

STATEMENT OF WORK
FOR THE
RAPID RESPONSE SPACE WORKS
(RRSW)
Execute End-to-End ORS Mission Task
Order
(SAMPLE)

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CONTENTS

1	Scope	3
1.1	Objective.....	3
2	Applicable Documents	3
3	Requirements	3
3.1	Mission Systems Engineering, Analysis, & Design Tool Simulation	3
3.2	Multi-Mission Modular Space Vehicle Design & Prototype Validation.....	4
3.3	Bus Flight Hardware and Software Build.....	5
3.4	Payload Flight Hardware Software Build.....	5
3.5	Space Vehicle Integration & RRSW Support.....	5
3.6	Launch Campaign & Mission Support	6
4	Programmatic Tasks	7
4.1	Design Reviews	7
4.2	Design Review Support	7
4.3	Technical Interchange Meetings	7
4.4	Customer Communications.....	7
4.5	Cost Performance	7
4.6	Contractor Integrated Performance Management	7
4.7	Integrated Master Schedule (IMS)	7
4.8	Integrated Baseline Reviews (IBRs).....	7
4.9	Risk Management.....	8
4.10	Quality Assurance.....	8
4.11	Work Breakdown Structure (WBS).....	8
5	Deliverable Documentation	8
5.1	Period of Performance	8
5.2	Deliverable Documentation	8

STATEMENT OF WORK

Rapid Response Space Works (RRSW) Execute End-to-End ORS Mission

1 Scope

This Statement of Work (SOW) delineates the tasks the contractor will accomplish to manage and execute the technical, schedule and cost performance necessary to meet the Operationally Responsive Space (ORS) mission requirements. The scope of this SOW is intended to include the efforts needed to meet the flight mission demonstration to include: the integration of the modular bus flight hardware with the modular RF payload flight hardware in a radar imaging configuration; system level test; validation of all mission components (payload, bus, ground, and launch); mission launch support; post-launch turn-on; calibration; checkout; user handoff; and on-orbit support. The contractor will refine the RRSW AI&T processes using inputs from the Modular Space Vehicles (MSV) bus and payload providers. Additionally they will demonstrate both a first-item AI&T of the space vehicles as well as a rapid AI&T of a RRSW rapid response from notification to on-orbit operations. This Task Order does not include actual launch or ground infrastructure development.

1.1 Objective

The objective of this Task Order is to integrate the modular payload architecture and the modular bus architecture, developed by the MSV contractors to a set of jointly developed interface standards into a space vehicle capable of executing the mission. The ORS Office has selected this MSV mission to be a mission that will address key ORS Office objectives to include: 1) Demonstration of the end-to-end RRSW response; 2) Demonstration of an open standards-based, rapidly configurable, multi-mission, modular bus architecture. The specific mission performance, operational user requirements, program requirements and constraints, to be used for this Task Order are documented under a separate document, the "Operationally Responsive Space (ORS) Architecture Guidebook." The ORS office has multiple separate developments planned and underway which will require complimentary interaction and support throughout the execution of this Task Order.

2 Applicable Documents

- Operationally Responsive Space (ORS) Architecture Guidebook
- ORS MSV Basic Contract Statement of Work

3 Requirements

3.1 Mission Systems Engineering, Analysis, & Design Tool Simulation

3.1.1 Mission Planning & System Engineering Support

The contractor shall support a Government conducted System Requirements Review (SRR) that will encompass the entire mission (i.e., all mission component requirements and providers will participate) early in the program. The SRR may occur at a contractor or Government facility. SRR details are captured in the RRSW Systems Engineering Management Plan (SEMP). The envisioned SRR covers traditional topics; assessment the overall program plan, approach to systems engineering methodology and simulation, space vehicle system performance projections/capabilities, requirements flow down, low level specification allocations,

risk assessment (including hardware and software) that is tied to the planned risk reduction and prototyping tasks.

The contractor shall perform systems engineering analysis and simulation as required throughout the program to technically guide the overall effort and to generate required technical support analysis for decision making. The contractor shall support the Government Integrated Product Teams (IPT) by providing program technical information, simulation analyses, and in developing the Tier-2 rapid response mission concept of operations.

3.1.1.1 Mission Plan

The contractor shall develop and maintain an overall Mission Plan. The Mission Plan will incorporate inputs from the payload, bus, launch, and ground systems contractors. The contents of the Mission Plan should include a detailed plan for the flight demonstration, description of operational concept (graphic); specifics on mission data collection/imaging; areas of interest to be imaged; data processing and analysis plans; and a list of tests to be executed that are will evaluate and quantify space vehicle capabilities and limitations. The “ORS Architecture Guidebook” contains information to be considered in the development of this plan. Maintenance of the Mission Plan indicates an expectation the plan will be kept current with findings and results throughout the program execution.

3.1.2 ORS Rapid Response Demonstration Plan

The contractor shall develop and maintain a RRSW Mission End to End Demonstration Plan. The “ORS Architecture Guidebook” contains a description of the RRSW end-to-end vision. Development of this plan will involve interaction and support among the separate mission component developers and providers. This interaction includes information exchange and participation in component AI&T. The content envisioned for this Demonstration Plan includes (but is not limited to): planned AI&T process step time allocations, description of key process steps, and Cost, Size, Weight, and Power (C-SWAP) analysis for each of the hardware and/or software components required for the mission execution, and disassembly, handling, and component storage requirements and processes. The contractor is responsible for tracking and updating the Demonstration Plan throughout the program according to RRSW Configuration Management procedures. The contractor will coordinate the incorporation of the Demonstration Plan into the development of other relevant plans and procedures (e.g., as pre-launch, post-launch turn-on, calibration, etc.).

3.1.3 Mission Design Toolkit

The Mission Design Toolkit (MDT) is a major ORS element to be developed under a separate Task Order for use within the RRSW, and across other MSV contractors, ORS Office, and other Government agencies. The contractor shall identify MDT requirements, constraints, and features to be addressed by the MDT throughout the duration of this Task Order.

3.2 Multi-Mission Modular Space Vehicle Design & Prototype Validation

3.2.1 Multi-Mission Modular Space Vehicle Specification & Interface
Section not used.

3.2.2 Hardware Risk Reduction/Verification

The contractor shall use hardware subsystems that meet Technology Readiness Level (TRL) of prototyped hardware or higher (flight qualified or flight proven) in the space vehicle designs. When space vehicle designs incorporate lower TRL levels, the contractor shall conduct Non-Recurring Engineering (NRE)/prototype activities to quantify and reduce the risk of employing that subsystem. The contractor shall implement risk mitigation for items identified as critical

high risk that have TRLs less than 7. Risk mitigation may involve the early inclusion of parallel paths for decisions at key development milestones.

3.2.3 Software Risk Reduction/Verification

The contractor shall analyze the mission software determined to be critical high risk (e.g., automated test and flight scripts) and provide quantitative results prior to system integration. The initial identification of critical high risk software and mitigation analyses occurs at SRR and will be updated at succeeding design reviews.

3.2.4 Space Vehicle Design

The contractor shall complete the mission unique detailed design of the integrated space vehicle to meet the ORS mission in accordance with the end-to-end demonstration requirements (modular breakdown, interfaces, rapid AI&T etc.). Detailed design will be accomplished with support and input of the bus and payload contractor(s).

The contractor design shall meet launch vehicle requirements, launch integration requirements, and be compatible with mission ground system components. Additionally, the design will be compatible with pre-launch checkout, post-launch checkout/turn-on and calibration.

The contractor shall participate in a mission CDR to enable a multi-disciplined product and process assessment to ensure the ORS mission is ready to proceed into system fabrication, software development, demonstration, test, and can meet the stated performance requirements within cost (program budget), schedule (program schedule), and risk.

The contractor shall refine the RRSW design process, AI&T procedures and standards based upon practice. Processes will identify if they are used for design and performance verification or for rapid AI&T. Rapid AI&T processes that differ from standard AI&T processes shall include justification of why the changes are within acceptable risk levels.

3.3 Bus Flight Hardware and Software Build

Section not used.

3.4 Payload Flight Hardware Software Build

Section not used.

3.5 Space Vehicle Integration & RRSW Support

3.5.1 Space Vehicle AI&T Plan

3.5.1.1 The contractor shall develop a plan for AI&T of the bus and payload into the final space vehicle. This plan will incorporate the instructions delivered from the MSV contractors for bus and payload into a full space vehicle set of instructions. The plan for AI&T will contain the step-by-step instructions for space vehicle assembly, disassembly, integration and test.

3.5.1.2 The contractor shall develop, maintain, and publish a Requirements Verification Matrix (RVM) for the space vehicle in the AI&T plan.

3.5.1.3 The contractor shall support the Government integrating the space vehicle RVM into the mission RVM.

3.5.1.4 The contractor shall provide sufficient verification documentation for proceeding to launch integration.

3.5.1.5 The contractor shall develop a plan to incorporate the ORS mission hardware, software, plans, procedures, documentation, and lessons learned into the RRSW assets.

3.5.2 Space Vehicle AI&T

3.5.2.1 The contractor shall execute the AI&T plan to assemble the bus and payload together into an integrated space vehicle, followed by the planned testing.

3.5.2.2 The contractor shall maintain a Failure Analysis Summary List that will identify all failures that have occurred during testing.

3.5.3 Shipping Container

The contractor shall design and develop a reusable space vehicle shipping container compatible with launch site requirements. The contractor shall package the space vehicle as required for shipment to the launch site as directed by the Government.

3.5.4 RRSW Support

The contractor shall identify the support required for space vehicle AI&T demonstrations and launch site shipment verifications. Required support can include that to be provided by external contractors and Government participation.

3.6 Launch Campaign & Mission Support

The contractor shall execute the following task with support from the bus, payload, launch, range, and ground systems contractors.

3.6.1 Launch Vehicle Integration Support

The contractor shall define, document, and support execution of the space vehicle to launch vehicle integration procedures. The contractor shall also provide support to the Government team for the actual launch vehicle integration. Support is defined as technical advice and troubleshooting integration difficulties.

3.6.2 Pre-Launch Checkout

The contractor shall define, document, and support execution of the RRSW mission pre-launch processes and procedures required to obtain a go-for-launch decision. The contractor shall also be responsible for conducting the pre-launch checkout procedures. Pre-launch check out procedures shall be developed in accordance with the rapid time to launch goals.

3.6.3 Post-Launch Turn-on/Checkout/Calibration

The contractor shall define, document, and support execution of the space vehicle turn-on procedures via a step-by-step process that is required to be followed for space vehicle checkout. The checkout process shall include the payload and bus calibration procedures.

3.6.4 Flight Software

The contractor shall assume responsibility for space vehicle turn-on, checkout, and calibration. The contractor shall develop the required software for executing the turn-on, checkout and calibration procedures.

3.6.5 Ground Infrastructure Compatibility

The contractor shall maintain compliance with the ground system infrastructure for flight control and data downlink.

3.6.6 Mission On-Orbit Anomaly Support

The contractor shall provide on-orbit anomaly resolution support to the Government on an as-needed basis.

3.6.7 Documentation

The contractor shall prepare and maintain program, design, test, and other relevant documentation in accordance with the RRSW Configuration Management Process.

4 Programmatic Tasks

4.1 Design Reviews

The contractor shall conduct a Test Readiness Review (TRR).

4.2 Design Review Support

The contractor will support Government reviews at ORS and/or MSV contractor sites, the launch site, and the Satellite Operations Center (SOC) including a SRR, CDR, Mission Readiness Review (MRR), Spacecraft Pre-Ship Review (S-PSR), and Launch Readiness Review (LRR) as directed.

4.3 Technical Interchange Meetings

The contractor shall conduct and/or support Technical Interchange Meetings with the Government, MSV bus and payload contractors, launch vehicle vendor, and ground segment provider as needed to identify, resolve, and establish architecture, technical interface, assembly, and integration activities/direction.

4.4 Customer Communications

The contractor shall maintain proactive, open, and responsive communication with the Government.

4.5 Cost Performance

The contractor shall establish a program cost baseline to measure cost progress. Control account cost progress shall be measured monthly. When an individual control account experiences a negative cost variance exceeding ten percent, the contractor shall advise the Government of the variance and provide a resolution plan.

4.6 Contractor Integrated Performance Management

The contractor shall establish, maintain, and use an integrated performance management system in the performance of this contract. Central to this integrated system shall be an Earned Value Management System (EVMS) in accordance with NASA Federal Acquisition Regulation Supplement (NFS) 1852.234-1, NFS 1852.234-2, and the EVMS guidelines contained in ANSI/EIA-748 (<http://guidebook.dcmamail.com/79/EVMIG.doc>). To establish the integrated performance management system, the EVMS shall be linked to and supported by the contractor's management processes and systems to include the integrated master schedule, contract work breakdown structure, change management, material management, procurement, cost estimating, and accounting. The correlation and integration of these systems and processes shall provide for early indication of cost and schedule problems, and their relation to technical achievement.

4.7 Integrated Master Schedule (IMS)

The contractor shall develop and maintain an Integrated Master Schedule (IMS) by logically networking detailed program activities. This IMS shall incorporate inputs from the bus and payload contractor IMS schedules. The contractor shall develop the schedule to contain the planned events and milestones, accomplishments, exit criteria, and activities from contract award to the completion of the contract. The contractor shall quantify risk in hours, days, or weeks of delay and provide optimistic, pessimistic, and most likely duration for each IMS activity and event.

4.8 Integrated Baseline Reviews (IBRs)

The contractor shall engage jointly with the Government's program manager in Integrated Baseline Reviews (IBRs) to evaluate the risks inherent in the contract's planned performance

measurement baseline. Initially, this shall occur as soon as feasible but not later than six months after contract award, and subsequently following all major changes to the baseline. Each IBR should verify that the contractor is using a reliable performance measurement baseline, which includes the entire contract scope of work, is consistent with contract schedule requirements, and has adequate resources assigned. Each IBR should also record any indications that effective Earned Value Management (EVM) is not being used. IBRs should also be conducted on subcontracts that meet or exceed the EVM application threshold. The prime contractor shall lead the subcontractor IBRs, with active participation by the Government. (See NFS 1852.234-2)

4.9 Risk Management

The contractor shall identify program risks and individual mitigation plans to retire risks as defined in the Risk Management Section of the RRSW SEMP. The contractor shall assess program risks on an ongoing basis and evaluate risk mitigation progress monthly.

4.10 Quality Assurance

The contractor shall develop and accomplish quality assurance in accordance with the Quality Assurance Section of the RRSW SEMP.

4.11 Work Breakdown Structure (WBS)

The contractor shall develop and maintain a contractor WBS for the Mission.

5 Deliverable Documentation

5.1 Period of Performance

The period of performance for this effort is anticipated as 48 months from the effective date of the task order. The ORS schedule goal for mission launch is 30 months from contract award.” The contractor shall deliver the following items or services as described below.

5.1.1 Space Vehicle

Deliver payload and support equipment to the RRSW facility which is anticipated at 18-24 months. This includes: payload hardware and baseline version of software, special handling equipment for payload, special adaptors, engineering unit hardware/software, and other fixtures.

5.1.2 Space Vehicle AI&T Support and Mission Demonstration

Three months of effort is anticipated for AI&T at the RRSW to establish Government acceptance of the bus hardware and software (to include delivery of updated versions of software) based on results of space vehicle testing. In addition, three months of effort is anticipated for RRSW mission demonstration.

5.1.3 Launch and On-orbit Mission Support

Eighteen months of on-orbit support to include 90 days of early on-orbit support for system checkout and as required, reach-back support for anomaly resolution.

5.2 Deliverable Documentation

The contractor shall deliver the documentation in accordance with the following Data Requirements List:

Report Number	Report Title	Report Number	Report Title
015	Program Plan	024	Systems Integration/Test Report

016	Contract Performance Report (CPR)	025	Interface Design Description
017	Cost Data Summary Report (CDSR)	026	Command and Telemetry Handbook
018	System Engineering Management Plan (SEMP)	027	Launch Site Procedures
020	Analysis, Test, Inspection and Demonstration Plan and Verification Summary	028	Launch and Early Orbit Handbook (LEOH)
021	Software Product Specification	029	Demonstration Plan
022	Space Vehicle Handbook (SVH)	031	Standard Operating Procedures
023	Systems Integration/Test Plan		