Recorded information comprising source code listings, design details, algorithms, processes, flow charts, formulas, and related material that would enable the computer program to be produced, created, or compiled.

(2) Does not include computer databases or computer software documentation.

"Computer software documentation" means owner's manuals, user's manuals, installation instructions, operating instructions, and other similar items, regardless of storage medium, that explain the capabilities of the computer software or provide instructions for using the software.

"Data" means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as financial, administrative, cost or pricing, or management information.

"Form, fit, and function data" means data relating to items, components, or processes that are sufficient to enable physical and functional interchangeability, and data identifying source, size, configuration, mating and attachment characteristics, functional characteristics, and performance requirements. For computer software it means data identifying source, functional characteristics, and performance requirements but specifically excludes the source code, algorithms, processes, formulas, and flow charts of the software.

"Limited rights" means the rights of the Government in limited rights data as set forth in the Limited Rights Notice of paragraph (g)(3) if included in this clause.

"Limited rights data" means data, other than computer software, that embody trade secrets or are commercial or financial and confidential or privileged, to the extent that such data pertain to items, components, or processes developed at private expense, including minor modifications.

"Restricted computer software" means computer software developed at private expense and that is a trade secret, is commercial or financial and confidential or privileged, or is copyrighted computer software, including minor modifications of the computer software.

**SECTION I OF NNG12441405R
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"Restricted rights," as used in this clause, means the rights of the Government in restricted computer software, as set forth in a Restricted Rights Notice of paragraph (g) if included in this clause, or as otherwise may be provided in a collateral agreement incorporated in and made part of this contract, including minor modifications of such computer software.

"Technical data" means recorded information (regardless of the form or method of the recording) of a scientific or technical nature (including computer databases and computer software documentation). This term does not include computer software or financial, administrative, cost or pricing, or management data or other information incidental to contract administration. The term includes recorded information of a scientific or technical nature that is included in computer databases (See 41 U.S.C. 403(8)).

"Unlimited rights" means the rights of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.

(b) Allocation of rights.

(1) Except as provided in paragraph (c) of this clause, the Government shall have unlimited rights in-

(i) Data first produced in the performance of this contract;

(ii) Form, fit, and function data delivered under this contract;

(iii) Data delivered under this contract (except for restricted computer software) that constitute manuals or instructional and training material for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under this contract; and

(iv) All other data delivered under this contract unless provided otherwise for limited rights data or restricted computer software in accordance with paragraph (g) of this clause.

(2) The Contractor shall have the right to-

(i) Assert copyright in data first produced in the performance of this contract to the extent provided in paragraph (c)(1) of this clause;

(ii) Use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, unless provided otherwise in paragraph (d) of this clause;

(iii) Substantiate the use of, add, or correct limited rights, restricted rights, or copyright notices and to take other appropriate action, in accordance with paragraphs (e) and (f) of this clause; and

(iv) Protect from unauthorized disclosure and use those data that are limited rights data or restricted computer software to the extent provided in paragraph (g) of this clause.

(c) Copyright-

(1) Data first produced in the performance of this contract.

**SECTION I OF NNG12441405R
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(i) Unless provided otherwise in paragraph (d) of this clause, the Contractor may, without prior approval of the Contracting Officer, assert copyright in scientific and technical articles based on or containing data first produced in the performance of this contract and published in academic, technical or professional journals, symposia proceedings, or similar works. The prior, express written permission of the Contracting Officer is required to assert copyright in all other data first produced in the performance of this contract.

(ii) When authorized to assert copyright to the data, the Contractor shall affix the applicable copyright notices of 17 U.S.C. 401 or 402, and an acknowledgment of Government sponsorship (including contract number).

(iii) For data other than computer software, the Contractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly by or on behalf of the Government. For computer software, the Contractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license in such copyrighted computer software to reproduce, prepare derivative works, and perform publicly and display publicly (but not to distribute copies to the public) by or on behalf of the Government.

(2) *Data not first produced in the performance of this contract.* The Contractor shall not, without the prior written permission of the Contracting Officer, incorporate in data delivered under this contract any data not first produced in the performance of this contract unless the Contractor-

(i) Identifies the data; and

(ii) Grants to the Government, or acquires on its behalf, a license of the same scope as set forth in paragraph (c)(1) of this clause or, if such data are restricted computer software, the Government shall acquire a copyright license as set forth in paragraph (g)(4) of this clause (if included in this contract) or as otherwise provided in a collateral agreement incorporated in or made part of this contract.

(3) *Removal of copyright notices.* The Government will not remove any authorized copyright notices placed on data pursuant to this paragraph (c), and will include such notices on all reproductions of the data.

(d) *Release, publication, and use of data.* The Contractor shall have the right to use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, except-

(1) As prohibited by Federal law or regulation (e.g., export control or national security laws or regulations);

(2) As expressly set forth in this contract; or

(3) If the Contractor receives or is given access to data necessary for the performance of this contract that contain restrictive markings, the Contractor shall treat the data in accordance with such markings unless specifically authorized otherwise in writing by the Contracting Officer.

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(i) The Contractor agrees not to establish claim to copyright, publish or release to others any computer software first produced in the performance of this contract without the Contracting Officer's prior written permission.

(ii) If the Government desires to obtain copyright in computer software first produced in the performance of this contract and permission has not been granted as set forth in paragraph (d)(3)(i) of this clause, the Contracting Officer may direct the contractor to assert, or authorize the assertion of, claim to copyright in such data and to assign, or obtain the assignment of, such copyright to the Government or its designated assignee.

(iii) Whenever the word "establish" is used in this clause, with reference to a claim to copyright, it shall be construed to mean "assert".

(e) Unauthorized marking of data.

(1) Notwithstanding any other provisions of this contract concerning inspection or acceptance, if any data delivered under this contract are marked with the notices specified in paragraph (g)(3) or (g) (4) if included in this clause, and use of the notices is not authorized by this clause, or if the data bears any other restrictive or limiting markings not authorized by this contract, the Contracting Officer may at any time either return the data to the Contractor, or cancel or ignore the markings. However, pursuant to 41 U.S.C. 253d, the following procedures shall apply prior to canceling or ignoring the markings.

(i) The Contracting Officer will make written inquiry to the Contractor affording the Contractor 60 days from receipt of the inquiry to provide written justification to substantiate the propriety of the markings;

(ii) If the Contractor fails to respond or fails to provide written justification to substantiate the propriety of the markings within the 60-day period (or a longer time approved in writing by the Contracting Officer for good cause shown), the Government shall have the right to cancel or ignore the markings at any time after said period and the data will no longer be made subject to any disclosure prohibitions.

(iii) If the Contractor provides written justification to substantiate the propriety of the markings within the period set in paragraph (e)(1)(i) of this clause, the Contracting Officer will consider such written justification and determine whether or not the markings are to be cancelled or ignored. If the Contracting Officer determines that the markings are authorized, the Contractor will be so notified in writing. If the Contracting Officer determines, with concurrence of the head of the contracting activity, that the markings are not authorized, the Contracting Officer will furnish the Contractor a written determination, which determination will become the final agency decision regarding the appropriateness of the markings unless the Contractor files suit in a court of competent jurisdiction within 90 days of receipt of the Contracting Officer's decision. The Government will continue to abide by the markings under this paragraph (e)(1)(iii) until final resolution of the matter either by the Contracting Officer's determination becoming final (in which instance the Government will thereafter have the right to cancel or ignore the markings at any time and the data will no longer be made subject to any disclosure prohibitions), or by final disposition of the matter by court decision if suit is filed.

(2) The time limits in the procedures set forth in paragraph (e)(1) of this clause may be modified in accordance with agency regulations implementing the Freedom of Information Act (5 U.S.C. 552) if necessary to respond to a request thereunder.

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(3) Except to the extent the Government's action occurs as the result of final disposition of the matter by a court of competent jurisdiction, the Contractor is not precluded by paragraph (e) of the clause from bringing a claim, in accordance with the Disputes clause of this contract, that may arise as the result of the Government removing or ignoring authorized markings on data delivered under this contract.

(f) Omitted or incorrect markings.

(1) Data delivered to the Government without any restrictive markings shall be deemed to have been furnished with unlimited rights. The Government is not liable for the disclosure, use, or reproduction of such data.

(2) If the unmarked data has not been disclosed without restriction outside the Government, the Contractor may request, within 6 months (or a longer time approved by the Contracting Officer in writing for good cause shown) after delivery of the data, permission to have authorized notices placed on the data at the Contractor's expense. The Contracting Officer may agree to do so if the Contractor-

(i) Identifies the data to which the omitted notice is to be applied;

(ii) Demonstrates that the omission of the notice was inadvertent;

(iii) Establishes that the proposed notice is authorized; and

(iv) Acknowledges that the Government has no liability for the disclosure, use, or reproduction of any data made prior to the addition of the notice or resulting from the omission of the notice.

(3) If data has been marked with an incorrect notice, the Contracting Officer may-

(i) Permit correction of the notice at the Contractor's expense if the Contractor identifies the data and demonstrates that the correct notice is authorized; or

(ii) Correct any incorrect notices.

(g) Protection of limited rights data and restricted computer software.

(1) The Contractor may withhold from delivery qualifying limited rights data or restricted computer software that are not data identified in paragraphs (b)(1)(i), (ii), and (iii) of this clause. As a condition to this withholding, the Contractor shall-

(i) Identify the data being withheld; and

(ii) Furnish form, fit, and function data instead.

(2) Limited rights data that are formatted as a computer database for delivery to the Government shall be treated as limited rights data and not restricted computer software.

(3) Notwithstanding paragraph (g)(1) of this clause, the contract may identify and specify the delivery of limited rights data, or the Contracting Officer may require by written request the delivery of limited rights data that has been withheld or would otherwise be entitled to be withheld. If delivery of that data is required, the Contractor shall affix the following "Limited Rights Notice" to the data and the

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Government will treat the data, subject to the provisions of paragraphs (e) and (f) of this clause, in accordance with the notice:

Limited Rights Notice (Dec 2007)

(a) These data are submitted with limited rights under Government Contract No. NNG12PZ60C. These data may be reproduced and used by the Government with the express limitation that they will not, without written permission of the Contractor, be used for purposes of manufacture nor disclosed outside the Government; except that the Government may disclose these data outside the Government for the following purposes, if any; provided that the Government makes such disclosure subject to prohibition against further use and disclosure:

(i) Use (except for manufacture) by support service contractors.

(ii) Evaluation by nongovernment evaluators.

(iii) Use (except for manufacture) by other contractors participating in the Government's program of which the specific contract is a part.

(iv) Emergency repair or overhaul work.

(v) Release to a foreign government, or its instrumentalities, if required to serve the interests of the U.S. Government, for information or evaluation, or for emergency repair or overhaul work by the foreign government.

(vi) or any other legitimate government use

(b) This notice shall be marked on any reproduction of these data, in whole or in part.

(End of notice)

(4)(i) Notwithstanding paragraph (g)(1) of this clause, the contract may identify and specify the delivery of restricted computer software, or the Contracting Officer may require by written request the delivery of restricted computer software that has been withheld or would otherwise be entitled to be withheld. If delivery of that computer software is required, the Contractor shall affix the following "Restricted Rights Notice" to the computer software and the Government will treat the computer software, subject to paragraphs (e) and (f) of this clause, in accordance with the notice:

Restricted Rights Notice (Dec 2007)

(a) This computer software is submitted with restricted rights under Government Contract No. NNG12PZ60C. It may not be used, reproduced, or disclosed by the Government except as provided in paragraph (b) of this notice or as otherwise expressly stated in the contract.

(b) This computer software may be-

(1) Used or copied for use with the computer(s) for which it was acquired, including use at any Government installation to which the computer(s) may be transferred;

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(2) Used or copied for use with a backup computer if any computer for which it was acquired is inoperative;

(3) Reproduced for safekeeping (archives) or backup purposes;

(4) Modified, adapted, or combined with other computer software, *provided* that the modified, adapted, or combined portions of the derivative software incorporating any of the delivered, restricted computer software shall be subject to the same restricted rights;

(5) Disclosed to and reproduced for use by support service Contractors or their subcontractors in accordance with paragraphs (b)(1) through (4) of this notice; and

(6) Used or copied for use with a replacement computer and other legitimate government use.

(c) Notwithstanding the foregoing, if this computer software is copyrighted computer software, it is licensed to the Government with the minimum rights set forth in paragraph (b) of this notice.

(d) Any other rights or limitations regarding the use, duplication, or disclosure of this computer software are to be expressly stated in, or incorporated in, the contract.

(e) This notice shall be marked on any reproduction of this computer software, in whole or in part.

(End of notice)

(ii) Where it is impractical to include the Restricted Rights Notice on restricted computer software, the following short-form notice may be used instead:

Restricted Rights Notice Short Form (Jun 1987)

Use, reproduction, or disclosure is subject to restrictions set forth in Contract No. NNG12PZ60C (and subcontract, if appropriate) with Constellation Software Engineering, Corp. (name of Contractor and subcontractor).

(End of notice)

(iii) If restricted computer software is delivered with the copyright notice of 17 U.S.C. 401, it will be presumed to be licensed to the Government without disclosure prohibitions, with the minimum rights set forth in paragraph (b) of this clause.

(h) *Subcontracting.* The Contractor shall obtain from its subcontractors all data and rights therein necessary to fulfill the Contractor's obligations to the Government under this contract. If a subcontractor refuses to accept terms affording the Government those rights, the Contractor shall promptly notify the Contracting Officer of the refusal and shall not proceed with the subcontract award without authorization in writing from the Contracting Officer.

(i) *Relationship to patents or other rights.* Nothing contained in this clause shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Government.

(End of Clause)

**SECTION J OF NNG12441405R
LIST OF ATTACHMENTS**

J.1 LIST OF ATTACHMENTS

The following attachments constitute part of this contract:

ATTACHMENT	DESCRIPTION	DATE	# OF PAGES
A	Telescope Concept Study SOW	June 29, 2012	18

(End of Clause)

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REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS

K.1 ANNUAL REPRESENTATIONS AND CERTIFICATIONS (52.204-8) (MAY 2012)

(a)(1) The North American Industry Classification System (NAICS) code for this acquisition is **541990**.

(2) The small business size standard is **\$14 million**.

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b)(1) If the clause at 52.204-7, Central Contractor Registration, is included in this solicitation, paragraph (d) of this provision applies.

(2) If the clause at 52.204-7 is not included in this solicitation, and the offeror is currently registered in CCR, and has completed the ORCA electronically, the offeror may choose to use paragraph (d) of this provision instead of completing the corresponding individual representations and certifications in the solicitation. The offeror shall indicate which option applies by checking one of the following boxes:

(i) Paragraph (d) applies.

(ii) Paragraph (d) does not apply and the offeror has completed the individual representations and certifications in the solicitation.

(c)(1) The following representations or certifications in ORCA are applicable to this solicitation as indicated:

(i) 52.203-2, Certificate of Independent Price Determination. This provision applies to solicitations when a firm-fixed-price contract or fixed-price contract with economic price adjustment is contemplated, unless—

(A) The acquisition is to be made under the simplified acquisition procedures in Part 13;

(B) The solicitation is a request for technical proposals under two-step sealed bidding procedures; or

(C) The solicitation is for utility services for which rates are set by law or regulation.

(ii) 52.203-11, Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions. This provision applies to solicitations expected to exceed \$150,000.

(iii) 52.204-3, Taxpayer Identification. This provision applies to solicitations that do not include the clause at 52.204-7, Central Contractor Registration.

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REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS

(iv) [52.204-5](#), Women-Owned Business (Other Than Small Business). This provision applies to solicitations that—

(A) Are not set aside for small business concerns;

(B) Exceed the simplified acquisition threshold; and

(C) Are for contracts that will be performed in the United States or its outlying areas.

(v) [52.209-2](#), Prohibition on Contracting with Inverted Domestic Corporations—Representation. This provision applies to solicitations using funds appropriated in fiscal years 2008, 2009, or 2010.

(vi) [52.209-5](#), Certification Regarding Responsibility Matters. This provision applies to solicitations where the contract value is expected to exceed the simplified acquisition threshold.

(vii) [52.214-14](#), Place of Performance—Sealed Bidding. This provision applies to invitations for bids except those in which the place of performance is specified by the Government.

(viii) [52.215-6](#), Place of Performance. This provision applies to solicitations unless the place of performance is specified by the Government.

(ix) [52.219-1](#), Small Business Program Representations (Basic & Alternate I). This provision applies to solicitations when the contract will be performed in the United States or its outlying areas.

(A) The basic provision applies when the solicitations are issued by other than DoD, NASA, and the Coast Guard.

(B) The provision with its Alternate I applies to solicitations issued by DoD, NASA, or the Coast Guard.

(x) [52.219-2](#), Equal Low Bids. This provision applies to solicitations when contracting by sealed bidding and the contract will be performed in the United States or its outlying areas.

(xi) [52.222-22](#), Previous Contracts and Compliance Reports. This provision applies to solicitations that include the clause at [52.222-26](#), Equal Opportunity.

(xii) [52.222-25](#), Affirmative Action Compliance. This provision applies to solicitations, other than those for construction, when the solicitation includes the clause at [52.222-26](#), Equal Opportunity.

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REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS

(xiii) 52.222-38, Compliance with Veterans' Employment Reporting Requirements. This provision applies to solicitations when it is anticipated the contract award will exceed the simplified acquisition threshold and the contract is not for acquisition of commercial items.

(xiv) 52.223-1, Biobased Product Certification. This provision applies to solicitations that require the delivery or specify the use of USDA-designated items; or include the clause at 52.223-2, Affirmative Procurement of Biobased Products Under Service and Construction Contracts.

(xv) 52.223-4, Recovered Material Certification. This provision applies to solicitations that are for, or specify the use of, EPA-designated items.

(xvi) 52.225-2, Buy American Act Certificate. This provision applies to solicitations containing the clause at 52.225-1.

(xvii) 52.225-4, Buy American Act—Free Trade Agreements—Israeli Trade Act Certificate. (Basic, Alternates I, II, and III.) This provision applies to solicitations containing the clause at 52.225-3.

(A) If the acquisition value is less than \$25,000, the basic provision applies.

(B) If the acquisition value is \$25,000 or more but is less than \$50,000, the provision with its Alternate I applies.

(C) If the acquisition value is \$50,000 or more but is less than \$77,494, the provision with its Alternate II applies.

(D) If the acquisition value is \$77,494 or more but is less than \$100,000, the provision with its Alternate III applies.

(xviii) 52.225-6, Trade Agreements Certificate. This provision applies to solicitations containing the clause at 52.225-5.

(xix) 52.225-20, Prohibition on Conducting Restricted Business Operations in Sudan—Certification. This provision applies to all solicitations.

(xx) 52.225-25, Prohibition on Contracting with Entities Engaging in Sanctioned Activities Relating to Iran—Representation and Certification. This provision applies to all solicitations.

(xxi) 52.226-2, Historically Black College or University and Minority Institution Representation. This provision applies to—

(A) Solicitations for research, studies, supplies, or services of the type normally acquired from higher educational institutions; and

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REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS

(B) For DoD, NASA, and Coast Guard acquisitions, solicitations that contain the clause at [52.219-23](#), Notice of Price Evaluation Adjustment for Small Disadvantaged Business Concerns.

(2) The following certifications are applicable as indicated by the Contracting Officer:

(i) [52.219-22](#), Small Disadvantaged Business Status.

(A) Basic.

(B) Alternate I.

(ii) [52.222-18](#), Certification Regarding Knowledge of Child Labor for Listed End Products.

(iii) [52.222-48](#), Exemption from Application of the Service Contract Act to Contracts for Maintenance, Calibration, or Repair of Certain Equipment Certification.

(iv) [52.222-52](#), Exemption from Application of the Service Contract Act to Contracts for Certain Services—Certification.

(v) [52.223-9](#), with its Alternate I, Estimate of Percentage of Recovered Material Content for EPA—Designated Products (Alternate I only).

(vi) [52.227-6](#), Royalty Information.

(A) Basic.

(B) Alternate I.

(vii) [52.227-15](#), Representation of Limited Rights Data and Restricted Computer Software.

(d) The offeror has completed the annual representations and certifications electronically via the Online Representations and Certifications Application (ORCA) website accessed through <https://www.acquisition.gov>. After reviewing the ORCA database information, the offeror verifies by submission of the offer that the representations and certifications currently posted electronically that apply to this solicitation as indicated in paragraph (c) of this provision have been entered or updated within the last 12 months, are current, accurate, complete, and applicable to this solicitation (including the business size standard applicable to the NAICS code referenced for this solicitation), as of the date of this offer and are incorporated in this offer by reference (see FAR [4.1201](#)); except for the changes identified below [*offeror to insert changes, identifying change by clause number, title, date*]. These amended representation(s) and/or certification(s) are also incorporated in this offer and are current, accurate, and complete as of the date of this offer.

FAR Clause #	Title	Date	Change
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REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS

Any changes provided by the offeror are applicable to this solicitation only, and do not result in an update to the representations and certifications posted on ORCA.

(End of Provision)

K.2 PROHIBITION ON CONTRACTING WITH ENTITIES ENGAGING IN SANCTIONED ACTIVITIES RELATING TO IRAN—REPRESENTATION AND CERTIFICATION (52.225-25) (NOV 2011)

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

Person--

(1) Means--

(i) A natural person;

(ii) A corporation, business association, partnership, society, trust, financial institution, insurer, underwriter, guarantor, and any other business organization, any other nongovernmental entity, organization, or group, and any governmental entity operating as a business enterprise; and

(iii) Any successor to any entity described in paragraph (1)(ii) of this definition; and

(2) Does not include a government or governmental entity that is not operating as a business enterprise.

Sensitive technology--

(1) Means hardware, software, telecommunications equipment, or any other technology that is to be used specifically--

(i) To restrict the free flow of unbiased information in Iran; or

(ii) To disrupt, monitor, or otherwise restrict speech of the people of Iran; and

(2) Does not include information or informational materials the export of which the President does not have the authority to regulate or prohibit pursuant to section 203(b)(3) of the International Emergency Economic Powers Act (50 U.S.C. 1702(b)(3)).

(b) The offeror shall email questions concerning sensitive technology to the Department of State at CISADA106@state.gov.

(c) Except as provided in paragraph (d) of this provision or if a waiver has been granted in

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accordance with 25.703-4, by submission of its offer, the offeror--

(1) Represents, to the best of its knowledge and belief, that the offeror does not export any sensitive technology to the government of Iran or any entities or individuals owned or controlled by, or acting on behalf or at the direction of, the government of Iran; and

(2) Certifies that the offeror, or any person owned or controlled by the offeror, does not engage in any activities for which sanctions may be imposed under section 5 of the Iran Sanctions Act. These sanctioned activities are in the areas of development of the petroleum resources of Iran, production of refined petroleum products in Iran, sale and provision of refined petroleum products to Iran, and contributing to Iran's ability to acquire or develop certain weapons or technologies.

(d) Exception for trade agreements. The representation requirement of paragraph (c)(1) and the certification requirement of paragraph (c)(2) of this provision do not apply if--

(1) This solicitation includes a trade agreements notice or certification (e.g., 52.225-4, 52.225-6, 52.225-12, 52.225-24, or comparable agency provision); and

(2) The offeror has certified that all the offered products to be supplied are designated country end products or designated country construction material.

(End of Provision)

K.3 REPRESENTATION BY OFFERORS THAT THEY ARE NOT THE ASSOCIATION of COMMUNITY ORGANIZATIONS for REFORM NOW (ACORN) or a SUBSIDIARY of ACORN (1852.209-73) (DEVIATION) (FEB 2012)

(a) In accordance with section 534 of The Consolidated and Further Continuing Appropriation Act of 2012 (Pub. L.112-55) none of the funds made available by the Act may be distributed to the Association of Community Organizations for Reform Now (ACORN) or its subsidiaries.

(b) The offeror represents, by submission of its offer, that it is not the Association of Community Organizations for Reform Now (ACORN) or a subsidiary thereof.

(End of Provision)

K.4 REPRESENTATION BY CORPORATIONS REGARDING AN UNPAID DELINQUENT TAX LIABILITY OR A FELONY CONVICTION UNDER ANY FEDERAL LAW (1852.209-75) (DEVIATION) (FEB 2012)

(a) In accordance with sections 544 and 543 of The Consolidated and Further Continuing Appropriation Act of 2012 (Pub. L.112-55), none of the funds made available by that Act may be used to enter into a contract with any corporation that-

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(1) Has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability, where the awarding agency is aware of the unpaid tax liability, unless the agency has considered suspension or debarment of the corporation and made a determination that this action is not necessary to protect the interests of the Government; or

(2) Was convicted (or had an officer or agent of such corporation acting on behalf of the corporation convicted) of a felony criminal violation under any Federal law within the preceding 24 months, where the awarding agency is aware of the conviction, unless the agency has considered suspension or debarment of the corporation and made a determination that this action is not necessary to protect the interests of the Government.

(b) The offeror represents that –

(1) It is is not a corporation that has had any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability; and

(2) It is is not a corporation that was convicted, or had an officer or agent acting on behalf of the corporation convicted, of a felony criminal violation under a Federal law within the preceding 24 months.

(End of Provision)

**K.5 RESTRICTION ON FUNDING ACTIVITY WITH CHINA--REPRESENTATION
(1852.225-72) (FEB 2012)**

(a) Definition - "China" or "Chinese-owned" means the People's Republic of China, any company owned by the People's Republic of China or any company incorporated under the laws of the People's Republic of China.

(b) Public Laws 112-10, Section 1340(a) and 112-55, Section 536, restrict NASA from contracting to participate, collaborate, or coordinate bilaterally in any way with China or a Chinese-owned company with funds appropriated on or after April 25, 2011. Contracts for commercial and non-developmental items are excepted from the prohibition as they constitute purchase of goods or services that would not involve participation, collaboration, or coordination between the parties.

(c) Representation. By submission of its offer, the offeror represents that the offeror is not China or a Chinese-owned company.

(End of Provision)

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L.1 SECTION L PROVISIONS INCORPORATED BY REFERENCE

- (52.204-6) DATA UNIVERSAL NUMBERING SYSTEM (DUNS)
NUMBER (APR 2008)
(52.215-1) INSTRUCTIONS TO OFFERORS--COMPETITIVE
ACQUISITION (JAN 2004)

(End of By Reference Section)

L.2 PROPOSAL MARKING AND DELIVERY

(Offeror: You MUST comply with these instructions to ensure that the designated receiving office can identify, date and time mark, secure, and deliver your proposal to the Contracting Officer.)

1. External Marking of Proposal Package(s)

All proposal packages must be closed and sealed.

The proposal package must include the offeror's name and return mailing address.

The required mailing address and external marking for proposals is as follows:

"Goddard Space Flight Center
Greenbelt, MD 20771
Building 16W—Shipping and Receiving Dock
Solicitation Number: NNG12441405R
Attn: Eboni Luck
Building 22, Room 204
PROPOSAL--DELIVER UNOPENED"

Suggested additional marking if delivery is made by a commercial delivery service:

"COMMERCIAL DELIVERY PERSONNEL: THIS PROPOSAL MUST BE DELIVERED TO THE DOCK MASTER, BUILDING 16W SHIPPING AND RECEIVING DOCK, NO LATER THAN (OFFEROR—ENTER DATE AND TIME)."

2. Designated Receiving Office

The designated receiving office for proposals is the Shipping and Receiving Dock, Building 16W, Goddard Space Flight Center, which must be accessed from Hubble Road off of Soil Conservation Road, north from Greenbelt Road. Proposals must be received

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INSTRUCTIONS, CONDITIONS AND NOTICES TO OFFERORS

at the designated receiving office **no later than the date and time stated on the solicitation face page.**

The Building 16W Shipping and Receiving dock is open from 7:30AM to 3:30PM, Monday through Friday, except Government holidays. Contractor personnel conduct the GSFC receiving function, which includes mailroom operations. Proposals must be marked with the date and time of receipt, subjected to security screening, secured, and delivered unopened to the Contracting Officer.

There is no public access to the Building 16W Shipping and Receiving Dock. GSFC passes are required for access to the receiving dock.

3. Methods of Proposal Delivery

There are three suggested methods of delivery to the designated proposal receiving office:

U.S. Postal Service Express Mail
Commercial Delivery Service
Delivery by company employee or other individual agent

It is highly encouraged for all offerors to use U.S. Postal Service Express Mail or Commercial Delivery Services.

If proposals are going to be delivered by a company employee or other individual agent that does not already have badged access to NASA/GSFC, the offeror **MUST** comply with the following instructions and allow sufficient time (potentially one hour or more) for security processing through the North Gate on Hubble Road:

- a. Vehicle must use the Truck Inspection lane (far right lane).
- b. Driver (and any passenger(s)) must be a U.S. Citizen (no exceptions).
- c. Driver shall state that they are delivering a proposal and provide the specific Solicitation Number. Driver must show a copy of the solicitation cover page (or appropriate solicitation instructions or amendment), which includes the solicitation number and proposal due date. The delivery date should be within 1 week of the proposal due date. The solicitation number shall match the solicitation number on the properly marked proposal packages (see section 1 of this provision).
- d. Driver (and any passenger(s)) must provide a valid Driver's License to the Security Officer for identification and recording purposes.

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- e. Vehicle must undergo a GSFC Security vehicle inspection.
- f. Driver will be provided with a pass authorizing them to proceed directly to the Shipping and Receiving Dock, Building 16W, ONLY.
- g. After delivering the proposal, the vehicle must immediately exit GSFC back through the North Gate.
- h. If the Solicitation documentation is not provided, the proposal packages are not properly marked, or the driver/vehicle does not pass security procedures, the driver may not be granted access through the North Gate and will be instructed to go the GSFC Main Gate on Greenbelt Road for security processing. If this happens, the driver should contact the Contracting Officer named in this solicitation for further assistance. Note, any delays associated with this process will not result in the Government's acceptance of a late proposal, which is why the use of the U.S. Postal Service or Commercial Delivery Services are highly encouraged.

Regardless of the method of delivery chosen, the offeror is responsible for delivery of the proposal to the designated receiving office no later than the date and time stated on the face page of the solicitation.

(End of Provision)

L.3 COMMUNICATIONS REGARDING THIS SOLICITATION

Any questions or comments regarding this solicitation shall cite the solicitation number and be directed to the following Government representative:

Name: Eboni Luck

Phone: 301-286-8509
(collect calls not accepted)

FAX: 301-286-1773

E-Mail: Eboni.Luck@nasa.gov

*Address: Goddard Space Flight Center
Greenbelt, MD 20771
Attention: Eboni Luck, Mail Code 201.8*

*(Note: Must be complete, including Mail Code, on all transmittals.)

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Oral questions will not be answered due to the possibility of misunderstanding or misinterpretation.

(b) Questions or comments should be submitted as soon as possible to allow for analysis and dissemination of responses in advance of the proposal due date. Late questions or comments are not guaranteed a response prior to the proposal due date.

(c) Questions or comments shall not be directed to the technical activity personnel.

(End of Provision)

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

The Government contemplates award of a **FIRM FIXED PRICE** contract resulting from this solicitation.

(End of Provision)

L.5 SERVICE OF PROTEST (52.233-2) (SEP 2006)

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the Government Accountability Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from Dock Master

Goddard Space Flight Center
Greenbelt, MD 20771
Bldg 16W - Shipping and Receiving Dock

Prominently mark the envelope or package as follows:

Protest: RFP – NNG12441405R
Attn: Eboni Luck
GSFC Mail Code 210.8
Contracting Officer Phone No. (301) 286-8509

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

(End of Provision)

L.6 PROTESTS TO NASA (1852.233-70) (OCT 2002)

Potential bidders or offerors may submit a protest under 48 CFR Part 33 (FAR Part 33)

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INSTRUCTIONS, CONDITIONS AND NOTICES TO OFFERORS

directly to the Contracting Officer. As an alternative to the Contracting Officer's consideration of a protest, a potential bidder or offeror may submit the protest to the Assistant Administrator for Procurement, who will serve as or designate the official responsible for conducting an independent review. Protests requesting an independent review shall be addressed to Assistant Administrator for Procurement, NASA Code H, Washington, DC 20546-0001.

(End of Provision)

L.7 SOLICITATION PROVISIONS INCORPORATED BY REFERENCE (52.252-1) (FEB 1998)

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

Federal Acquisition Regulation (FAR) provisions:
<http://www.arnet.gov/far/>

NASA FAR Supplement (NFS) provisions:

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

(End of Provision)

L.8 PROPOSAL PREPARATIONS –GENERAL INSTRUCTIONS

It is NASA's intent, by providing the instructions set forth below, to solicit information that will demonstrate the offeror's competence to successfully complete the requirements specified in the Attachment A, Statement of Work. Generally, the proposal should:

- Demonstrate understanding of the overall and specific requirements of the proposed contract.
- Convey the company's capabilities for transforming understanding into accomplishment.
- Present in detail, the plans and methods for so doing.

In the event that other organizations are proposed as being involved in conducting this work, their relationships during the effort shall be explained and their proposed

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contributions shall be identified and integrated into each part of the proposal, as appropriate.

(a) PROPOSAL FORMAT AND ORGANIZATION

(1) Offerors shall submit proposals in four volumes as specified below:

<u>Volume</u>	<u>Title</u>	<u>Copies</u>
I	Offer Volume	Original Plus 3 Hard Copies and Two Electronic Copies
II	Mission Suitability Volume	Original Plus 3 Hard Copies and Two Electronic Copies
III	Price Volume	Original Plus 3 Hard Copies and Two Electronic Copies
IV	Past Performance Volume	Original Plus 3 Hard Copies and Two Electronic Copies

(2) All pages of Volumes I, II, III, and IV shall be numbered and identified with the offeror's name, RFP number and date. Subsequent revisions, if requested, shall be similarly identified to show revision number and date. A table of contents shall be provided with figures and tables listed separately.

(3) Two electronic copies of the offeror's proposal, designating one as "back-up," shall be submitted (in addition to the hardcopies specified above) in Microsoft Word and Excel for Windows. Price proposal charts shall use Microsoft Excel for Windows. Electronic files of Volumes I, II, III, and IV shall be on virus free CD-ROM (CD-R format) discs with an external label indicating: (1) the name of the offeror, (2) the RFP number, (3) the format and software versions used, (4) a list of the files contained on the disk and (5) date of the information. In the event of any inconsistency between data provided on electronic media and hard copies, the hard copy data will be considered to be correct.

(4) The format for each proposal volume shall parallel, to the greatest extent possible, the format of the evaluation factors and subfactors contained in Section M of this solicitation. The proposal content shall provide a basis for evaluation against the requirements of the solicitation. Each volume of the proposal shall specify the relevant evaluation criteria being addressed, if appropriate. The proposal shall include a matrix showing where in the proposal the technical requirements of the SOW of this RFP are satisfied (i.e. SOW elements versus offeror's proposal page numbers). It is intended that this be a simple matrix that should in no way inhibit an innovative approach or burden the

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offeror. This proposal matrix is excluded from the page limitations contained in paragraph (b)(1) below.

(5) Information shall be precise, factual, detailed and complete. Offerors shall not assume that the evaluation team is aware of company abilities, capabilities, plans, facilities, organization or any other pertinent fact that is important to accomplishment of the work as specified in the SOW. The evaluation will be based primarily on the information presented in the written proposal. The proposal shall specifically address each listed evaluation factor and subfactor.

(b) PROPOSAL CONTENT AND PAGE LIMITATIONS

(1) The following table contains the page limitations for each portion of the proposal submitted in response to this solicitation. Additional instructions for each component of the proposal are located in the contract provision noted under the Reference heading.

Proposal Component	Volume	Reference	Page Limitations
Offer Volume (Standard Form (SF)-33 and Sections B-J of Model Contract including Representations and Certifications)	I	L.9	None
Mission Suitability Volume	II	L.10	15 Pages
Price Volume	III	L.12	None
Past Performance Volume	IV	L.11	None

(2) A page is defined as one side of a sheet, 8-1/2" x 11", with at least one inch margins on all sides, using not smaller than 12 point type Times New Roman font. Line spacing or the amount of vertical space between lines of text shall not be less than single line (Microsoft Word's default line spacing). Character spacing shall be "Normal", not "Expanded" or "Condensed." The margins may contain headers and footers, but shall not contain any proposal content to be evaluated. Foldouts count as an equivalent number of 8-1/2" x 11" pages. The metric standard format most closely approximating the described standard 8-1/2" x 11" size may also be used.

Volumes I, II, III, and IV shall be submitted in separate ringed (or similarly bound) binders. Diagrams, tables, artwork, and photographs may be reduced and, if necessary, run landscape or folded to eliminate oversize pages. Text in Diagrams, schedules, charts, tables, artwork, and photographs shall be no smaller than 10 point. Diagrams, tables, artwork, and photographs shall not be used to circumvent the text size limitations of the proposal.

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(3) Title pages, tabs, and tables of contents are excluded from the page counts specified in paragraph (1) of this provision (as well as other documents specified in table (b)(1) above). In addition, the Price volume of your proposal is not page limited. However, this volume is to be strictly limited to cost and price information. Information that can be construed as belonging in one of the other volumes of the proposal will be so construed and counted against that volume's page limitation.

(4) The Government intends to evaluate proposals and award contract(s) without discussions with offerors (except clarifications as described in FAR 15.306(a)). Therefore, the offeror's initial proposal should contain the offeror's best terms from a cost or price and technical standpoint. The Government reserves the right to conduct discussions if the Contracting Officer later determines them to be necessary. If discussions are held and final proposal revisions are requested, the Government will specify separate page limitations in its request for that submission.

(5) Pages submitted in excess of the limitations specified in this provision will not be evaluated by the Government and will be returned to the offeror in accordance with NFS 1815.204-70(b).

(End of Provision)

L.9 OFFER VOLUME

This must be a separate volume.

(a) STANDARD FORM (SF) 33, OFFEROR FILL INS AND SECTION K

Blocks 12 through 18 of the SF 33 and the indicated Offeror required fill-ins in Sections B-K must be completed. The signed SF33 and the pages with the required fill-ins must be submitted. Annual representations and certifications shall be completed electronically in accordance with provision K.1, Annual Representations and Certifications (52.204-8). The balance of the solicitation need not be returned unless the Offeror has made changes to other pages that will constitute part of the contract. Any such changes must be separately identified in the Summary of Exceptions. All SF 33s require original signatures.

(1) It is requested that Offerors indicate, in Block 12 of the SF 33, a proposal validity period of 120 days. However, in accordance with paragraph (d) of FAR provision 52.215-1, "Instructions to Offerors--Competitive Acquisitions," a different validity period may be proposed by the Offeror.

(2) Provide the names and phone numbers of persons to be contacted for clarification of questions of a technical nature and business nature. Identify any consultants used in writing this proposal (if any) and the extent to which their services will be available in the

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subsequent performance of this effort.

The contract schedule refers to TBD and TBP. They are defined as follows:

TBD = TO BE DETERMINED BY THE GOVERNMENT

TBP = TO BE PROPOSED BY THE CONTRACTOR

(b) SUMMARY OF EXCEPTIONS

Include a statement of acceptance of the anticipated contract provisions and proposed contract schedule, or list all specific exceptions to the terms, conditions, and requirements of Sections A through J of this solicitation, to the Representations and Certifications (Section K) or to the information requested in Section L. Include the reason for the exception, or refer to where the reason is addressed in the proposal. This list must include all exceptions, both "business" and "technical".

Include any new terms, conditions or clauses proposed by the Offeror which are of benefit to the Government. Discuss the benefit to the Government in Volume I, II, III, or IV as appropriate.

Offerors are cautioned that exceptions or new terms, conditions, or clauses may result in a determination of proposal unacceptability (NFS 1815.305-70), may preclude award to an Offeror if award is made without discussions, or may otherwise affect an Offeror's competitive standing.

(c) ADDITIONAL INFORMATION TO BE FURNISHED

(1) Contract Administration

Furnish the information listed below:

a. Cognizant Government audit agency with mailing address, email address, telephone number, and fax number.

b. Cognizant Government inspection agency with mailing address, email address, telephone number, and fax number.

c. Cognizant Government Administrative Contracting Officer by name with mailing address, email address, telephone number, and fax number.

(2) Responsibility Information

Provide information addressing all of the elements under FAR 9.104 to demonstrate

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INSTRUCTIONS, CONDITIONS AND NOTICES TO OFFERORS

responsibility (address the elements under this section that are not addressed in another proposal volume).

(3) Taxpayer Identification Number

Prime offerors shall provide their Taxpayer Identification Number (TIN) (the number required by the Internal Revenue Service (IRS) to be used by the offeror in reporting income tax and other returns).

(4) Subcontractor Listing

The Offeror shall provide a summary listing (by name and address) of all subcontractors (regardless of dollar value) that have been identified throughout the Offeror's proposal and the subcontract value associated with each entity.

(5) Government Property

Section L of this solicitation contains NASA FAR Supplement provisions 1852.245-80, "Government Property Management Information" and 1852.245-81, "List of Available Government Property." The first provision requires the submittal of certain information regarding the Offeror's Government property management procedures. The second provision requires the Offeror's to indicate if they intend to use any Government property that may be offered by this solicitation or if the Offeror requests the use of Government property not identified by this solicitation. This information should be included in this volume.

(End of Provision)

L.10 MISSION SUITABILITY PROPOSAL INSTRUCTIONS

This must be a separate volume.

Contents of Mission Suitability Proposal Instructions

1. General Instructions
2. Mission Suitability Volume Format
3. Mission Suitability Instructions by Subfactor

1. General Instructions

The Mission Suitability Proposal should be specific, detailed, and provide all the information requested by these instructions. The Mission Suitability Proposal must demonstrate that the offeror understands the requirements and has the ability to meet the requirements. General statements such as the "requirements are understood" or "standard

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INSTRUCTIONS, CONDITIONS AND NOTICES TO OFFERORS

procedures will be employed" are not adequate. Also, restatement or paraphrasing of the requirements should be avoided. Information previously submitted, if any, will be not be considered unless it is resubmitted as part of the proposal. It must not be incorporated by reference.

2. Mission Suitability Volume Format

The Mission Suitability Proposal must be divided and presented by each Mission Suitability subfactor as follows:

Subfactor A--Technical Approach
Subfactor B—Management Approach

3. Mission Suitability Instructions by Subfactor

Subfactor A--Technical Approach

The offeror shall provide a technical plan that demonstrates an understanding of the technical requirements of the Statement of Work. The narrative shall clearly demonstrate a thorough understanding of the requirements set forth and the methodologies and experience base that the offerors will draw upon in producing a feasible telescope concept. In particular, the offeror shall demonstrate an understanding of the technical and programmatic (i.e. cost, schedule, management) challenges of designing, developing, fabricating, integrating, and testing a set of telescopes for the SGO mission. The offeror shall provide a description of the approach that will be used for the development of the SGO telescope concept and their methodologies for demonstrating the ability of the concept to meet the requirements, especially the challenging stability and scattered light requirements. The narrative shall include how testing requirements will factor into the development of the telescope. The offeror shall discuss the systems engineering process used in development of the concept. The offeror shall also describe the processes that will be used to produce one or more mission-optimized designs. The offeror shall discuss the proposed use of integrated structural, thermal and optical modeling for the design of the SGO telescope and past experience in performing this type of analysis on telescopes of similar complexity. The offeror shall provide a summary of expected trade studies to be performed in the concept development and provide rationale for how these trade studies can reduce technical risk or cost.

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INSTRUCTIONS, CONDITIONS AND NOTICES TO OFFERORS

Subfactor B—Management Approach

The offeror's proposal shall describe in detail its overall management approach for the proposed activities. The proposal shall describe the organization and management methods that will be utilized in performing work under the contract and shall also describe plans for interfacing with and facilitating communication with the Government's personnel.

(End of Provision)

L.11 PAST PERFORMANCE VOLUME

An Offeror's past performance record indicates the relevant quantitative and qualitative aspects of performing services or delivering products similar in size, content, and complexity to the requirements of this acquisition. The information requested below is anticipated to be sufficient for purposes of the evaluation of past performance.

However, offerors may submit additional information at their discretion if they consider such information necessary to establish a record of relevant past performance. Refer to FAR 15.305(a) (2) (iii).

The Offeror shall provide, at a minimum, the following information in support of its proposal to facilitate the evaluation of your company experience and past performance as a whole and as related to the requirements of the proposed contract.

(a) INFORMATION FROM THE OFFEROR

Offerors shall furnish the information requested below for all of your most recent contracts (completed and ongoing) for similar efforts that developed a conceptual design and implementation approach in complexity that is required for the Telescope Concept Study. Indicate which contracts/subcontracts are most related (i.e. similar in size, scope and complexity) and how they are related to the proposed effort, as well as which contracts/subcontracts were performed by the division of your company (if applicable) that will perform the proposed contract/subcontract.

- Customer's name, mailing address, email address, and telephone number of both the lead contractual and technical personnel most familiar with the Offeror's performance record. (Please verify the telephone numbers provided are current and correct).
- Contract number, type, and total original and present or final contract value.
- Date of contract, place(s) of performance, and delivery dates or period of performance.

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- Brief description of contract work and comparability to the proposed effort with reference to specific comparable SOW elements, where applicable. It is not sufficient to state that it is comparable in magnitude and scope. Rationale must be provided to demonstrate that it is comparable.
- Method of acquisition: competitive or noncompetitive.
- Nature of award: initial or follow-on. If initial, indicate whether award was preceded by a Government, customer, or Offeror financed study.
- Identify and explain major technical problems and how they were overcome. List any major deviations or waivers to technical requirements that were granted by the customer.
- The Offeror shall include a frank discussion of experiences (if any) that resulted in lessons learned and/or new processes that improved performance or had significant positive (or adverse) impact over the life of the contract.
- Identify and explain completion successes and delays, including adherence to program schedules. Provide an assessment of the performance (technical and schedule) on these past programs and support these assessments with metrics such as award or incentive fees earned.
- Cost management history; identify and explain any cost overruns and underruns, and cost incentive history, if applicable (Offerors to provide evidence of evaluation of performance such as Fee Determination Letters, etc.).
- Average number of personnel on the contract per year and percent turnover of personnel per year.
- Recent customer evaluations of past performance including Award Fee Evaluations results, Fee Determination Official letters, Annual Performance Evaluation Forms, etc. (Excluded from the page limitation).

List any contracts terminated (partial or complete) within the past 5 years and basis for termination (convenience or default). Include the contract number, name, address, and telephone number of the terminating officer (please verify telephone numbers). Include contracts that were "descoped" by the customer because of performance or cost problems (Excluded from the page limitation).

- (b) PRIOR CUSTOMER EVALUATIONS (PAST PERFORMANCE QUESTIONNAIRES)

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INSTRUCTIONS, CONDITIONS AND NOTICES TO OFFERORS

The Offeror and any proposed significant subcontractors shall submit the questionnaires provided in **Exhibit A** to each of the above references to establish a record of past performance. The Offeror shall instruct each of its references to return the questionnaire directly to the Government in a sealed envelope. The questionnaire respondent shall be a representative from the technical customer and/or responsible Contracting Officer with direct knowledge of your firm's performance. If possible, the Offeror and any proposed significant subcontractors shall provide questionnaires to customers from NASA contracts, other Government contracts, and commercial contracts. For proposed significant subcontractors, references shall concern only work performed by the significant subcontractor's business entity that will perform the work under this contract, if awarded.

The Offeror is responsible for ensuring that the questionnaire is completed and submitted no later than the closing date of this solicitation designated in Block 9 of the SF 33 to:

Goddard Space Flight Center
Attn: Eboni Luck/Code 210.8
Solicitation No. RFP-NNG12441405R
Building 22, Room 206
Greenbelt, MD 20771

(End of Provision)

L.12 PRICE PROPOSAL INSTRUCTIONS

The offeror shall complete clause B.2, in the attached model contract in their entirety. Failure to properly complete these clauses may result in the Offeror's proposal being deemed non-responsive and removed from further consideration.

(End of Provision)

L.13 PROVISIONS INCORPORATED BY REFERENCE -- SECTION L

Provision(s) in L.1 at the beginning of this Section are incorporated by reference, with the same force and effect as if they were given in full text. Provisions incorporated by reference which require a fill-in by the Government include the text of the affected paragraph(s) only. This does not limit the provision to the affected paragraph(s). The Contractor is responsible for understanding and complying with the entire provision. The full text of the provision is available at the addresses contained in provision 52.252-1, Solicitation Provisions Incorporated by Reference, of this solicitation.

(End of Provision)

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EVALUATION FACTORS FOR AWARD

M.1 SOURCE SELECTION AND EVALUATION FACTORS--GENERAL

1. Source Selection

This competitive negotiated acquisition shall be conducted in accordance with FAR 15.3, "Source Selection", and NASA FAR Supplement (NFS) 1815.3, same subject. The Source Evaluation Board procedures at NFS 1815.370, "NASA formal source selection will not apply.

The attention of offerors is particularly directed to NFS 1815.305, "Proposal evaluation" and to NFS 1815.305-70, "Identification of unacceptable proposals".

A trade-off process, as described at FAR 15.101-1, will be used in making source selection.

2. Evaluation Factors and Subfactors

The evaluation factors are Mission Suitability, Price, and Past Performance. These factors, as described at NFS 1815.304-70, will be used to evaluate each proposal. This Section M provides a further description for each evaluation factor, inclusive of subfactors. Only the Mission Suitability factor is numerically scored.

3. Relative Order of Importance of Evaluation Factors

The Price Factor is significantly less important than the combined importance of the Mission Suitability Factor and the Past Performance Factor. As individual Factors, the Past Performance Factor is less important than the Mission Suitability Factor but more important than the Price Factor.

(End of Text)

M.2 MISSION SUITABILITY FACTOR

The Mission Suitability Proposal must be divided and presented by each Mission Suitability subfactor as follows:

- Subfactor A—Technical Approach
- Subfactor B—Management Approach

1. Mission Suitability Subfactors and Description of Each Subfactor

A. Technical Approach

Description of Factor: The Contractor's proposal will be assessed to determine if the

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EVALUATION FACTORS FOR AWARD

work that has been proposed meets the technical requirements of the Statement of Work (SOW), including a variety of sub-factors related to how the work will be accomplished, as indicated below:

Sub-factors Considered for Evaluation. Each subfactor shall have the weight indicated:

1. **Technical Requirements** – The Contractor will be evaluated on their ability to provide effective and efficient methods to meet the technical requirements and schedules as described in the contract's Statement of Work. This includes a subjective assessment of the quality of ease of manufacturing, inherent risks of the proposed design, and heritage of the proposed design. Also to be considered is the quality and timeliness of technical progress reports and other required deliverables as outlined in the Statement of Work. The contractor must specifically show a clear understanding, as demonstrated in their proposal, of the two most challenging driving requirements as outlined in the SOW and attached requirements document, namely the picometer level stability requirement and the stray light requirement, and show a plan of how to meet them. The contractor must also be able to show the resources to do the mechanical design of the system, including mechanisms, optical mounting, and dimensional stability analysis.
2. **Optical Requirements** - The contractor shall have a detailed understanding of the various components and complexities of lenses and mirrors in telescope design, such as surface finish and roughness, optical figure, thin film coatings, focus, and mid-spatial frequency errors. The contractor must be able to use their understanding of these components to develop an optical prescription with full tolerance analysis including a measure of the scattered light performance of the proposed system.
3. **Manufacturing Capability** – The Contractor will be evaluated on their manufacturing capabilities, with specific emphasis on their facilities, instrumentation, laboratories, experienced personnel, and ability to handle materials and manufacture structures from a wide variety of structural elements such as composites and single crystal silicon. The manufacturing capability must include a demonstration or documentation of the processes necessary to achieve and maintain the fabrication and assembly tolerances necessary to build 10 identical and interchangeable copies of the complete telescope.
4. **Innovation** – Innovative methods, techniques, technologies and/or process improvements will be evaluated for their impact on effectiveness and efficiencies under the contract, such as developing a plan for manufacturing 10 identical telescopes.

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EVALUATION FACTORS FOR AWARD

B. Management Approach

- 1. **Personnel Management** – The Contractor will be evaluated on their ability to provide staffing at appropriate skill levels to provide effective and efficient services. The extent to which the Contractor has applied and retained competent and experienced personnel to assure successful performance.
- 2. **Communications** – Assessment of the Contractor’s ability to maintain good communication within its organization and with the Government. Contractor must have a proven track record that all problems, technical issues and changes were promptly reported to all concerned.
- 3. **Risk Management** –The Contractor will be evaluated on its ability to identify risks; analyze their impact and prioritize them; develop and carry out plans for risk mitigation, acceptance, or other action.

The offeror’s overall technical and management approach will be evaluated for effectiveness, efficiency and thoroughness to determine whether the offeror adequately addresses the requirements and any potential challenges of this effort.

2. Weights and Scoring

In accordance with NFS 1815.304-70(b)(1), the Mission Suitability factor will be weighted and scored on a 1000 point scale.

The weights (points) associated with each Mission Suitability subfactors are as follows:

	<u>Points</u>
Subfactor A--Technical Approach	700
Subfactor B—Management Approach	<u>300</u>
Total	1000

The Mission Suitability subfactors will be evaluated using the adjectival rating, definitions, and percentile ranges at NFS 1815.305(a)(3)(A).

The maximum points available for each subfactor will be multiplied by the assessed percent for each subfactor to derive the score for the particular subfactor. For example, if a subfactor has possible 200 points and receives a percent rating 80, then the score for that subfactor would be 160 points.

3. Evaluation Findings

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EVALUATION FACTORS FOR AWARD

The Government will evaluate proposals by classifying findings as strengths, weaknesses, significant strengths, significant weaknesses, or deficiencies using the following:

Weakness – a flaw in the proposal that increases the risk of unsuccessful contract performance

Significant Weakness – a proposal flaw that appreciably increases the risk of unsuccessful contract performance

Deficiency – a material failure of a proposal to meet a Government requirement or a combination of significant weaknesses in a proposal that increases the risk of unsuccessful contract performance to an unacceptable level

Strength (not in FAR/NFS) – a proposal area that enhances the potential for successful performance or contributes toward exceeding the contract requirements in a manner that provides additional value to the government (this could be associated with a process, technical approach, materials, facilities, etc.).

Significant Strength (not in FAR/NFS) – a proposal area that greatly enhances the potential for successful performance or contributes significantly toward exceeding the contract requirements in a manner that provides additional value to the Government.

M.3 PAST PERFORMANCE EVALUATION FACTOR

For purposes of this provision, “offeror” includes the prime offeror together with any significant subcontractors. Overall ratings will be based on the combined past performance of the prime and all significant subcontractors. The Past Performance factor will evaluate each offeror's record of performing services or delivering products that are similar in size, content, and/or complexity to the requirements of this solicitation. The overall confidence rating assigned to Past Performance (see below) will reflect a subjective evaluation of the information contained in the oral presentation, if applicable; written narrative; past performance evaluation input provided through customer questionnaires; and other references, if any, that the Government may contact for additional past performance information. Offerors without a record of relevant past performance, or for whom information on past performance is not available, shall receive a neutral rating in accordance with FAR 15.305(a)(2)(iv).

As part of the relevant past performance evaluation, the Government may attribute the experience or past performance of a parent or affiliated company (including a parent or affiliated company that is being otherwise proposed as a subcontractor on this effort) to an Offeror where the firm's proposal demonstrates that the resources of the parent or affiliate will affect the performance of the Offeror. The Government will take into consideration whether the resources of the parent or affiliated company (its workforce,

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EVALUATION FACTORS FOR AWARD

management, facilities or other resources) will be provided or relied upon for contract performance such that the parent or affiliate will have meaningful involvement in contract performance.

Past Performance Ratings – The level of confidence ratings set forth below will be used to evaluate the Past Performance factor for each offeror.

Each of the adjective ratings below has a "performance" component and a "relevance" component. The following adjectival rating guidelines will be used when assessing both components. In assessing relevance, the Government will consider the degree of similarity in size, content, and complexity to the requirements in this solicitation, as well as how current is the past performance.

In assessing performance, the Government will make an assessment of the offeror's overall performance record. The Government will evaluate the offeror's past performance record for meeting technical; schedule; cost; management; occupational health; safety; security; mission success; subcontracting plan goals and small disadvantaged business participation targets, if applicable; and other contract requirements. Isolated or infrequent problems that were not severe or persistent, and for which the offeror took immediate and appropriate corrective action, may not reduce the offeror's rating. On the other hand, ratings will be reduced when problems were within the contractor's control and were significant, persistent, or frequent, or when there is a pattern of problems or a negative trend of performance.

Very High Level of Confidence

The Offeror's relevant past performance is of exceptional merit and is very highly pertinent to this acquisition; indicating exemplary performance in a timely, efficient, and economical manner; very minor (if any) problems with no adverse effect on overall performance. Based on the Offeror's performance record, there is a very high level of confidence that the Offeror will successfully perform the required effort.

High Level of Confidence

The Offeror's relevant past performance is highly pertinent to this acquisition; demonstrating very effective performance that would be fully responsive to contract requirements with contract requirements accomplished in a timely, efficient, and economical manner for the most part with only minor problems with little identifiable effect on overall performance. Based on the Offeror's performance record, there is a high level of confidence that the Offeror will successfully perform the required effort.

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EVALUATION FACTORS FOR AWARD

Moderate Level of Confidence

The Offeror's relevant past performance is pertinent to this acquisition, and it demonstrates effective performance; fully responsive to contract requirements; reportable problems, but with little identifiable effect on overall performance. Based on the Offeror's performance record, there is a moderate level of confidence that the Offeror will successfully perform the required effort.

Low Level of Confidence

The Offeror's relevant past performance is at least somewhat pertinent to this acquisition, and it meets or slightly exceeds minimum acceptable standards; adequate results; reportable problems with identifiable, but not substantial, effects on overall performance. Based on the Offeror's performance record, there is a low level of confidence that the Offeror will successfully perform the required effort. Changes to the Offeror's existing processes may be necessary in order to achieve contract requirements.

Very Low Level of Confidence

The Offeror's relevant past performance does not meet minimum acceptable standards in one or more areas; remedial action required in one or more areas; problems in one or more areas which adversely affect overall performance. Based on the Offeror's performance record, there is a very low level of confidence that the Offeror will successfully perform the required effort.

Neutral

In the case of an Offeror without a record of relevant past performance or for whom information on past performance is not available, the Offeror may not be evaluated favorably or unfavorably on past performance [see FAR 15.305(a) (2) (ii) and (iv)].

M.4 PRICE EVALUATION FACTOR

This is a firm fixed price acquisition.

A price analysis will be conducted in accordance with FAR 15.305(a) (1). Price analysis is described at FAR 15.404-1(b). This analysis is done to ensure that a "fair and reasonable" price is paid by the Government. However, the analysis is not intended to be protective of the offeror.

(End of Provision)

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EVALUATION FACTORS FOR AWARD

M.5 OFFER/NO OFFER RESPONSE SHEET

Compliance is requested, but not required.

This page may be used to indicate whether your company intends to submit an offer in response to this solicitation. You may also indicate your intent by E-Mail or FAX. The E-Mail address is Eboni.Luck@nasa.gov The FAX number is (301) 286-1773. If mailed, return the completed page to the individual and address on the face page of this solicitation.

The _____ (name of firm) (/ / intends) (/ / does not intend) to submit an offer in response to **RFP- NNG12441405R**.

(End of Provision)

PAST PERFORMANCE QUESTIONNAIRE INSTRUCTIONS
(Updated September, 2010)

Sections I through III provide for contract-related descriptive information and identification of the evaluator.

Section IV lists the major work elements within our Statement of Work (SOW). Please provide your assessment of the "relevant experience" and "performance" associated with our SOW evidenced within the contract for which you are a reference. Your assessment of the relevancy should reflect the fact that the principal purpose of our contract is the Space-based Gravitational-wave Observatory Telescope Opportunities.

"**Significant Experience**" means that a full range of services was routinely performed by the contractor under the associated SOW element. "**Moderate Experience**" describes a contractor who has experience in several aspects of a work element even though the experience may not have been on a continuous basis or directly related to the purpose of our contract. "**Minimal Experience/Did not Perform**" means that, although at least some aspects of the work may have been performed, such performance was limited in scope or frequency, or the work element was not performed under the contract.

Section V evaluates the contractor's technical, schedule, and cost performance and management. (Additional pages may be used for comments if desired). It is very important to keep in mind that only performance in the **past five (5) years** is relevant. If you cannot answer any questions, please circle "N/R" for Not Rated.

The following definitions are offered for your use in assigning a performance rating for each of the factors in Sections IV and V:

Very High (VH)	The Offeror's relevant past performance is of exceptional merit ; indicating exemplary performance in a timely, efficient, and economical manner; very minor (if any) problems with no adverse effect on overall performance.
High (H)	The Offeror's relevant past performance demonstrates very effective performance that would be fully responsive to contract requirements with contract requirements accomplished in a timely, efficient, and economical manner for the most part with only minor problems with little identifiable effect on overall performance.
Moderate (M)	The Offeror's relevant past performance t demonstrates effective performance; fully responsive to contract requirements; reportable problems, but with little identifiable effect on overall performance.
Low (L)	The Offeror's relevant past performance meets or slightly exceeds minimum acceptable standards; adequate results; reportable problems with identifiable, but not substantial, effects on overall performance.
Very Low (VL)	The Offeror's relevant past performance does not meet minimum acceptable standards in one or more areas; remedial action required in one or more areas; problems in one or more areas which, adversely affect overall performance.
N/R	Not Rated

Section VI provides for evaluation of the contractor's management of cost and award/incentive fee history.

RETURN THIS QUESTIONNAIRE TO
BY **SEPTEMBER 5, 2012**.

NASA Goddard Space Flight Center
Attn: Eboni Luck, Code 210.S
Greenbelt, MD 20771
Phone: 301-286-8210 FAX: 301-286-1766
e-mail: Eboni.Luck@nasa.gov

PAST PERFORMANCE QUESTIONNAIRE

I. Contract Information

- A. Name of Company/Division Being Evaluated: _____
- B. Address: _____
- C. Contractor Cage Code and/or DUNS number _____
- D. Contract Number: _____
- E. Contract Type: _____
- F. Period of Performance (including options): From: _____ To: _____
- G. Total Contract Value: _____
- H. Award Information: Competitive: Yes ___ No ___
Basis of Selection: Technical ___ Cost/Price ___
Other (specify) _____

II. Description of Contract

Briefly describe the services provided under this contract:

During the contract performance being evaluated, this firm was the:

Prime Contractor ___ Significant Subcontractor ___ Team Member ___
Other (describe) _____

Does a corporate or business relationship exist between the firm being evaluated and your organization?

Yes ___ No ___. If yes, please describe: _____

III. Evaluator Information

Name: _____
Title: _____
Agency/Company: _____
Address: _____
Phone: _____ Date Questionnaire Completed: _____
Role in Program/Contract: _____
Length of Involvement in this Program/ Contract: _____

PAST PERFORMANCE QUESTIONNAIRE

IV. SOW Survey: Relevant Experience and Performance Ratings: Please check the appropriate blocks for both Relevance (Significant, Moderate, Minimal/Did Not Perform) and the Performance (VH, H, M, L, VL, N/R) for each SOW Element Listed below (see page 1 definitions and instructions).

SOW ELEMENT	SIGNIFICANT	MODERATE	MINIMAL/ DID NOT PERFORM	PERFORMANCE RATING (Please circle)					
Planning / Coordinating Workflow				VH	H	M	L	VL	N/R
Communicating plans to the customer				VH	H	M	L	VL	N/R
Meeting delivery dates				VH	H	M	L	VL	N/R
Providing build documentation with flight hardware				VH	H	M	L	VL	N/R
Meeting verification requirements				VH	H	M	L	VL	N/R
Meeting mission assurance requirements				VH	H	M	L	VL	N/R
Showing clear understanding of the driving requirements				VH	H	M	L	VL	N/R
Demonstrating Resources to do Mechanical Design of System				VH	H	M	L	VL	N/R
Demonstrating necessary manufacturing facilities and laboratories				VH	H	M	L	VL	N/R
Demonstrating understanding of the various components and complexities of lenses and mirrors in telescope design				VH	H	M	L	VL	N/R
				VH	H	M	L	VL	N/R
				VH	H	M	L	VL	N/R
				VH	H	M	L	VL	N/R
				VH	H	M	L	VL	N/R
				VH	H	M	L	VL	N/R
				VH	H	M	L	VL	N/R
				VH	H	M	L	VL	N/R
				VH	H	M	L	VL	N/R
				VH	H	M	L	VL	N/R

PAST PERFORMANCE QUESTIONNAIRE

V. General Performance Survey

NO	PERFORMANCE QUESTIONS	PERFORMANCE RATING (Please Circle)					
		VH	H	M	L	VL	N/R
1.	Overall performance in planning and controlling the program	VH	H	M	L	VL	N/R
2.	Quality of services and support provided	VH	H	M	L	VL	N/R
3.	Compliance with technical requirements and performance standards	VH	H	M	L	VL	N/R
4.	Content, accuracy, quality, and timeliness of technical reports and deliverables	VH	H	M	L	VL	N/R
5.	Ability to design and/or deliver a product that meets or exceeds performance requirements within costs and schedule	VH	H	M	L	VL	N/R
6.	Timely identification and mitigation of risks	VH	H	M	L	VL	N/R
7.	Contractor's ability to identify and correct performance deficiencies in a timely manner	VH	H	M	L	VL	N/R
8.	Compliance with technical process and control requirements (quality assurance, configuration management, etc.)	VH	H	M	L	VL	N/R
9.	Ability to recruit and retain highly skilled personnel, including ability to fill key vacancies in a timely manner.	VH	H	M	L	VL	N/R
10.	Ability to handle fluctuating workloads	VH	H	M	L	VL	N/R
11.	Adherence to safety and health procedures	VH	H	M	L	VL	N/R
12.	Overall Safety and Health injury/illness record	VH	H	M	L	VL	N/R
13.	Demonstrated understanding and compliance with mission safety requirements	VH	H	M	L	VL	N/R
14.	Communicating and interfacing with Government	VH	H	M	L	VL	N/R
15.	Ability to effectively manage subcontractor performance	VH	H	M	L	VL	N/R
16.	Ability to build effective working relationships with associate contractors, subcontractors and the Government in a team environment.	VH	H	M	L	VL	N/R
17.	Timeliness, quality, and accuracy of schedule reporting	VH	H	M	L	VL	N/R
18.	Adequacy of Contractor's system(s) for processing task orders and/or changes.	VH	H	M	L	VL	N/R
19.	Overall responsiveness to Government requests	VH	H	M	L	VL	N/R
20.	Ability to establish realistic cost estimates	VH	H	M	L	VL	N/R
21.	Ability to establish realistic schedule estimates	VH	H	M	L	VL	N/R
22.	If performance based, how successful was the Contractor in meeting the contract metrics?	VH	H	M	L	VL	N/R
23.	Adherence to estimated costs and contract cost targets	VH	H	M	L	VL	N/R
24.	Ability to anticipate, identify and control cost growth.	VH	H	M	L	VL	N/R
25.	Ability to meet Small Business Subcontracting Plan Goals	VH	H	M	L	VL	N/R
26.	Timeliness, quality, and accuracy of Small Business Subcontracting Plan reporting	VH	H	M	L	VL	N/R
27.	Ability to meet Small Disadvantaged Business Participation targets	VH	H	M	L	VL	N/R
28.	Timeliness, quality, and accuracy of financial	VH	H	M	L	VL	N/R

	reporting						
29.	Overall evaluation of cost performance	VH	H	M	L	VL	N/R

PAST PERFORMANCE QUESTIONNAIRE

Section VI:

What is the Contract Value:

	Initial Value	Current Value
Estimated Cost:	\$ _____	\$ _____
Fee:	\$ _____	\$ _____
Total Value:	\$ _____	\$ _____

Briefly describe any change(s) from original contract value:

What are the total contract expenditures to date (cost/fees to date based on invoices, reports, etc)?

What is the **Annual** Contract Value to Date (The current contract expenditures to date divided by the number of years of performance to date)?

Was there a cost overrun? () Yes () No
If yes, please explain:

If this was an award fee contract, what are the individual and/or average ratings of performance by your organization? Please attach any available award fee letters or database entries

Please comment on particularly strong/weak points of Contractor's performance (technical, schedule, and/or cost).

Overall Contract Performance Rating (circle one)

Very High High Moderate Low Very Low

Would you select this Contractor Again? () Yes () No

Please add any other comments you may feel are pertinent.

Rater's Signature

Date

Space-based Gravitational-wave Observatory (SGO)

Code 663

**Telescope Concept Study
Statement of Work (SOW)**

June 29, 2012

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1.0 Introduction

This Statement of Work specifies what is to be performed by the contractor in support of the SGO (Space-based Gravitational-wave Observatory) Telescope Study. This study activity is intended to determine a feasible telescope concept for the preliminary science requirements as outlined in Attachment A, and assess the critical thermal, optical, mechanical and dynamic environments that drive the SGO telescope design. The study will also assess the critical cost, schedule, and technical performance and risk drivers and develop cost and schedule estimates for the design, build and test of a prototype telescope, as well as cost and schedule estimates for the production of ten (10) interchangeable flight telescopes.

2.0 Reference Documents

The following document relating to this study is attached.
Attachment A: SGO Telescope preliminary requirements

3.0 Work to be performed

The contractor shall perform a study that results in at least one feasible telescope concept using the SGO Telescope Requirements Document. The preliminary requirements of the telescope are the responsibility of the SGO Project and are provided to allow the selected vendors to submit an adequate design that meets those requirements.

3.0.1 Scope

- 1) Identify a single existing design that is close to meeting the specifications and identify the optical and mechanical modifications necessary to fully meet the requirements.
- 2) Do the design work necessary, including
 - a. Optical prescription with all first-order properties
 - b. Surface finish, roughness, etc
 - c. Scattered light performance
 - d. Tolerance analysis
- 3) Do the mechanical design necessary, including
 - a. Mass, volume
 - b. Mechanisms
 - c. Optical mounting
 - d. Dimensional stability analysis
 - e. Materials
- 4) Any thermal analysis required
- 5) Develop a test plan for verifying and validating the telescope design
- 6) Develop a plan for manufacturing 10 identical telescopes, including a detailed schedule

3.1 Study Content

At a minimum the contractor shall address and provide information on the following to a degree of accuracy that is commensurate with a prototype design:

3.1.1 Telescope Physical Description

- Provide figures of the on-orbit configuration showing physical layout of the primary components.
- Provide a detailed master equipment list for the proposed concept.

3.1.2 Telescope Design Description

- Provide detailed descriptions of the mechanical structure, thermal control, optical design and any mechanisms used, including an assessment of the heritage and performance history of the mission critical components.
- Provide a summary of the mass properties and electrical resources for the telescope.
- Identify and modify an existing design that can meet requirements summarized below:
 - validate a design against the requirements
 - perform a trade study regarding on- vs. off-axis design
 - advise and modify the design for low cost and manufacturability
 - investigate existing, proven designs
 - Materials choice for both optics and structure: Select Silicon Carbide, single crystal silicon, or other
 - Supply a price and delivery quotation for a prototype
 - Supply a price quotation for 10 interchangeable telescopes

3.1.3 Meetings and Reports

Three meetings shall be supported as part of this SOW, including vendor travel:

- Kickoff meeting at the vendor location within two weeks of award. Two or three GSFC personnel to attend to go over all of the required input to make sure all information is available and all requirements are understood
- Interim progress meeting. Can be virtual (i.e. a telecon) to be held at the midway point to be sure the study is proceeding as expected and to resolve any issues that have come up
- Final report to be held at GSFC at the conclusion of the study.

3.1.4 Systems Engineering

3.1.4.1 Design

- Provide results of trade studies performed in the development of the proposed concept to show that the proposed concept balances technical risk and cost while meeting the general design requirements with adequate margins. Provide analysis of significant break points in cost, schedule, technical performance and risk for the telescope design determined as a result of trade studies performed.
- Provide and substantiate error budgets for all relevant portions of the telescope, including mechanical, optical and thermal.

- Provide mechanical envelopes and tolerances for the telescope.
- Substantiate the verifiability of the telescope design.
- Describe any technology development required to meet the proposed concept and provide an assessment of the current technology readiness levels for the telescope components.
- At the completion of the study, participants are encouraged to identify areas for further investigation to advance the objectives of the telescope design for SGO.
- Modify an existing design that meets the requirements or most closely approaches them.
 - Science field of view is required (+/- 10 micro-rad)
 - Larger field of view of +/- 0.6 deg is desirable: specify max possible
- outputs
 - Prescription
 - Surface figures for each surface
 - Element spacing
 - Lens/mirror composition
 - Performance data
 - End-to-end wavefront
 - Field of view achieved
 - Seidel aberrations
 - Throughput
 - Manufacturability concerns
 - Surface shape
 - Figure tolerance
 - Required rms surface roughness
 - Alignment and/or shop tolerances required to achieve performance and guarantee interchangeability

3.1.4.2 Validation

- Provide validation of the design and performance.

3.1.5 Cost and Schedule

- Provide the cost and schedule for developing and testing the proposed concept, including details of the design, fabrication and test phases. Identify any long lead items and provide a schedule for procurement of those items. Provide a detailed schedule for the manufacture of 10 identical and interchangeable telescopes

4.0 End of Contract Deliverables and Period of Performance

- 1) Complete mechanical, optical, and thermal design
- 2) Test plan
- 3) Manufacturing plan with schedule for 10 telescopes
- 4) ROM with and without testing, and with NRE and RE for fabricating 10 identical telescopes
- 5) Period of performance not to exceed 6 months after contract award, with completion by December 31, 2012 if possible.

Attachment A: Summary of Key Telescope Requirements

Purpose

The purpose of this document is to collect together information relevant to the telescope design for a space-based Gravitational-wave Observatory (SGO) Mission. These missions have very similar requirements, but to be specific the requirements quoted in this document are taken from the ESA-led New Gravitational-wave Observatory (NGO, or eLISA) Mission. The main thrust behind much of the work done to date has focused on the optical design of the telescope, but of course a real implementation must include mechanical and thermal concerns as well. The content thus includes additional information beyond just the bare requirements.

System Context and Role of the Telescope

The basic measurement any SGO is making is a strain in spacetime on the order of 10^{-21} . The strain measurement is made by making an interferometric measurement of the separation between spacecraft that are a large distance apart. Typically this means measuring differential separations of order 10 picometers over baselines of order 10 gigameters.

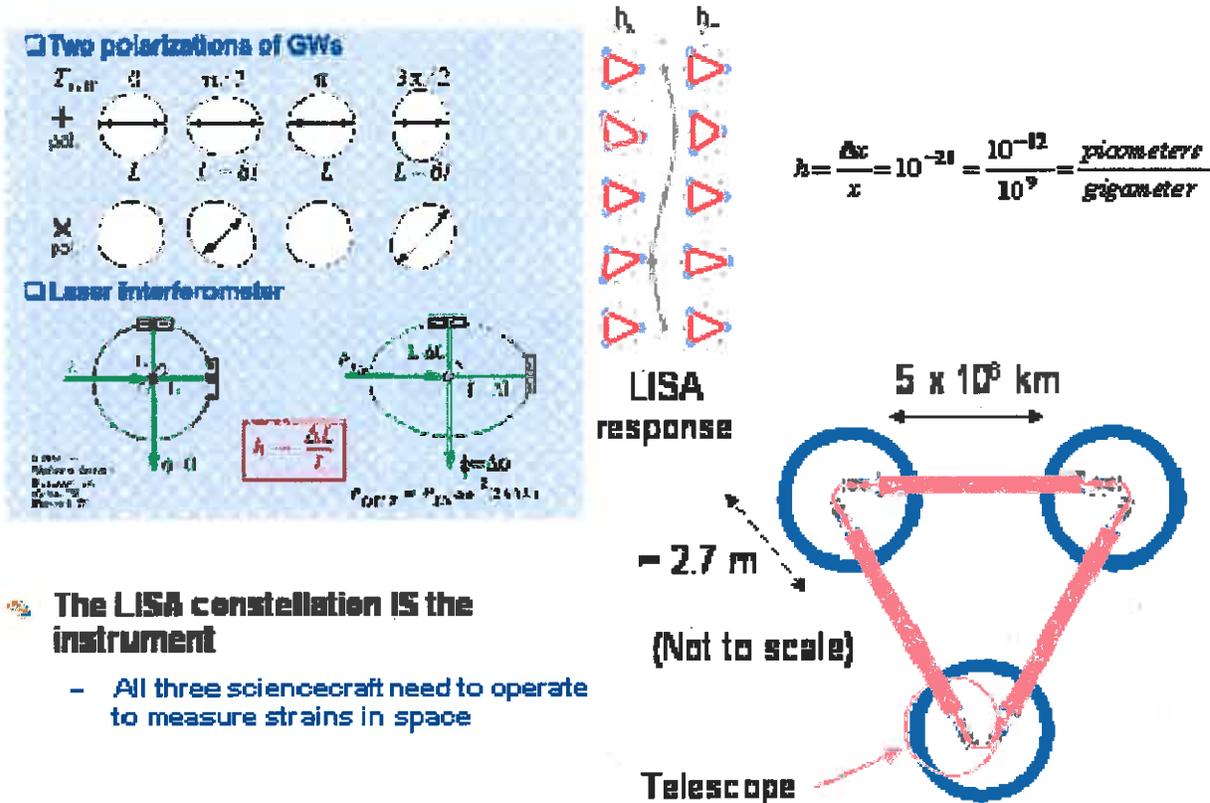


Figure 1: High level view of the LISA gravitational wave measurement.

Figure 1 shows a high level cartoon of how this measurement works. There are two telescopes in each spacecraft, and their main function is to collimate the beam for propagation between spacecraft. This figure is highly approximate, both in scale and in depicting the actual physics of beam propagation. In reality the beam spreads due to diffraction so that the size of the beam at the far spacecraft is approximately 30 km.

The telescope has two basic roles:

- 1) Deliver optical power efficiently to the detector on a far spacecraft
- 2) Maintain dimensional pathlength stability through the telescope to a level consistent with the IMS measurement budget.

For a more complete description of the mission, the measurement, and the spacecraft, please see *Laser Interferometer Space Antenna (LISA) Mission Concept*, LISA-PRJ-RP-001, (<http://lisa.gsfc.nasa.gov/Documentation/LISA-PRJ-RP-0001.pdf>).

Each telescope is part of an overall optical assembly that contains an optical bench and a proof mass, which is part of the gravitational reference sensor (GRS). There are two of these optical assemblies per science-craft, as shown in **Figure 2**.

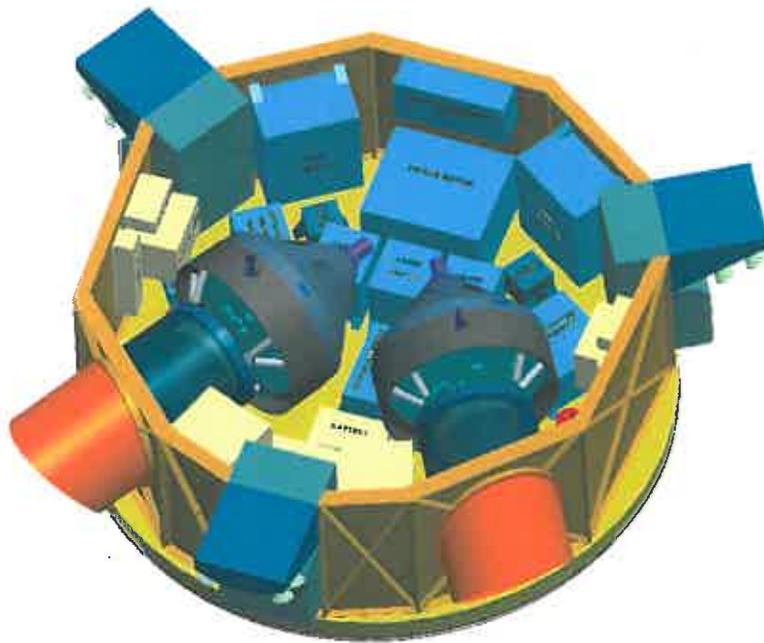


Figure 2: Spacecraft showing telescope placement and optical assembly

The three spacecraft orbit around the sun in the same orbit as the earth, but they are lagging or leading by approximately 20 degrees in orbital phase. The three orbits are independent but phased so that the spacecraft maintain their relative separation as an equilateral triangle in a plane inclined at 60 degrees to the sun. The spacecraft separation is not perfect, but varies slightly over time. **Figure 3** shows how the pointing between science-craft changes. To accommodate these changes the optical assembly is articulated in the plane of the triangle to accommodate the ~ 1.6 degree peak-to-peak variation in pointing. The (instantaneous) field of view of the telescope is specified to accommodate the pointing variation perpendicular to the plane of the triangle.

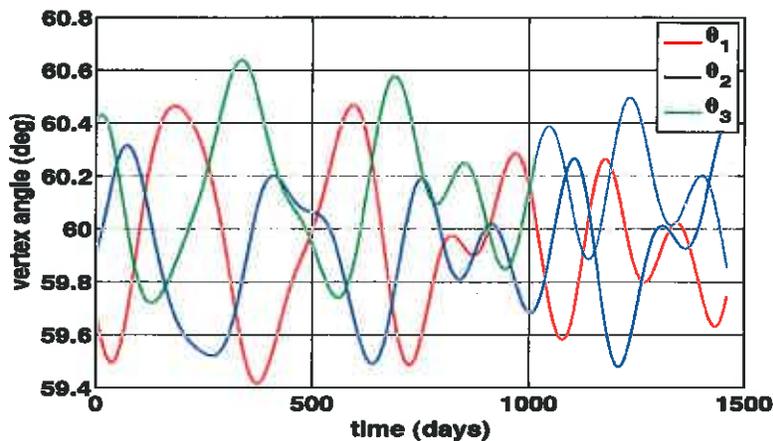
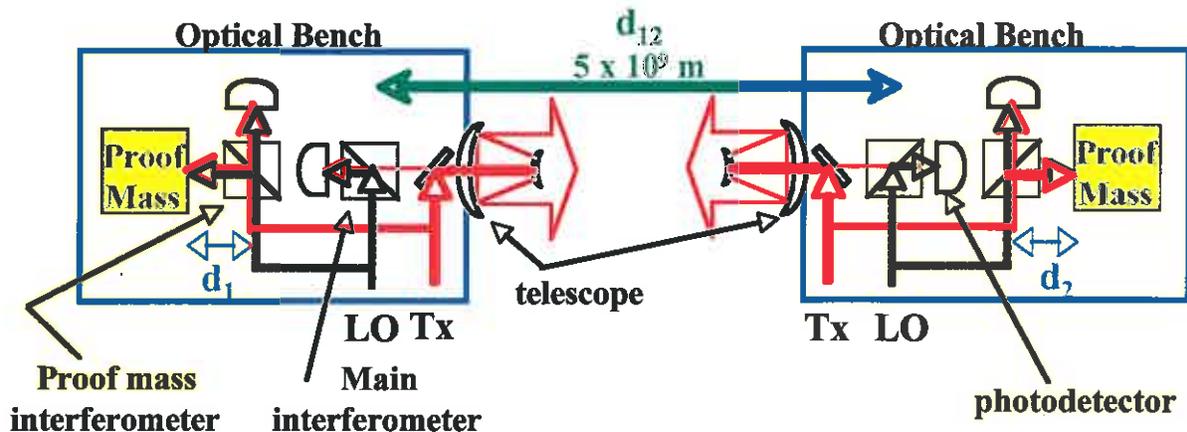


Figure 3: Variation in pointing between spacecraft over the course of the mission. This angular variation is accommodated in the design by moving the entire optical assembly, which includes the telescope.

The basic distance measurement between science-craft, or really proof masses, is divided into three parts for convenience. Two of the parts are the separations of the proof masses from their local optical benches. These separations are on the order of half a meter and are referred to as the “short arm” interferometer. The third separation is between optical benches in different science-craft, and is of order 5×10^9 meters, or 5×10^6 km. **Figure 4** shows how this functional breakdown of the distance measurement works. The telescope is part of the long arm measurement only.



$$d_{\text{total}} = d_1 + d_2 + d_{12}$$

Figure 4: Functional breakdown of the measurement of the proofmass separation. The telescope is part of the long arm measurement d_{12}

As part of the long arm measurement, the telescope functions as an afocal beam expander/de-expander. It takes a collimated beam of 200 mm diameter and transforms it to a 5 mm diameter beam for the optical bench. **Figure 5** shows a notional optical layout showing this function of the telescope. Optically, the telescope forms a real exit pupil in front of the bench. **Figure 5** shows a notional layout.

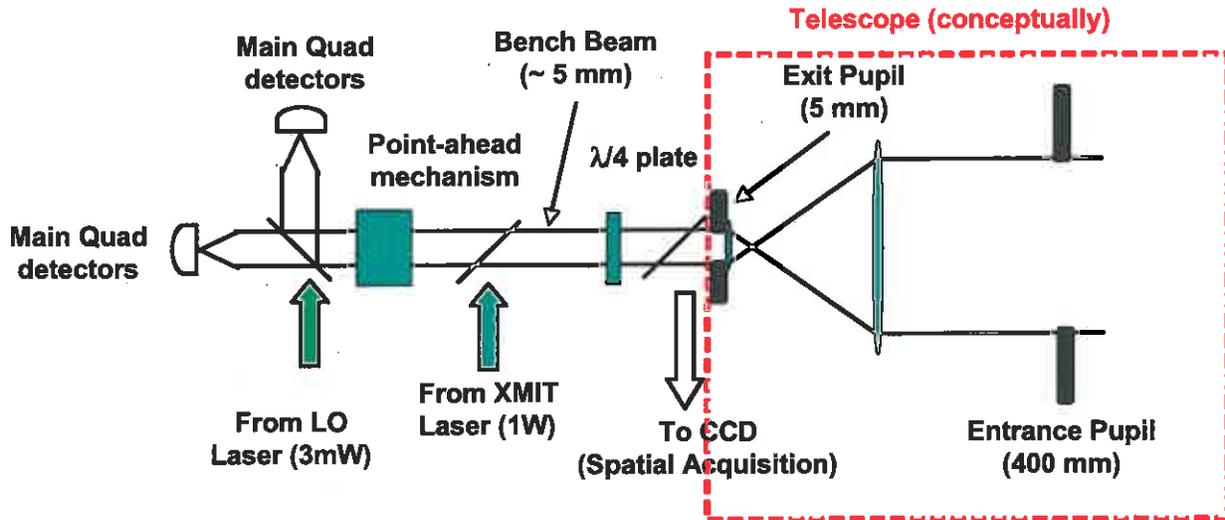


Figure 5: Notional Aft Optics Layout

Figure 6 shows a functional layout of the optical bench showing how the telescope interfaces to the bench and the send and receive paths. A “look behind” architecture is shown to accommodate the point ahead angle, which is explained in a later section of this document.

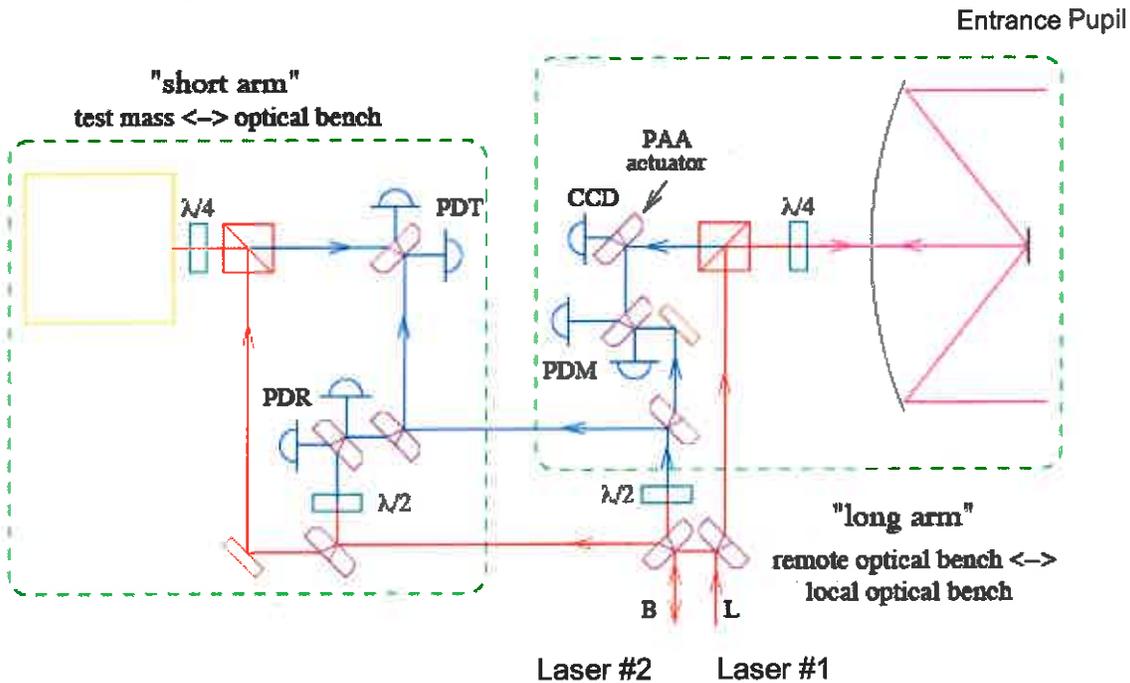


Figure 6: Optical Bench Functional Layout

Functional Description

The primary functions of the telescope are to expand the beam prior to transmission to remote spacecraft, and to collect the light from the far spacecraft. The Telescope Subsystem also provides a beam with parameters (diameter, divergence) compatible with the beam combining optics on the spacecraft. It is designed to be afocal; that is it takes in a collimated beam and outputs a collimated beam.

The primary characteristics of the baseline telescope are:

- Two mirror reflecting telescope followed by a collimating mirror pair
- 200mm primary mirror diameter
- nominal 5 mm diameter collimated beam to the optical bench

Critical Requirements

The driving requirements of the Telescope Subsystem are given in **Table 1**. Requirements (3) and (16) are specific to the use of the telescope for metrology rather than imaging and are the most challenging.

	Parameter	Derived From	NGO
1	Wavelength		1064 nm
2	Net Wave front quality of as built telescope subs system over science field of view under flight-like conditions	Pointing	$\lambda/30\text{RMS}$
3	Telescope subsystem optical path length ¹ stability under specified environment	Path length Noise/ Pointing	$1 \text{ pm} / \sqrt{\text{Hz}} \times \sqrt{\left(1 + \left(\frac{0.003}{f}\right)^4\right)}$ where $0.0001 < f < 1 \text{ Hz}$ $1 \text{ pm} = 10^{-12} \text{ m}$
4	Field-of-View (Acquisition)	Acquisition	+/- 200 μrad
5	Field-of-View (Science)	Orbits	+/- 7 μrad out-of-plane ² +/- 4.2 μrad in-plane
6	Transmitted beam diameter on primary mirror	Shot noise/ Pointing	$0.92 \cdot D$
7	Entrance Mirror Diameter	Noise/ pointing	200 mm
8	Entrance Pupil	Pointing	Entrance of beam tube (or primary)
11	Location of image of primary mirror (exit pupil)	Pointing	~10 cm (on axis) behind primary mirror
12	Pupil distortion	SNR	10%
13	Beam size on bench	short arm interferometer	5 mm
14	Mechanical length		350 mm

15	Optical efficiency	Shot noise	>0.85
16	Scattered Light	Displacement noise	< 10 ⁻¹⁰ of transmitted power

Table 1: Summary of critical requirements for the Telescope Subsystem

Notes for Table 1: [Requirements (3) and (16) are the most challenging]

¹Optical path length is the net total path length through the telescope as experienced by either the transmitted or received beam from input pupil to exit pupil, which can be defined as the accumulated phase divided by the wavenumber ($2\pi/\lambda$), where lambda is the design wavelength, 1064 nm. The key specification is the stability with time. The absolute value is less important.

²Out-of-plane or in-plane refers to two orthogonal spatial directions in the telescope. The final application for these telescopes involves mounting them in three spacecraft that form an equilateral triangle that is in the same orbit as the earth about the sun, but lagging by 22 degrees in orbital phase. The plane of the triangle is inclined at 60 degrees from the ecliptic. In-plane refers to the plane of this triangle, and out-of-plane is normal to it. There is no fixed architectural feature of the telescope corresponding to this symmetry for an on-axis telescope. For an off-axis telescope, the designer has the freedom to align one of these axes with the off-axis symmetry. See the discussion in the section on system context for more information.

Delivered Power to the far field

One of two basic roles of the telescope is to deliver power efficiently to the far fields. This property is specified by the Strehl ratio, which is the ratio of the on-axis power from an optical system in the far field to the power that same system would have if there were no wavefront aberrations. Essentially the Strehl is the ratio of the on-axis power delivery efficiency of a real optical system compared to a perfect diffraction limited system. For small wavefront errors, the Strehl is given by:

$$S = e^{-(2\pi\sigma)^2}$$

where σ is the wavefront error in fractions of a wave. For the LISA measurement, the laser traverses the telescope twice – once at the transmitter and once at the receiver. The power efficiency is then given by the product of the Strehl ratios for the two telescopes, which we take to be the same for simplicity.

Figure 7 shows a plot of the square of the Strehl ratio versus wavefront aberration. The system level optical wavefront error (WFE) specification is $\lambda/20$, which corresponds to a Strehl ratio squared of 0.82, or equivalently a power loss through the optical system due to optical aberrations of ~ 18%.

The total system specification includes contributions to the WFE from the laser and other optical components in the transmit or receive path, including folding mirrors, beamsplitters, and the point-ahead mechanism mirror. The allocation to the telescope from the $\lambda/20$ total is $\lambda/30$.

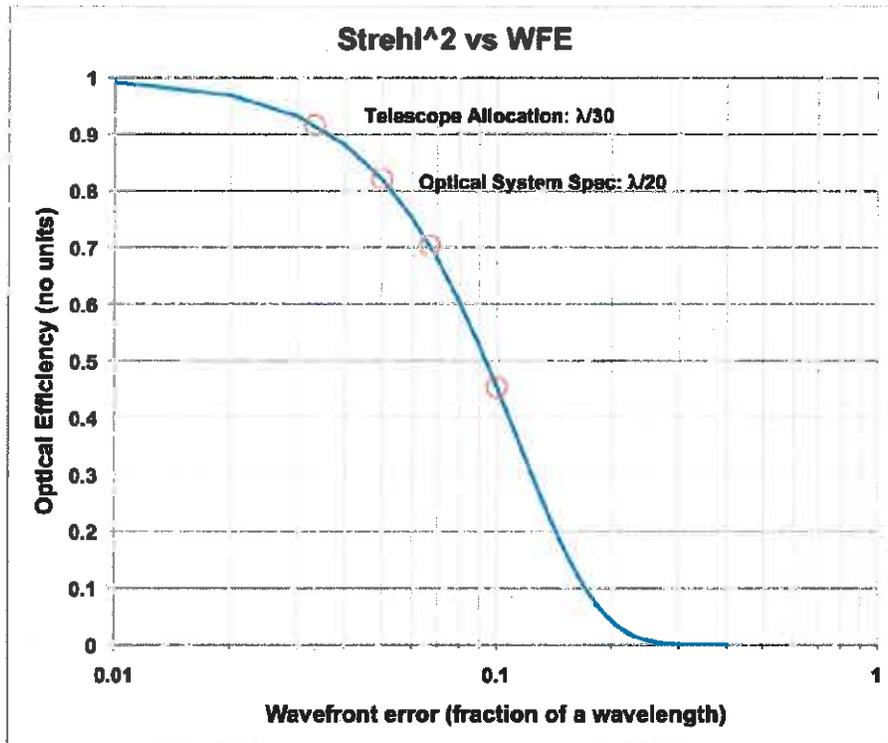


Figure 7: Optical power efficiency, Strehl², versus wavefront error.

Scattered Light Requirements

(This section will be completed as more becomes known.)

The received power for a typical detector is on the order of 100 pW for a 1W transmitted power, for a total loss due to diffraction of order 10^{-10} between spacecraft. In order to have the scattered light from the telescope nominally equal to the incoming received power from the far spacecraft, the scattered light shall be $\leq 10^{-10}$ x the power of the transmitter as measured at the receiver.

Point Ahead Requirements

Due to the finite light travel time between spacecraft it is necessary to point the transmitter in a slightly different direction from the receiver. The nominal value of this angular separation is +/- 6 microradians in the plane of the triangle for the LISA configuration. This is accommodated by the (instantaneous) field of view of the telescope.

Figs. 8a and b show the point ahead angles for a drift-away orbit specified for SGO-Mid, a de-scoped version of LISA. For this configuration, the point ahead angle is very small and can be accommodated within the instantaneous FOV of the telescope.

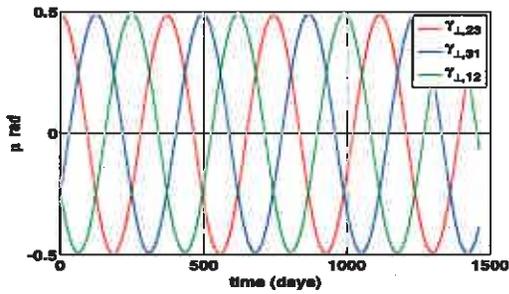


Fig 8a: Out of plane Point Ahead

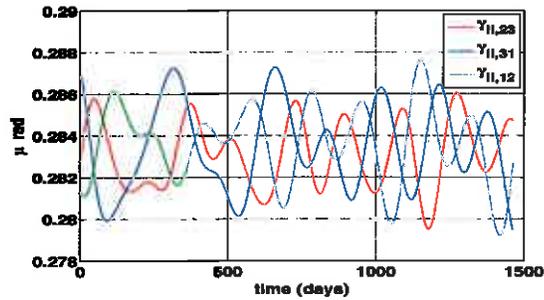


Fig 8b: In-plane Point Ahead

The separation can be implemented either by offsetting the transmitter from the telescope line of sight (“point ahead”) or the receiver (“look behind”).

Thermal Requirements

There will be both an axial and a transverse temperature gradient. The precise details of the temperature distribution require specification of the mounting of the telescope and the coatings surrounding it, but the nominal boundary conditions are that the optical bench should be at or near room temperature (300 deg K) and the secondary mirror is looking at cold space.

For the transverse gradient, the solar array is facing the sun at 60 degrees, and the bottom deck of the science-craft faces space. The internal boundary conditions temperatures depend on the details of the science-craft construction.

Figure 9 below shows a set of emissivities assumed for the telescope and surrounding environment, and Figure 10 shows the resulting temperature map. The baseline assumption is that the telescope sits at roughly -70C, and there is an axial thermal gradient of < 1C and a transverse gradient of < 1.5C. These results for the gradients are limited by the large cell size of the finite element thermal model, and represent an upper limit. These figures are shown for illustrative purposes only and do not constitute a specific requirement.

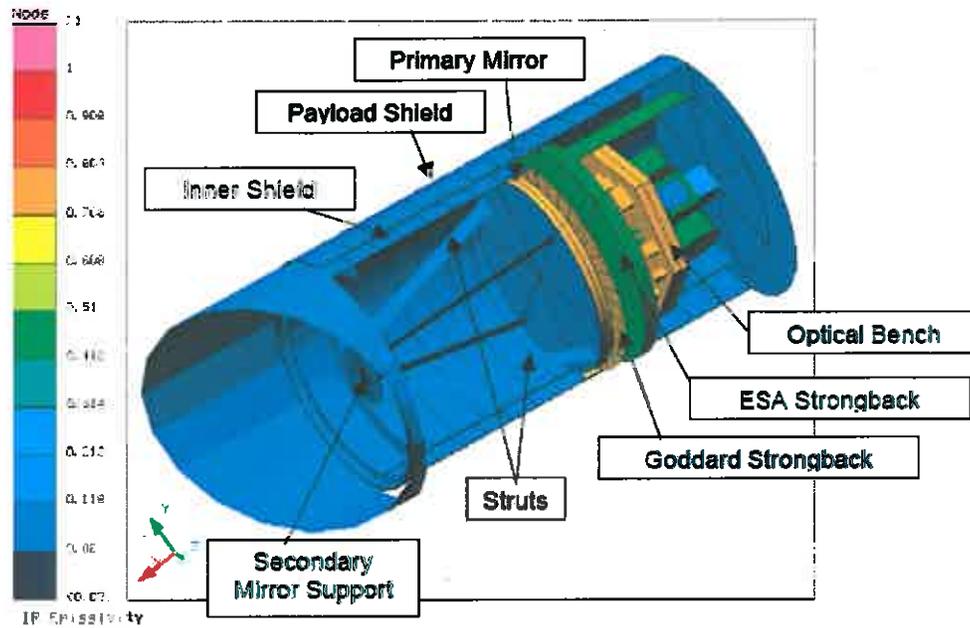


Figure 9: Telescope Assembly Emissivity Map

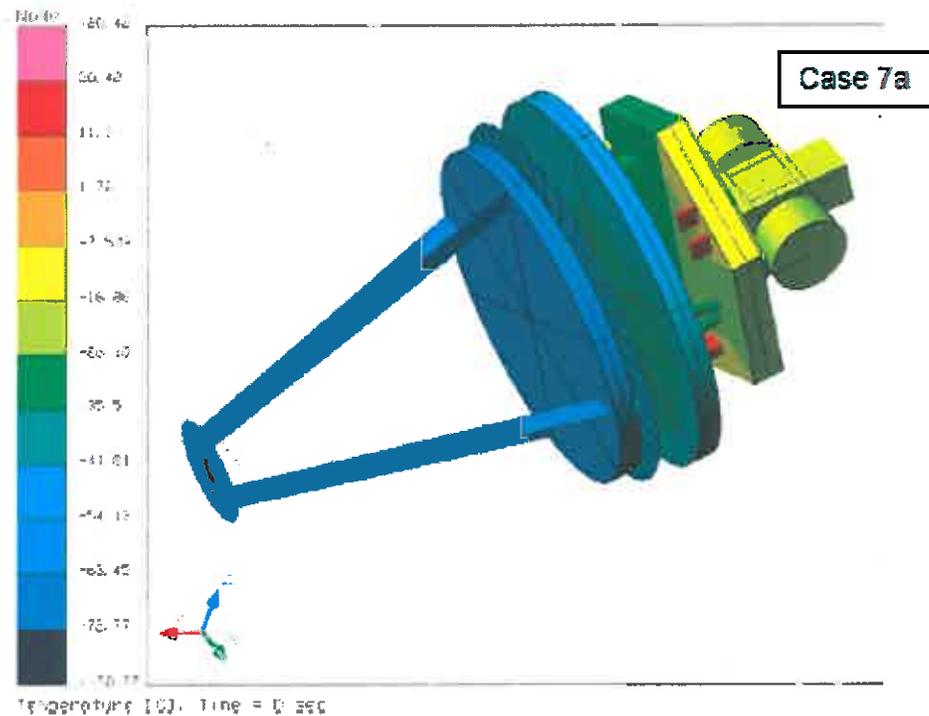


Figure 10: Nominal Telescope Temperature Distribution. This is the result of one model, and is shown for illustration purposes only – not as a requirement.

Sensitivity Analysis

Below (**Table 2**) are the results of an alignment sensitivity study done by Joe Howard of the GSFC Optics Branch on the baseline optical design shown in Figure 11. A step file is also available.

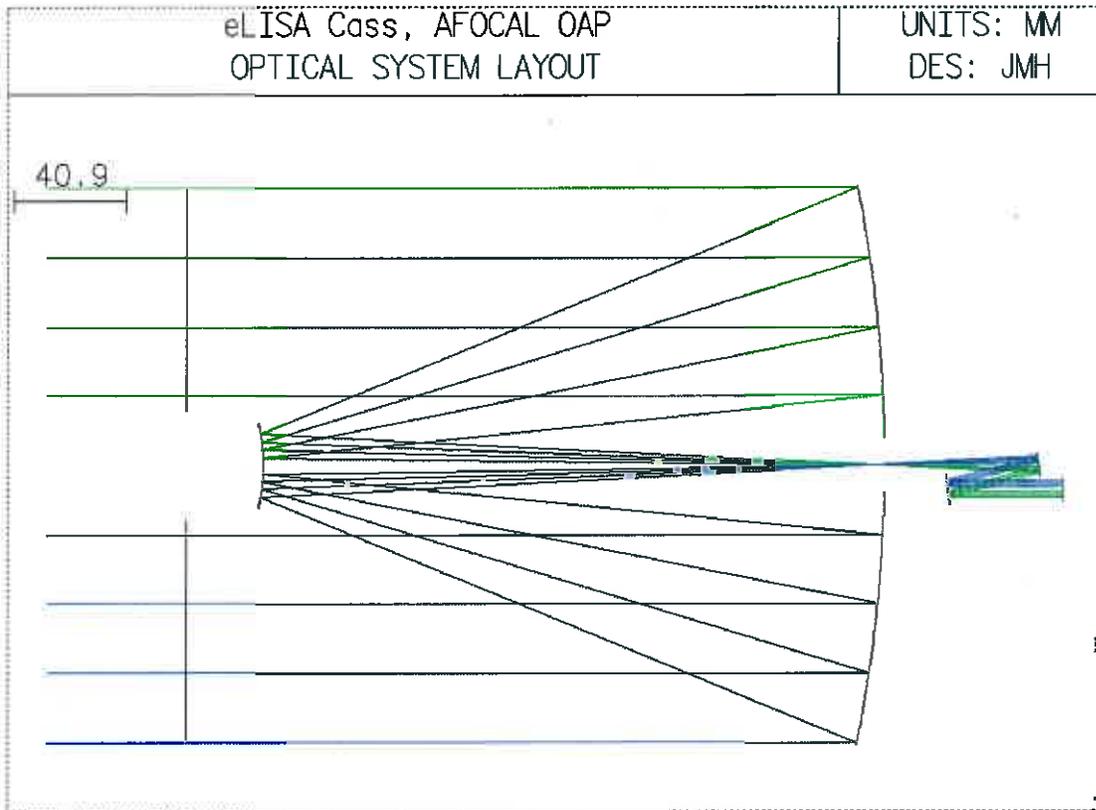


Figure 11: Baseline optical system layout

Lambda = 1.064 um
 Lam/30 = 35.46667 nm

RMS WFE sensitivity

units = nm WFE for um or urad motion

Perturbation	x	y	z	rx	ry	rz
PM	1.71	1.71	21.65	0.86	0.86	0.00
SM	1.72	1.72	21.94	0.10	0.10	0.00
Lens	0.00	0.00	0.23	0.00	0.00	0.00
exit pupil	0.00	0.00	0.00	0.00	0.00	0.00

Lens compensation

87 um motion of lens compensates 1 um SM axial motion
 0.2 nm RMS WFE results from 1 um SM axial motion with lens compensation

5000 um range of lens motion from nominal
 57.47126 um total range of SM compensation (from nominal)

CHIEF RAY SENSITIVITIES

OPL sensitivity units = um/um or um/urad

Perturbation	x	y	z	rx	ry	rz
PM	-1.96E-06	-1.96E-06	2	-1.01E-06	-1.01E-06	0
SM	8.17E-07	8.17E-07	-2	-1.17E-07	-1.17E-07	0
Lens	8.13E-07	8.13E-07	0	6.82E-10	6.82E-10	0
exit pupil	0	0	1	0	0	0

X-tilt sensitivities units = urad/um or urad/urad

Perturbation	x	y	z	rx	ry	rz
PM	-148.8508	0	0	0	-151.3024	0
SM	133.0901	0	0	0	17.33673	0
Lens	15.76067	0	0	0	-0.054361	0
exit pupil	0	0	0	0	1	0

Y-tilt sensitivities units = urad/um or urad/urad

Perturbation	x	y	z	rx	ry	rz
PM	0	-148.8508	0	151.3024	0	0
SM	0	133.0901	0	-17.33673	0	0
Lens	0	15.76067	0	0.054361	0	0
exit pupil	0	0	0	-1	0	0

Table 2: Sensitivity Analysis of the optical layout

Given these sensitivity numbers and a maximum wavefront error of lambda/30, and an optical pathlength stability specification of 1 pm/sqrt(Hz), the sensitivity analysis can be recast in terms of maximum allowed motions.

Table 3 shows the maximum allowed motions for a each of the elements in the telescope to keep the residual wavefront error below lambda/30. For example, the upper left hand corner shows that the primary mirror can be translated in the x direction by 20.7 microns before the residual wavefront error exceeds lambda/30. This number is calculated from the sensitivity number in **Table 2** by dividing the number of nanometers in a lambda/30 distortion by the sensitivity. Note

that the units of the table are either microns or microradians according to whether they are translations or angles.

**Max allowed motions
RMS WFE sensitivity**

units = um or urad for lambda/30 WFE

Perturbation	x	y	z	rx	ry	rz
PM	20.71	20.71	1.64	41.36	41.36	0.00
SM	20.68	20.68	1.62	365.23	365.23	0.00
Lens	0.00	0.00	152.03	0.00	0.00	0.00
exit pupil	0.00	0.00	0.00	0.00	0.00	0.00

CHIEF RAY SENSITIVITIES

max OPL 1.00E-06 microns

OPL sensitivity units = um or urad for a max OPL shift

Perturbation	x	y	z	rx	ry	rz
PM	-0.51	-0.51	5.00E-07	-0.99	-0.99	0
SM	1.22	1.22	-5.00E-07	-8.56	-8.56	0
Lens	1.23	1.23	0	1466.02	1466.02	0
exit pupil	0	0	1.00E-06	0	0	0

max tilt 1 urad

X-tilt sensitivities um or urad of a max tilt

Perturbation	x	y	z	rx	ry	rz
PM	-0.006718	0	0	0	-0.006609	0
SM	0.0075137	0	0	0	0.057681	0
Lens	0.0634491	0	0	0	-18.39556	0
exit pupil	0	0	0	0	1	0

Y-tilt sensitivities units = urad/um or urad/urad

Perturbation	x	y	z	rx	ry	rz
PM	0	-0.006718	0	0.006609	0	0
SM	0	0.007514	0	-0.057681	0	0
Lens	0	0.063449	0	18.39556	0	0
exit pupil	0	0	0	-1	0	0

Table 3: Maximum Allowed Motions for an optical path length difference (OPD) of 1 pm/√Hz or a wavefront error (WFE) of lambda/30.

Stability Requirement

The telescope is used for a precision length measurement, not for imaging, so the optical path length through the telescope must be extremely stable. The requirement for stability is specified as an amplitude spectral density – that is, the square root of a power spectral density. Figure 12 shows a plot of the requirement as a function of the measurement frequency. For more details on this requirement plus a description of how it is measured, please see reference [1].

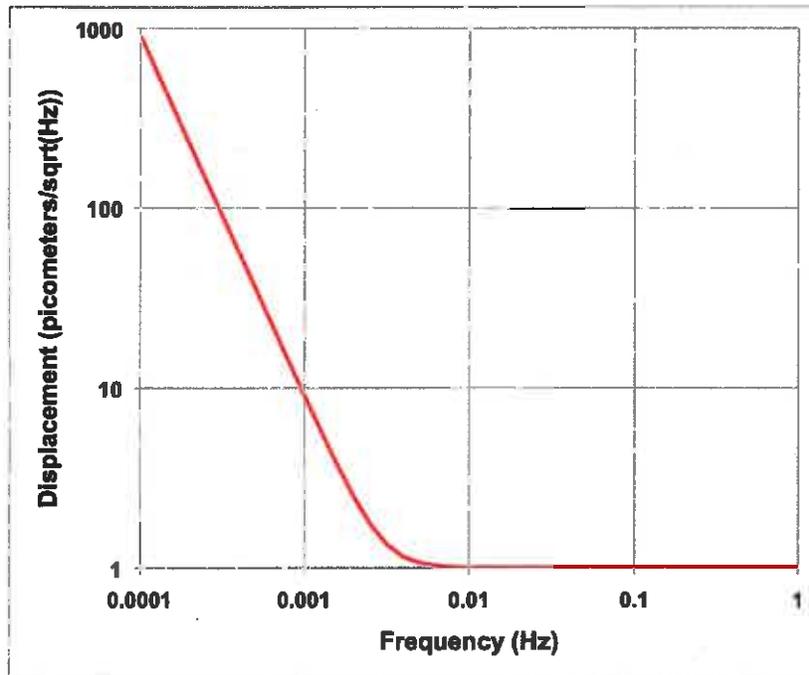


Figure 12: Path length stability requirement as a function of measurement frequency. Units are in picometers (10^{-12} m) per $\sqrt{\text{Hz}}$.

References

- [1] J. Sanjuán, et al., Carbon fiber reinforced polymer dimensional stability investigations for use on the laser interferometer space antenna mission telescope, Rev Sci Instrum 82, 124501 (2011). DOI: 10.1063/1.3662470