

J. SKALIS

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Statement of Work

SPACE CARGO TRANSPORTATION SYSTEM

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Contract

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TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 INTRODUCTION	1
2.0 SCOPE	1
3.0 GENERAL BACKGROUND	2
3.1 Program Management	2
3.2 Applicable, Compliance and Reference Documents	2
4.0 CONTRACTOR TASKS	3
4.1 Program Management	3
4.1.1 Planning Coordination	3
4.1.2 Configuration Management	4
4.1.2.1 Engineering Release	4
4.1.2.2 Interface Control	4
4.1.2.3 Product Specifications	4
4.1.2.4 Design Reviews	4
4.2 System Engineering	4
4.2.1 System Engineering Analyses	4
4.2.2 Structural, Dynamic, Thermal and MP Analyses	5
4.2.3 Reliability	6
4.2.4 Maintainability	6
4.2.5 Safety	6
4.2.6 SCTS Logistics Planning	6
4.3 SCTS Container	7
4.3.1 Design and Development	7
4.4 C-5A Container Loading and Stowage System	7
4.4.1 Design and Development	7
4.5 SCTS Container Ground Support Equipment	7
4.5.1 Design and Development	7

TABLE OF CONTENTS (Continued)

<u>Section</u>	<u>Page</u>
4.6 SCTS Container Special Support Equipment	7
4.6.1 Design and Development	7
4.7 Fabrication and Test Planning	7
5.0 SPECIAL CONSIDERATIONS	9
5.1 Meetings	9
5.1.1 Program Reviews	9
5.1.2 SCTS Working Group Meetings	9

GLOSSARY

CDR	Conceptual design Review
FDR	Final design Review
FMEA	Failure Modes Engineering Analysis
GSE	Ground Support Equipment
ICD	Interface Control Drawings
P/L	Payload
PDR	Preliminary Design Review
SCTS	Space Cargo Transportation System
SOW	Statement of Work
SPO	Special Program Office
SSE	Special Support Equipment
STS	Space Transportation System
TBD	To be determined
TIM	Technical Interface Meetings

1.0 INTRODUCTION

This Statement of Work (SOW) defines tasks to be accomplished by Lockheed Missiles and Space Co., Inc. as the Space Cargo Transportation System (SCTS) Integration Contractor and the designer and fabrication of the container system and its handling equipment.

The SCTS Program provides for design of a container and support equipment for transportation of STS payloads from contractor facilities to Shuttle launch facilities via use of a C-5A aircraft. A design baseline for sea transit as a back-up is also provided.

2.0 SCOPE

This SOW delineates the contractor tasks required to perform the design, analysis and integration effort to establish the requirements baseline and to develop the engineering design of the SCTS system. Included in this effort will be evaluation of candidate vendors for fab of the SCTS hardware. A subsequent phase will provide for fab and demonstration testing of performance capabilities prior to use for transport of actual STS payloads. A separate effort is underway to modify two C-5A aircraft to be compatible with the SCTS and to support SCTS operations for transport of shuttle payloads.

The SCTS Contractor shall complete the preliminary design effort performed on Contracts of the container and support systems and shall interface with Georgia Lockheed Aircraft Company (Gelac) in their studies to modify a C-5A aircraft to be compatible for transport of the container system.

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After the preliminary design is complete or concurrent with the preliminary design phase, if applicable, the SCTS Contractor shall perform the detail designs necessary to commence fabrication of the container and its support equipment, issue and manage subcontracts as necessary and perform tests as necessary to assure that it is capable of transporting designated payloads with a modified C-5A aircraft.

3.0 GENERAL BACKGROUND

3.1 Program Management

The SPO is responsible for overall management of this program. LMSC is responsible for the design and development effort delineated in this SOW.

3.2 Applicable, Compliance and Reference Documents

The Contractor shall comply with the referenced documents as specified in this SOW.

4.0 CONTRACTOR TASKS

4.1 Program Management

Subject to SPO direction, LMSC as the SCTS contractor shall provide over-all program management, technical direction, coordination, and administrative effort necessary to ensure that requirements of this SOW are properly implemented, and are performed in a timely and cost effective manner. The Program Management and Controls system employed shall be sufficient to provide accurate and timely visibility into technical approach and schedule performance.

4.1.1 Program Management, Planning, and Coordination. LMSC shall provide and manage activities necessary for planning, scheduling, organizing, controlling, monitoring and reporting program tasks, schedules, and costs, including support of working groups, program and management-level meetings and reviews. The following specific tasks are included:

- a. Prepare and maintain program plans which define the roles of LMSC, subcontractor and government agencies in the coordination, design and integration of the SCTS with the C-5A aircraft modification program and with the designated payload users.
- b. Coordinate develop, and maintain detailed schedules of LMSC, subcontractors, and government agencies sets related activities. Maintain status of schedules and advise the SPO of potential problem areas.
- c. Use the P-240 Program Data Center as a central respository of all published management, engineering, and interface data pertinent to the SCTS.
- d. Maintain the SCTS Master Schedule (Level 3).
- e. Provide Program briefing and status reports to the SPO.
- f. Provide publications services for technical reports, maintenance and updating of program plans, and interface documents.
- g. The Contractor shall advise the SPO of significant problems or issues which require action by the SPO.

4.1.2 Configuration Management

4.1.2.1 Engineering Release. The Contractor shall prepare engineering and manufacturing drawings for all designs and shall control this design documentation.

4.1.2.2 Interface Control. The Contractor shall integrate with other programs and prepare and maintain current the following ICDs:

- a. P/L to Container ICD
- b. SCTS to C-5A ICD
- c. SCTS to Launch Facilities ICD.

4.1.2.3 Product Specifications. The Contractor shall define the product configuration for each SCTS major component in a Product Specification in accordance with MIL-STD-490 as applicable to the CI.

4.1.2.4 Design Reviews. The Contractor shall conduct a PDR, CDR and FDR on the container, loading and stowage equipment and GSE. A PDR shall be conducted for SSE. A CDR to review SSE design will be conducted during the follow-on phase. Documentation in support of these reviews shall be in contractor format, as appropriate.

4.2 System Engineering

4.2.1 System Engineering Analyses. The Contractor shall develop a specification for design and development of the SCTS. Results of conceptual phase studies shall be incorporated in the baseline requirements. Interface requirements for compatibility between the SCTS and the C-5A and designated payloads shall be incorporated in the specifications. The Contractor shall interface with P/L contractors and derive SCTS requirements to accommodate the following:

- a. P/L characteristics, i.e., size, MP, trunnion and keel fitting locations.

- b. P/L contractor facility constraints and limitations for P/L loading into the container.
- c. Road transport conditions from P/L facilities to airfields.
- d. P/L environmental control requirements.
- e. P/L environmental monitoring and recording requirements during storage and transportation in the container.
- f. P/L service requirements during transportation.

At the start of this effort, the SPO will specify the three P/Ls that the SCTS shall be designed to transport from contractor facilities to the Shuttle launch facilities.

The Contractor shall obtain technical support from Gelac to define C-5A-SCTS interface details to define requirements for the container, support system design, details for loading, stowage and unloading of C-5A and C-5A flight environments.

The Contractor shall interface with California and other state (TBD) highway transportation departments as specified by the SPO to obtain requirements for container system design. Limitations of SCTS usage based on road restrictions shall be identified to the SPO and approved by them.

4.2.2 Structural, Dynamic, Thermal and MP Analyses. The Contractor shall provide overall design support through analysis of the transportation system. Validate the compliance with the SCTS requirements including land, aircraft and barge transport. Determine analytically the design features which will maintain thermal, humidity, acceleration on venting environmental control in the transporter compartment. Perform structural strength on stiffness analyses to assure adequate structural margins of safety for critical loading. Investigate the system effect of thermal and mechanical loading. Compile, maintain and document mass properties. Provide mass properties support in estimating component weights.

4.2.3 Reliability. The Contractor shall prepare and implement a Reliability Program Plan which reflects tailoring of MIL-STD-785B requirements to the specific SCTS program needs. Contractor shall perform FMEA analyses and implement appropriate changes to assure compliance with program reliability requirements.

4.2.4 Maintainability. The Contractor shall perform studies and analyses to ensure that maintainability requirements of the SCTS specifications are satisfied.

4.2.5 Safety. The Contractor shall prepare and implement a System Safety Program Plan (SSPP) which reflects tailoring of MIL-STD 882B requirements to the specific SCTS program needs. Contractor shall develop design criteria check-list, perform hazards analysis and ensure design is compliant with safety requirements.

4.2.6 SCTS Logistics Planning. The Contractor shall prepare a Logistics Plan that addresses:

- a. Loading and unloading of P/Ls into the container.
- b. Loading and unloading of container in C-5A.
- c. P/L handling and support equipment at each P/L facility.
- d. P/L security and safety requirements.
- e. Preliminary plans for unloading P/Ls at STS facilities.
- f. STS facility compatibility and SSE.
- g. Container maintenance and spare parts inventory requirements analyses.
- h. Functions, responsibilities and training baseline for SCTS operating personnel.
- i. Provide logistics supply support to the SCTS container design effort.
- j. Prepare Technical Publications Plan.

4.3 SCTS Container

4.3.1 Design and Development. The Contractor shall develop a design and prepare drawings of the SCTS container which complies with the SCTS specification.

4.3.2 The Contractor shall identify those subsystems and components that will be designed by vendors under subcontract.

4.4 C-5A Container Loading and Stowage System

4.4.1 Design and Development. The Contractor shall develop a design and prepare drawings of the C-5A container Loading and Stowage System which complies with the SCTS specification.

4.4.2 The Contractor shall identify those subsystems and components that will be designed by vendors under subcontract.

4.5 SCTS Container Ground Support Equipment

4.5.1 Design and Development. The Contractor shall develop designs and prepare drawings of the SCTS container Ground Support Equipment (GSE) which complies with the SCTS specification.

4.6 SCTS Container Special Support Equipment (SSE)

4.6.1 Design and Development. The Contractor shall develop designs and prepare drawings of the SCTS container Special Support Equipment.

4.7 Fabrication and Test Planning

4.7.1 The Contractor shall review and analyze the component and subsystem designs and perform a Make or Buy analysis. The results of this study are to be reviewed and approved by the LMSC Make or Buy Committee.

4.7.2 The Contractor shall identify and issue advanced requests for long lead items to support fabrication of SCTS hardware per the Program Master schedule. Provide materials and processes technical information and consultation for preliminary and detail design.

4.7.3 The Contractor shall develop requirements and criteria for facilities required to fabricate, assemble and test components, subsystems and the assembled SCTS. Internal capabilities and those of potential vendors shall be evaluated. Preliminary test plans shall be developed for testing of the SCTS. Prepare contamination control guidelines for design, operation and maintenance.

4.7.4 The Contractor shall review the required facilities and logistics for transporting the assembled container, P/L configurations and weight simulator to the C-5A aircraft load simulation test site. Requirements and criteria shall be developed and issued as a Preliminary Fabrication and Test Facilities Planning Document.

4.7.5 The Contractor shall conduct vendor surveys to assess supplier capabilities. Preliminary SOWs, drawings and specifications shall be released to qualified vendors. RFQs from vendors shall be obtained prior to CDR and to support planned fab effort during the follow-on phase.

5.0 SPECIAL CONSIDERATIONS

5.1 Meetings

5.1.1 Program Reviews. The Contractor shall support monthly Program Reviews to be held at the contractor's facility. The contractor shall report on design progress, identify technical problems and present resolution plans to resolve open critical issues.

5.1.2 SCTS Working Group Meetings. The Contractor shall support and participate in quarterly SCTS Interface Working Group sessions chaired by the SPO. Working Group shall consist of representatives from various government agencies, LMSC, Gelac and designated P/L contractors. Contractor shall prepare the agenda and support conduct of the meetings. The Contractor will be notified of the date and location at least 15 calendar days prior to each meeting.