

TECHNICAL WORK MAY NOT BEGIN PRIOR TO CO APPROVAL

NASA/GODDARD SPACE FLIGHT CENTER

Page 1 of 7

REQUEST FOR TASK PLAN / TASK ORDER

CONTRACTOR	CONTRACT NO./TASK NO.	JOB ORDER NUMBER	APPROP. FY
GSS Group, Inc.	NAS5- 99124 TASK NO. 297 AMENDMENT	586-258-90-83-89	FY00

TASK TITLE: (NTE 80 characters; include Project name)
Flight Linux Operating System for Use with Spacecraft Onboard Computers

APPROVALS: (Type or print name and sign)

ASSISTANT TECHNICAL REPRESENTATIVE (OR TASK MONITOR)	DATE	ORG CODE	MAIL CODE	PHONE
Mary Ann Esfandiari <i>Mary Ann Esfandiari</i>	6/9/00	586	586	(301)286-2406
BRANCH HEAD	DATE	CODE		PHONE
Mary Ann Esfandiari <i>Mary Ann Esfandiari</i>	6/9/00	586		(301)286-2406
CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE (COTR)	DATE	CODE		PHONE
Robert S. Lebair, Jr. <i>Robert S. Lebair, Jr.</i>	6/9/00		560	301-286-6588
FLIGHT HARDWARE, CRITICAL GSE OR SOFTWARE? <small>(IF YES, NEED CODE 303 CONCURRENCE NEXT BLOCK)</small>	CONTRACTING OFFICER'S QUALITY REP.	DESIGNATED FAM:		
<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	Larry Moore			

The contractor shall identify and explain the reason for any deviations, exceptions, or conditional assumptions taken with respect to this Task Order or to any of the technical requirements of the Task Order Statement of Work and related specifications. The contractor shall complete and submit the required Reqs and Certs.

(To be completed by Contracting Officer)
C.O. Requested Quote on:
Date: JUN 12 2000

Contractor will develop specification or statement of work under this task for a future procurement. NO YES

Flight hardware will be shipped to GSFC for testing prior to final delivery. NO YES N/A

Government Furnished Property/Facilities: NO YES - SEE LIST OF GFP (offsite only) / FACILITIES (onsite only)

Onsite Performance: NO YES If yes: TOTAL PARTIAL
 If partial, indicate onsite work in SOW by asterisk (*)

Surveillance Plan Attached: NO YES

Highlighted Contract Clauses: *(to be completed by Contracting Officer)*

The effective date of this task order is the date of the Contracting Officer's signature below.

INCENTIVE FEE STRUCTURE (check one)
(See Contract NAS5-99124, Attachment K, Incentive Fee Plan)

	<input checked="" type="checkbox"/> No. 1	<input type="checkbox"/> No. 2	<input type="checkbox"/> No. 3	<input type="checkbox"/> No. 4	<input type="checkbox"/> No. 5
Cost	10%	50%	25%	25%	%
Schedule	15%	25%	25%	50%	%
Technical	75%	25%	50%	25%	%

(To be completed by Contracting Officer)

The target cost of this task order is \$ 219,420.

The target fee of this task order is \$ 13,929.

The total target cost and target fee of this task order as contemplated by the Incentive Fee clause of this contract is \$ 233,349.

The maximum fee is \$ 20,358.

The minimum fee is \$0.

AUTHORIZED SIGNATURE:

THIS TASK ASSIGNMENT IS ISSUED ACCORDING TO THE CONTRACT CLAUSE "TASK ASSIGNMENTS AND REPORTS"

Elizabeth J. Austin 7/7/00 **ELIZABETH J. AUSTIN**
 SIGNATURE OF CONTRACTING OFFICER DATE TYPED NAME OF CONTRACTING OFFICER

CONTRACTOR'S ACCEPTANCE:

 AUTHORIZED SIGNATURE DATE

TECHNICAL WORK MAY NOT BEGIN PRIOR TO CO APPROVAL

NASA/GODDARD SPACE FLIGHT CENTER

Page 2 of 7

REQUEST FOR TASK PLAN / TASK ORDER

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	NAS5-	TASK NO.	AMENDMENT
QSS Group, Inc.	99124	297	

Applicable paragraphs from contract Statement of Work:

STATEMENT OF WORK: (Continue on blank paper if additional space is required)

This Task results from the selection of a proposal entitled "Flight Linux Operating System for Use with Spacecraft Onboard Computers", AIST-0083-0075, in response to NASA Research Announcement (NRA) for the Advanced Information Systems Technology (AIST) Program, NRA-99-OES-08.

Under this proposal, the contractor will utilize the Linux Kernel (FlightLinux) as a proposed onboard OS for the purpose of enabling or enhancing science data processing onboard. Work will be done collaboratively with the Flight Software Systems Branch. The overall purpose will be to provide a means to migrate science data processing components from the ground to the flight computer to reduce data downlink volumes or target specific observations based on real-time on-board analysis. The real-time extensions to Linux provide the interrupt response and deterministic behavior required for on-board control. FlightLinux will be the concept to be evolved and evaluated during this effort. The potential use of FlightLinux could provide the means to reduce the development time and cost of flight systems, while increasing the timeliness and accessibility of onboard science data. A variety of laboratory bench-top systems, as well as the potential use of the WIRE on-orbit test bed provide a set of opportunities to test the concepts expressed and evolved in this proposal.

Follow-on tasks are expected for a full 3 years, as defined in the subject proposal.

PERFORMANCE SPECIFICATIONS:

Management: Accomplishment of objectives, clear incremental progress as shown in monthly reports and bi-weekly meetings, efficient and appropriate staffing, responsiveness to issues posed by task monitor, coordination and good working relationship with task monitor and other related contractor efforts, and schedule adherence.

Technical Objectives: Adherence to technical goals stated in proposal, clear and concise metrics that demonstrate impact and value to overall flight missions, demonstrated measureable progress toward goals, reports that specifically address goals and progress towards same and suggested follow-on work.

Deliverables: Technical Accuracy, appropriateness to NASA community use, readability and comprehensiveness of reports, use of illustrative graphics to clarify points.

APPLICABLE DOCUMENTS:

NRA-99-OES-08

Flight Linux Operating System for use with Spacecraft Onboard Computers, AIST-0083-0075

TASK END DATE: 6/30/01**MILESTONES/DELIVERABLES AND DATES:**

- Flight Linux Web Site: (7/30/00); Posix report (8/25/00); Target Architecture Report (10/10/00); Embedded Testbed (12/10/00); Bulk memory device driver (3/30/01); Onboard Lan Architecture (5/30/01)
- Bi-weekly meetings with task monitor
- Reports required by the NRA for AIST Management Office: (See page 3 for detailed descriptions of reports)
- Bi-monthly technical report (9/10/00, 11/10/00, 1/10/01, 3/10/01, 5/10/01)
- Interim Review Data Package (12/10/00)
- Annual Review Data Package (6/20/01)
- Annual Report (6/20/01)
- Annual AIST Workshop submission (3/01/01)
- Technical Progress Report; monthly, due the 15th of the month

PERFORMANCE STANDARDS:**Schedule:** Adherence to schedule**Technical:** Technical accuracy of product, quantitative measures of progress, adherence to goals**FINAL DELIVERY DESTINATION (NAME, BLDG, ROOM):**

Mary Ann Esfandiari, building 23, room W325

TECHNICAL WORK MAY NOT BEGIN PRIOR TO CO APPROVAL

NASA/GODDARD SPACE FLIGHT CENTER

REQUEST FOR TASK PLAN / TASK ORDER

Contract NAS5-99124

Task #: **297****Description of Reports required by the NRA for AIST Management Office:**

The following provides a description of each of the above listed deliverables:

- 1) Monthly Financial Reports provide cost plan (cost per month) and monthly cost status in the standard STAAC Directorate (Code 700) reporting format. This format shows plan versus actual for obligations and cost, and also has an area to explain any deviations from the plan. The awardee must address: (a) the variance of planned versus actual costs, and include work that has been completed and cost incurred from the project (should be traceable to the schedule), (b) the status of major procurements that have been incurred to date and (c) the amounts obligated to suppliers and subcontractors, including open purchase orders against which materials have not been received nor services rendered. In addition, the PI shall plan to support monthly obligation and cost phasing plans consistent with HQ/Code B requirements, as well as any required Program Operating Plan (POP) formats. Delivery to Level II (ESTO) at GSFC must be in accordance with the agency schedule.
- 2) Bi-monthly Technical Reports include a plan for technical, schedule, and resource activities for the year. The PI is encouraged to use an electronic mechanism, with a web-based interface for submitting data, once it is released by the program office. A brief teleconference/meeting may be conducted between the ESTO technical representative and the PI to review and discuss each report. These reports must include the following:
 - a) Technical status: The PI must summarize accomplishments for the preceding two months, including technical accomplishments (trade study results, requirements analysis, design, etc.), technology development results, results of tests and/or demonstrations.
 - b) Schedule status: The PI must address the status of major tasks and the variance from planned versus actual, including tasks completed, tasks in process and expected to complete later than planned, tasks that are delayed starting with rationale for each, and recovery plans as appropriate.
 - c) In the first report, an initial assessment of the Technology Readiness Level (TRL) and the basis for that assessment for the critical technology developments of the activity. (See attached for definitions of TRL Levels.)
 - d) In the first report, a "Quad Chart" which contains the following information (See attached for basic template.):
 - First Quadrant: Include a visual, graphic, or other pertinent information
 - Second Quadrant: "Description and Objectives"
 - Third Quadrant: "Approach" and "Co-I's/Partners"
 - Fourth Quadrant: "Schedule and Deliverables" and "Applications/Missions"

TECHNICAL WORK MAY NOT BEGIN PRIOR TO CO APPROVAL

NASA/GODDARD SPACE FLIGHT CENTER

REQUEST FOR TASK PLAN / TASK ORDER

Contract NAS5-99124

Task #: **297**

- 3) Interim Reviews are conducted by the ESTO at the PI's facility, or at a mutually agreed upon location. In addition to hard copy handouts at the review, the mid-year review package shall also be submitted in electronic form (MS-Word or PowerPoint compatible format). This review summarizes the work accomplished and results leading up to this mid-year milestone review and must:
 - a) Describe the primary findings, technology development results, and technical status, e.g., status of elements, prototype implementations, results of tests and/or proof-of-concept demonstrations, etc. Demonstrate technical results and status in the laboratory, if appropriate.
 - b) Describe the work planned for the remainder of the year and critical issues that need to be resolved to successfully complete the remaining planned work.
 - c) Summarize the cost and schedule status of the project, including any schedule slippage/acceleration.
 - d) Update the TRL assessment.
- 4) Annual Reviews present a summary of the work accomplished and anticipated results at the end of each year, in a format similar to the Interim Review. Interim Review content described above. The planned work discussion should focus on the upcoming year and any critical issues related to continuation. The PI should also recommend whether the work should be continued, based on results to date, and provide a strong rationale for the recommendation. The ESTO technical representative will conduct the review at the contractor's facility, or a mutually agreed to location. The Annual Review for the last year should be comprehensive and should also include a discussion of the planned content of the written report. In addition to hard copy handouts at the review, the review package shall also be submitted in electronic form (MS-Word or PowerPoint compatible format). This review must include:
 - a) A description of the work accomplished and the results leading up to this review.
 - b) A summary of the primary findings, technology development results, and technical status, e.g., status of elements, construction of breadboards or prototype implementations, results of tests and/or demonstrations, etc. The contractor should provide a laboratory demonstration, when appropriate, to show technical results and status.
- 5) Annual Report should be submitted within 10 days following the end of the Annual Review. The final report shall be submitted in electronic (MS-Word compatible) format and paper copy by the end of the scheduled period of performance, and should include the following:
 - a) Results of all analyses, element, subsystem, or system designs, breadboards and/or prototype implementations and designs.
 - b) Performance analysis results of tests and/or demonstrations; estimation of reduction of size, mass, power, volume, cost, improved performance, or description of enabled capability not previously possible; and documentation of technology dependencies.
 - c) Tables, graphs, diagrams, curves, sketches, photographs and drawings in sufficient detail to explain, comprehensively, the results achieved.

TECHNICAL WORK MAY NOT BEGIN PRIOR TO CO APPROVAL

NASA/GODDARD SPACE FLIGHT CENTER

REQUEST FOR TASK PLAN / TASK ORDER

Contract NAS5-99124

Task #: **297**

- d) An updated TRL assessment, including a rough order of magnitude cost and a description of, and estimate of, the duration of the follow-on activities necessary to achieve TRL 7 for technologies that remain at less than TRL 7 at the completion of the (final) year (option year, or base period of performance, as applicable).
 - e) Updated "Quad Chart" from original bimonthly submission.
- 6) Annual Workshop involving all selected proposers to the NRA is planned to be held at or in the vicinity of a NASA Center. For the workshop, the contractor should make a presentation, provide a paper, or create a poster providing project description and objectives, approach, technical status, and schedule information.

TECHNICAL WORK MAY NOT BEGIN PRIOR TO CO APPROVAL

NASA/GODDARD SPACE FLIGHT CENTER

REQUEST FOR TASK PLAN / TASK ORDER

Contract NAS5-99124

Task #: **297****Attachment A
Technology Readiness Levels Summary****TRL 1 Basic principles observed and reported**

Transition from scientific research to applied research. Essential characteristics and behaviors of systems and architectures. Descriptive tools are mathematical formulations or algorithms.

TRL 2 Technology concept and/or application formulated

Applied research. Theory and scientific principles are focused on specific application area to define the concept. Characteristics of the application are described. Analytical tools are developed for simulation or analysis of the application.

TRL 3 Analytical and experimental critical function and/or characteristic proof-of-concept

Proof of concept validation. Active R&D is initiated with analytical and laboratory studies. Demonstration of technical feasibility using breadboard/brassboard implementations that are exercised with representative data.

TRL 4 Component/subsystem validation in laboratory environment

Standalone prototype implementation and test. Integration of technology elements. Experiments with full-scale problems or data sets.

TRL 5 System/subsystem/component validation in relevant environment

Thorough testing of prototype in representative environment. Basic technology elements integrated with reasonably realistic supporting elements. Prototype implementations conform to target environment and interfaces.

TRL 6 System/subsystem model or prototype demonstration in a relevant end-to-end environment (ground or space)

Prototype implementations on full-scale realistic problems. Partially integrated with existing systems. Limited documentation available. Engineering feasibility fully demonstrated in actual system application.

TRL 7 System prototype demonstration in an operational environment (ground or space)

System prototype demonstration in operational environment. System is at or near scale of the operational system, with most functions available for demonstration and test. Well integrated with collateral and ancillary systems. Limited documentation available.

TRL 8 Actual system completed and "mission qualified" through test and demonstration in an operational environment (ground or space)

End of system development. Fully integrated with operational hardware and software systems. Most user documentation, training documentation, and maintenance documentation completed. All functionality tested in simulated and operational scenarios. V&V completed.

TRL 9 Actual system "mission proven" through successful mission operations (ground or space)

Fully integrated with operational hardware/software systems. Actual system has been thoroughly demonstrated and tested in its operational environment. All documentation completed. Successful operational experience. Sustaining engineering support in place.



<Title>

PI: <name>/<institution>

Proposal No.: <Proposal #>



Description and Objectives

<enter info here>

<Include a visual, graphic, or other pertinent information here>

Approach

<enter info here>

Co-I's/Partners

<enter info here>

Schedule and Deliverables

<enter info here>

Application/Mission

<enter info here>