451 / LASER COMMUNICATIONS RELAY DEMONSTRATION PROJECT

Laser Communications Relay Demonstration (LCRD) Statement of Work Retroreflector Substrate

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Greenbelt, Maryland

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Preface

This document is under configuration management by the Laser Communications Relay Demonstration (LCRD) Project.

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Section 1. Introduction

The Laser Communications Relay Demonstration (LCRD) project at NASA Goddard Space Flight Center (GSFC) requires a retro-reflecting solid corner cube (Retroreflector or RCC) for a space-qualified optical system. This Statement of Work (SOW) defines the effort required by a vendor to manufacture, test, and deliver these components. The units shall be built according to the drawing provided by GSFC and shall be built according to standard practice for space applications.

In this document the term "work product" is used to refer to the entire deliverable required by GSFC. All material procured as part of this contract shall be delivered to GSFC at contract completion. See Section 4.1 for the detailed list of work product deliverables.

In this document the terms Goddard, GSFC, NASA, and government refer to NASA's Goddard Space Flight Center. The terms vendor, supplier, and contractor refer to the companies that will be involved with this acquisition.

The Retroreflector requirements are described in the technical specification document, LCRD-PYLD-OM-SPEC-0016 and all associated subordinate documents, referred to in the Applicable Documents Section.

The Retroreflector Fabrication contract shall be conducted in accordance with the schedule in Section 5. Days in this document are defined as normal working days.

The enumeration in this document of certain requirements shall not be construed to exclude other requirements that are standard for space applications.

Section 2. Applicable Documents

All documents identified here shall apply in the situations where they are referenced.

LCRD-PYLD-OM-SPEC-0016	Performance Specification for Retroreflector Substrate
GSFC Drawing 2188880	Substrate, Retroreflector, Retroreflector Assembly

Conflicting requirements: Discrepancies between this document and any references, or between this document and any document that references this document, shall be submitted to GSFC for interpretation, clarification, and resolution.

Section 3. GSFC Responsibilities

GSFC will be responsible for issuing all contractual and technical direction to the vendor regarding the work-product.

The GSFC Contracting Officer (CO) will have overall responsibility for the contract. The CO will provide all the contractual direction and clarification within the "as-written" requirements and schedules of the SOW and Specification.

Section 4. Vendor Responsibilities

This section defines the work-product, the program management, the verification testing, and the fabrication and testing required from the Vendor.

4.1 Work Product

4.1.1 Work Product Summary

Table 4-1 lists the hardware and documentation work products that are deliverables for this effort. The vendor shall provide all the resources required to design (where necessary), manufacture, verify, and deliver the work products. Delivery schedule for work product items shall be in accordance with the schedule outlined in Section 5.

Table 4-1: Work Product

Qty	Item	Description
HARDWARE		
5	Retroreflectors	See LCRD-PYLD-OM-SPEC-0016
8	Witness Samples	See LCRD-PYLD-OM-SPEC-0016
All	Shipping Container	Used to ship all work pieces
DOCUMENTATION		
1	Shipping Plan	Submitted to GSFC for approval before shipping. See LCRD-PYLD-OM-SPEC-0016, Section 4.4.
All	Red Flag Reports	All incidents affecting schedule or performance
1	Stress Relief Procedure	Submitted to GSFC for approval prior to use. See LCRD-PYLD-OM-SPEC-0016, Table 4-2.
END ITEM DATA PACKAGE		

1 per component	Analysis, Demonstration, Inspection, Test and Similarity Results Report per Verification Test Matrices	See LCRD-PYLD-OM-SPEC-0016, Section 5.
All	Non-conformance Reports	
All	Red Flag Reports	
All	Non-conformance Waiver Requests	
All	Certificates of Conformance	See Section 4.2.3 of this document
All	Inspection and Test Reports	See Section 4.2.3 of this document
All	Traceability Information	See Section 4.1.2 of this document

4.1.2 Documentation and End Item Data Package

The vendor shall prepare and deliver to GSFC the documentation listed above in Table 4-1.

Al listed procedures shall be delivered to GSFC and written approval obtained from GSFC prior to their use. With the exception of the End Item Data Package, GSFC will respond within ten (10) days of receipt. Failure by GSFC to reply within this timeframe will be interpreted as agreement with the proposed procedure. The response time for the End Item Data Package is listed in Table 5-1. The End Item Data Package will be reviewed and accepted in writing by GSFC.

GSFC shall have access to all in-process data including, but not limited to, test procedure descriptions and their results, inspection records, equipment calibration records and material certification and traceability.

The End Item Data Package shall include all test, inspection, demonstration, analysis, and similarity verification data per the Verification Matrices in the specification document, LCRD-PYLD-OM-SPEC-0016, and all associated subordinate documents and drawings. GSFC shall reserve all data rights to the End Item Data Package.

Any non-conformances or failures to comply with the SOW or Specifications shall be reported to GSFC within two (2) days. A formal Non-Conformance Waiver Request shall be submitted to GSFC within five (5) days. Non-Conformance Reports, along with all subsequent related correspondence, shall be included as part of the End Item Data Package.

4.1.3 Documentation Format and Marking

All documents shall be created to permit indexed access to individual procedures, test results, data and reports and shall be submitted in any of the following acceptable electronic formats:

- Documents in PDF format
- Test data in Comma Separated Value or Excel format with full supporting documentation of field names and units
- Interferogram test data, preferably in Zygo Metropro *.dat format

No password protection shall be applied to individual deliverable files. Password protected zip files or other secure means of transporting documents to GSFC is acceptable.

All preliminary documentation submitted to GSFC shall be clearly marked "PRELIMINARY" and shall be re- submitted in its final form on or before delivery of the end product.

4.2 Program Management

The vendor shall plan, execute, and report the contracted efforts utilizing management systems that effectively control schedule. In addition, the vendor shall implement a systematic approach for management of information and data generated during the course of the program. The system shall provide for identification, preparation, approval, and control of internal and deliverable documentation.

The vendor shall maintain a schedule which clearly identifies critical paths and major milestones agreed upon by both the vendor and GSFC. Schedule updates shall be provided to GSFC whenever changes of more than ten (10) days to the milestones dates occur.

4.2.1 Reporting

At any time, if an event occurs that may delay the scheduled completion of the milestones, or if any acceptance testing result fails, then GSFC shall be notified by email to the Contracting Officer within 24 hours of the event. The email shall include, at a minimum, the nature of the event, the potential impact to the schedule, and the actions to be taken in response to the event. This email shall be followed by an e-mail Red Flag Report within 2 days of occurrence.

4.2.2 Quality Assurance

The vendor shall have a documented Quality Management System. GSFC reserves the right to survey and assess the supplier's quality program for adequacy. Examples of reference quality systems include ISO9001:2008 and SAE AS9100-B. The vendor shall submit documentation of its Quality Management System with the proposal.

4.2.2.1 Identification, Traceability, and Marking

The supplier shall maintain a documented traceability system to track all system components from delivery and inspection through to final completed Retroreflector testing and verification. The same unique identification markings physically applied to the units packaging shall clearly link all testing and qualification data to the unit under test.

4.2.2.2 Source Inspection

GSFC reserves the right to conduct routine audits of the work to monitor progress, conformance to design, quality, and testing. Work under this contract is subject to GSFC surveillance and inspection at the vendor's plant. The vendor will be notified three (3) days prior to any visit.

4.2.2.3 Shipping and Handling

The vendor shall label the exterior of the package to ensure adequate identification of precautions needed to ensure the integrity of the product being shipped or stored.

The vendor shall ensure that special labeling requirements be listed in the appropriate shipping documents and on each package.

GSFC reserves the right to reject and to return to the vendor any material damaged due to inadequate packaging.

The vendor is responsible for delivery to GSFC. The vendor is responsible for sufficient shipping containers for all RCCs and witness samples.

4.2.3 Acceptance and Delivery

A Certificate of Conformance (COC) shall accompany the delivery of the work product, signed by an authorized agent of the vendor, certifying that all items in the shipment are in conformance with the GSFC SOW and Specification and all associated subordinate specification documents. The Retroreflectors shall have a COC containing, at minimum, the following:

- Part Number
- Serial Number
- PO number
- Specification/SOW file names and revision numbers
- Nonconformance waiver reference, if any
- Signature and title of the authorized representative

Inspection and Test reports shall accompany each retroreflector delivery to GSFC.

The vendor shall deliver all work products to the GSFC facility in Greenbelt, MD.

Final inspection and acceptance of the work product shall occur at GSFC. GSFC final acceptance of the work product shall be granted upon successful completion of the GSFC receiving inspection.

4.3 Verification Testing

The vendor shall conduct testing in accordance with the GSFC SOW and Specifications. Each specification attribute shall be verified according to the verification matrix detailed in Section 5 of LCRD-PYLD-OM-SPEC-0016.

GSFC may observe any final acceptance testing at the vendor's facility. The vendor shall provide prior notification to GSFC of final acceptance testing according to the schedule in Section 5 of this document.

All verification test data shall be included as part of the End Item Data Package as referenced in Section 5 and Section 4.1.

Section 5. Giver – Receiver List

Table 5-1: Giver-Receiver List

Qty		Time in working days	From - To
PROGRAM MANAGEMENT			
All	Conference Calls	As Needed	GSFC – Vendor Vendor – GSFC
All	Notification of test or assembly event	5 days prior to event	Vendor – GSFC
All	Red Flag reports	As required, Telecon w/in 1 day, Written w/in 2 days	Vendor - GSFC
All	Non-conformance Waiver Requests	5 days post event	Vendor - GSFC
All	Non-conformance Waiver Approval	3 days post submission	GSFC - Vendor
1	Final Work Product Acceptance	10 days after delivery	GSFC - Vendor
1	Schedule indicating major milestones	Within 10 days following date of contract award, then monthly for program duration	Vendor - GSFC
HARDWARE			
5	Retroreflectors	Per contract	Vendor - GSFC
8	Witness Samples	Per contract	Vendor - GSFC
All	Shipping Containers	On Delivery	Vendor - GSFC
DOCUMENTATION			
1	Stress Relief Procedure	Within 10 days of contract award	Vendor - GSFC
1	Stress Relief Procedure Approval	5 days post submission	GSFC - Vendor
1	Shipping Plan	At least 30 days before shipment	Vendor - GSFC
1	Shipping Plan Approval	10 days post submission	GSFC - Vendor

1 per shipment	End Item Data Package	With hardware delivery	Vendor - GSFC
1 per shipment	End Item Data Package Approval	10 days post submission	GSFC - Vendor

Appendix A. Abbreviations and Acronyms

Acronym	Definition
AOI	Angle of Incidence
AR	Anti-Reflective
CO	Contracting Officer
COC	Certificate of Conformance
DCN	Document Change Notice
EIDP	End Item Data Package
GSFC	Goddard Space Flight Center
LCRD	Laser Communication Relay Demonstration
OM	Optical Module
PO	Purchase Order
NASA	National Aeronautics and Space Administration
NGIN	Next Generation Integrated Network
PV	Peak-to-Valley
RCC	Retroreflecting Corner Cube
RH	Relative Humidity
SOW	Statement of Work
WFE	Wavefront Error

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