Notice to Prospective Offerors Concerning the Existing Statement of Work (SOW)

The existing SOW is provided as background for the contemplated S&MA Support Services Contract. It is also provided in order to minimize Freedom of Information Act (FOIA) requests for this document.

Substantial changes are expected from the existing SOW and the SOW that will be developed for the new S&MA Support Services Contract.

Prospective offerors are invited to review the existing SOW and provide comments and questions pertaining to the information contained by ***January 20, 2005***. Questions should be submitted directly to Cody Corley at cody.corley-1@nasa.gov.

SECTION C

DESCRIPTION/SPECIFICATIONS/WORK STATEMENT

C.1 STATEMENT OF WORK (10-203) (OCT 1985)

The Contractor shall furnish all resources necessary and/or incidental to performance of the work set forth in the following Statement of Work, commencing on page C-1.1.

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STATEMENT OF WORK
SR&QA CONTRACT

1.0 SCOPE

The effort described by this Statement of Work (SOW) is intended to provide the JSC Safety, Reliability, and Quality Assurance (SR&QA) Office, Code NA, with assistance in the fields of safety, reliability, maintainability, quality engineering, and quality assurance within JSC and also outside JSC at vendor manufacturing/engineering facilities.

In fulfilling this SOW, the SR&QA support contractor shall provide support consisting of engineering and nonengineering services. The contractor is responsible for providing the facilities*, materials, supplies, and equipment necessary to provide the required services, except for those items specifically identified as Government-furnished or installation-provided, in accordance with the contract terms and conditions.

The principal tasks of work described in this SOW support the overall NASA mission of flying the Space Shuttle safely and of designing, building, and flying safe and reliable future spacecraft. The objective is to provide support for NASA JSC programs and institutions, and the work involves the evaluation of designs and fabrication processes associated with manned spacecraft projects and operations. Note that this includes the review of work done by other contractors and other NASA organizations.

Functions/tasks described herein as "review," "certify," "ensure compliance," "verify," "evaluate," etc., shall not be construed as implying that the contractor has the authority to approve/disapprove Government policies, procedures, specifications, or requirements or those of any other Government contractor. Nor will language herein be construed to mean that the contractor has the authority to accept/reject on the Government's behalf any products or services. The contractor's functions involving evaluation, verification, certification, review, etc., require presentation of its analysis to the appropriate Government official for further action. Under no circumstances shall the contractor have approval or acceptance authority, nor is the contractor ever authorized to act as an agent of the Government or to represent itself as such.

The major part of this work is located at JSC in Houston, Texas. However, some resident support is required at other locations. As of the effective date of this contract, these include the White Sands Test Facility (WSTF), New Mexico, and at the Downey, California, field office and Kennedy Space Center in Florida; however, additional resident locations may be required to be established by the contractor in the future, depending on the evolution of existing programs and new ones assigned to NASA. The Downey office has both Space Shuttle and Space Station support elements. In addition, the work involves temporary duty at NASA prime and subcontractor facilities.

*See H.4, Key Personnel and Facilities

2.0 GENERAL

2.1 ORGANIZATION

The SR&QA Office at JSC is currently organized into three divisions: The Institutional Safety and Quality Division, the Shuttle Safety and Mission Assurance Division, and the Space Station Safety and Mission Assurance Division. In addition, the SR&QA office is in charge of the Quality Assurance, Reliability, and Safety Offices located in Downey, California, and the WSTF in New Mexico.

One staff organization reports to the SR&QA Office. It is the Space Shuttle SR&QA Office. The primary function of this office is to provide a direct interface with the Level II Space Shuttle program management, to perform management level analysis in response to program requirements, and to coordinate action items and detailed technical reviews between program management and SR&QA personnel.

2.2 BACKGROUND

The work breakdown structure of this SOW corresponds to the current NASA, JSC, SR&QA civil service organization. This structure is used for convenience and is not intended to imply any preferred support contractor organization. Note that SR&QA civil service organizations occasionally change as the NASA mission, external organizations, or programs change. For example, until recently, the civil service organization included a safety division, a reliability division, and a quality division with separate offices for Space Station integration, Space Shuttle Level III integration, and Space Shuttle Level II integration. The organization is now comprised of a Flight Systems Safety and Mission Assurance Division, an Operations and Quality Assurance Division, and separate offices for International Space Station independent assessment and Space Shuttle Level II integration. Also note the work breakdown structure used in this SOW includes a section which lists all of the work unique to the Space Station (Section 6). This section may be removed or modified as Space Station program support requirements dictate.

The fundamental requirements for the work described in this SOW are based on NASA safety, reliability, maintainability, and quality policies and on program specific requirements that result from those policies. The work is further tailored to the business processes currently used by NASA programs and institutions to meet those requirements.

2.3 MANAGEMENT AND ADMINISTRATION

Work shall be performed only through the issuance of written task orders to the contractor.

The contractor is required to adhere to schedules provided by JSC with consideration given to minimizing cost and maximizing productivity.

2.4 DATA REQUIREMENTS

The Data Requirements List (DRL) and Data Requirements Descriptions (DRD's), found in Section J, are part of this SOW.

3.0 ABBREVIATIONS/ACRONYMS

ANSI	American National Standards Institute
ASNT	American Society for Nondestructive Testing
ASQC	American Society for Quality Control
AALA	American Association of Laboratory Accreditors
CAE	Computer Aided Engineering
CAR	Corrective Action Record
CCB	Configuration Control Board
CCP	Configuration Change Panel
CDR	Critical Design Review
CFC	Chlorofluorocarbon
CFE	Contractor-Furnished Equipment
CIL	Critical Items List
CIR	Cargo Integration Review
CLDF	Clear Lake Development Facility
CR	Change Request
DPA	Destructive Physical Analysis
DR	Discrepancy Report
DRD	Data Requirements Description
ECP	Engineering Change Proposal
EEE	Electric, Electronic, and Electromechanical
EVA	Extra Vehicular Activity
EVVA	Embedded Validation and Verification Assurance
FDF	Flight Data File
FIAR	Failure Investigation Action Report
FMEA	Failure Modes and Effects Analysis
FRR	Flight Readiness Review
FSRP	Flight Safety Review Panel
GFE	Government-Furnished Equipment
GIDEP	Government-Industry Data Exchange Program
GSE	Ground Support Equipment
HCCM	Hazard Controls Configuration Management
IFA	In-Flight Anomaly
IRM	Information Resources Management
ISL	Inertial Systems Laboratory
ISO	International Standards Organization
ISQD	Institutional Safety and Quality Division
JAEL	JSC Avionics Engineering Laboratory
JATL	JSC Analysis and Test Laboratory
JIMP	Joint Integration Management Panel
JPRB	Joint Program Review Board
JSC	Johnson Space Center
KSC	Kennedy Space Center
LCC	Launch Commit Criteria
LDO	Long Duration Orbiter
LeRC	Lewis Research Center (NASA) GRC - Glenn
MER	Mission Evaluation Room
MIP	Mandatory Inspection Point
MRB	Material Review Board
MSA	Management Safety Assessment
MSFC	Marshall Space Flight Center
MSRA	Mission Software Readiness Assurance
NASA	National Aeronautics and Space Administration

NBL	Neutral Buoyancy Laboratory
NDE	Nondestructive Evaluation
NSRS	NASA Safety Reporting System
NSTS	National Space Transportation System
OEM	Original Equipment Manufacturer
OER	Orbiter Engineering Review
OMRSD	Operations and Maintenance Requirements and Specifications Document
OPF	Orbiter Processing Facility
ORI	Operational Readiness Inspection
PAR	Prelaunch Assessment Review
PCIN	Program Change Information Notice
PDR	Preliminary Design Review
PERB	Program Engineering Review Board
PIT	Problem Investigation Team
PRACA	Problem Reporting and Corrective Action
PRCB	Program Requirements Control Board
PROFS	Professional Office System
PRR	Preliminary Requirements Review
PRT	Problem Review Team
PSRP	Payload Safety Review Panel
PV/S	Pressure Vessels/Systems
QA	Quality Assurance
QARSO	Quality Assurance, Reliability and Safety Office
RAIS	RCN Automated Information System
RBDA	Reliability Block Diagram Analysis
RCN	Requirements Change Notice
RECP	Request for Engineering Change Proposal
RID	Review Item Disposition
RMAT	Reliability Maintainability Analysis Tool
SAIL	Shuttle Avionics Integration Laboratory
SFP	Summary Flight Plans
SIR	System Integration Review
S&MA	Safety and Mission Assurance
SMT	Surface Mount Technology
SOW	Statement of Work
SPC	Statistical Process Control
SPRCB	Special Program Requirements Control Board
SR&QA	Safety Reliability and Quality Assurance
SSP	Space Shuttle Program
SSRP	System Safety Review Panel
TOMRS	Test Operations and Maintenance Requirement Specification
TRR	Test Readiness Review
TRRB	Test Readiness Review Board
WETF	Weightless Environment Training Facility
WSTF	White Sands Test Facility

4.0 INSTITUTIONAL SAFETY AND QUALITY WORK

4.1 QUALITY PROGRAM PLANNING

In order to maintain modern SR&QA policies and program requirements for JSC, the SR&QA contractor must support the SR&QA office in the maintenance of up-to-date requirements that are consistent with modern management systems and

philosophies and that are used throughout the aerospace industry. Specifically, the contractor shall: provide support services to:

a. Maintain up-to-date quality assurance requirements and assure uniformity of implementation of quality requirements for JSC programs and projects. This includes developing and implementing JSC-approved procedures and controls that are consistent with the ANSI/ASQC Q90 Quality Management System.

b. Review program change notices, engineering change notices, engineering change proposals (ECP's), and other program documentation and recommend disposition as required to assure a quality product.

c. Maintain JSC quality procedures, plans, and policies pertaining to JSC on-site operations.

d. Coordinate the Institutional Safety and Quality Division (ISQD) resources planning for new programs during the initial implementation period to ensure ISQD support is in place and operational.

e. Support the preparation of quality and pertinent documentation for present and future programs. This includes, but is not limited to, SR&QA related Data Requirement Documents (DRD's) for other contracts.

f. Participate in the audits in support of NASA programs.

g. Support the review of work statements, requests for proposal, and purchase requests to ensure the inclusion of an adequate quality assurance program in accordance with established policies and standards with implementing procedures for in-process manufacturing and testing of delivered hardware.

4.2 GFE/FACILITIES QUALITY ENGINEERING

The contractor shall support the processing of Government-Furnished Equipment (GFE) flight equipment to assure that all aspects of quality are fully considered and implemented from the design concepts phase through the development, production, test, certification, and operational phases. The contractor shall:

a. Participate in failure analysis and failure investigations and recommend corrective action.

b. Develop and review trend analyses on problems and nonconformances (See DRD 19).

c. Assess spaceflight hardware for potential reuse or reapplication to other programs.

d. Review and develop failure modes and effects analyses (FMEA's) and critical items lists (CIL's) and develop inspection rationale in accordance with established JSC policies/procedures.

e. Participate in the review of hazard reports which call for quality engineering verification of hazard controls to support NASA programs.

f. Review drawings and specifications for JSC facilities and for GFE, with special emphasis on tolerances, manufacturing procedures, and inspection techniques including nondestructive evaluation (NDE) in accordance with established Government standards and policies.

g. Prepare and maintain JSC quality procedures and quality plans for JSC on-site facilities.

h. Participate in JSC material review boards (MRB's) in accordance with JSCM 5312.

i. Review and provide an assessment of test plans and test procedures for certification, preinstallation, prototype, and acceptance tests.

j. Participate in milestone reviews including, but not limited to, program requirement reviews, preliminary and critical design reviews, and various prelaunch readiness reviews.

k. Evaluate proposed engineering changes such as requests for engineering change proposals (RECP's) and ECP's for the quality assurance impact, and support the configuration change panel/configuration change board (CCP/CCB) as required.

l. Participate in the performance of SR&QA audits at JSC contractors, as required, to determine the effectiveness of program plan implementation.

m. Support the JSC project offices in the review of hardware for maintenance and repair to be accomplished at depots other than at the original equipment manufacturer.

n. Participate in JSC facility reviews and boards such as test readiness review boards (TRRB's) and operational readiness inspections (ORI's).

4.3 PROBLEM REPORTING AND CORRECTIVE ACTION (PRACA)

JSC programs require the SR&QA office to operate, maintain, and support a PRACA system. PRACA is a business process used to assure that all technical problems related to space flight hardware are recorded, appropriate investigations are conducted, and recurrence control is put in place as required. The PRACA system addresses problems occurring during manufacturing, assembly, test, maintenance, and operations. Accordingly, the SR&QA contractor shall provide the following services:

a. Distribute problem reports within 24 hours of receipt to responsible PRT engineers for review, analysis, and disposition.

b. Operate and maintain a data base system for the retrieval of problem data and reports in response to JSC and contractor requests for information.

c. Process problem data as required and enter it into the PRACA database. The contractor shall maintain up-to-date electronic and hard copy documentation of all received problem reports.

d. Provide technical support at meetings and reviews including, but not limited to, Project Office Monday morning stand-up meetings and PRCB's by providing the status of open problems, performing assigned action items, assisting in the resolution of problem related issues, and assisting in the clarification of PRACA requirements and business processes. The contractor shall provide statistical analysis of open problems for major programs.

e. Prepare and distribute daily open problem lists and Project Office problem review agenda (see DRD No. 11).

f. Prepare and provide PRACA training for personnel who participate in the PRACA process.

g. Coordinate with outside contractors and Government organizations as required to efficiently operate the PRACA system and to initiate change requests for modifications/enhancements to the PRACA data system and software.

h. Provide system testing and validation of all PRACA software releases and document results.

i. Prepare and maintain documents, procedures, etc., governing PRACA system operation and operational data base support.

j. Perform periodic evaluations of the PRACA data base to ensure accuracy and integrity. Identify and correct invalid/incorrect data, and implement corrective action to preclude recurrence.

Note: The PRACA process is described in NSTS 08126 for the Level II Shuttle program, and in JSC 24636 for the Level III Orbiter and GFE projects.

4.4 INSTITUTIONAL PROCESS ENGINEERING

The contractor shall provide qualified engineering and technical support in materials and process engineering and new technology development to assure that state-of-the-art quality technology is applied to existing and future JSC flight and institutional programs. Areas of expertise provided by the contractor shall include, but not be limited to, metals, welding, soldering, brazing, nonmetallic materials including composites, and adhesives, electronic Surface Mounted Technology (SMT), lubrication, seals, contamination, statistics, fasteners, contamination-related environmental technology, general chemistry, fluids and Non-Destructive Evaluation (NDE). The following work is included in this engineering effort:

a. Evaluate data provided by hardware contractors and subcontractors on equipment which presents potential concerns such as pyrotechnic systems, pressure vessels, and components exposed to oxidizers, fuel, and ignition sources to verify compliance with contract requirements.

b. Provide materials and process engineering expertise for review of flight and flight-related system problems and recommend corrective actions to prevent problem recurrence.

c. Support special problem investigations as required, review process-oriented hardware failure analyses and investigations, and provide findings and recommendations.

d. Review selected JSC and contractor drawings and specifications. Present findings on adequacy and compliance, with emphasis on process technology.

e. Review process specifications and procedures for fabrication, assembly, and testing and prepare comments and findings covering inadequacies in process control documents or implementation of procedures.

f. Review nondestructive test procedures including procedures concerning the use of NDE for pressure vessels and fracture control of structural components. Provide findings on adequacy and compliance.

g. Support the development and maintenance of workmanship standards for manufacturing and process technologies.

h. Recommend requirements for the JSC procurement of clean rooms, tools, related equipment, and services. The contractor shall review JSC clean room facilities and operations and provide comments and findings regarding adequacy/compliance.

i. Support the preparation of cleanliness specifications and procedures for vehicle testing, preflight checkout, and functional operations. The contractor shall coordinate specifications and procedures with responsible NASA organizations and contractors.

j. Review JSC contamination control activity and provide recommendations concerning adequacy.

k. Support the preparation of institutional quality engineering and assurance requirements and plans.

l. Participate in the preparation and evaluation of process technologies for ground-based and on-orbit applications.

m. Provide statistical process control (SPC) expertise for evaluating techniques for effective hardware and software process controls. The contractor shall apply state-of-the-art statistical quality control techniques to the evaluation of variability in quality assurance processes as well as hardware and software development and manufacturing processes.

n. Support NASA chlorofluorocarbon (CFC) replacement activities.

4.5 ELECTRICAL, ELECTRONIC, ELECTROMECHANICAL (EEE), AND MECHANICAL PARTS WORK

a. Participate in establishment of parts reliability requirements; provide parts technology support for parts design, materials, and construction; and support preparation of parts specification, screening, qualification, derating, handling, vendor survey, destructive physical analysis, failure trending, and data submittal requirements.

b. Review JSC contractor parts plans and support SR&QA audits of their methods of requirements implementation.

c. Conduct reviews for compliance with contractual requirements. Items reviewed include, but are not limited to: parts selections, applications, assembly techniques, specifications, test requests, test data, nonstandard part approval requests, destructive physical analyses, and waivers. The contractor shall participate in the resolution of deficiencies.

d. Review ``as-built'' versus ``as-designed'' parts lists and provide findings to the JSC technical monitor.

e. Review parts problem reports and dispositions in accordance with established problem reporting processes. The contractor shall evaluate problem analyses and corrective action through engineering analysis and liaison with parts users and suppliers.

f. Review the impact or potential impact of ALERT issues and report findings to the appropriate Government official.

g Provide information for electronic data bases of parts lists, documentation review/approval status, and technology issues.

h. Support change control, certification, FMEA/CIL, problem reporting and corrective action (PRACA), milestones, and review.

i. Provide parts expertise to perform special studies and assessments.

j. Provide parts expertise to support the SR&QA laboratories as required.

k. Support the JSC engineering effort for establishing a JSC approved microcircuits list.

l. Provide Mechanical and EEE parts and ALERT reporting and processing support for JSC flight preparation and operations activities including FRR's, PAR's, L-2 Reviews, and Mission Evaluation Room (MER) operations as required.

4.6 GOVERNMENT-INDUSTRY DATA EXCHANGE PROGRAM (GIDEP)/ALERT SYSTEM

a. Prepare and distribute ALERTS for subjects which are of mutual interest to JSC contractors and other NASA installations.

b. Review all ALERTS for applicability to JSC contracts and make appropriate distribution.

c. Evaluate JSC contractor responses to ALERTS relative to applicability to equipment and adequacy of closeout action.

d. Maintain the GIDEP/ALERT system files and distribution list.

e. Maintain the official JSC repository for GIDEP data and provide electronic access to computer reports. The contractor shall provide assistance in locating and obtaining copies of GIDEP alert reports and data. The contractor shall maintain a permanent phone number for receiving GIDEP inquiries.

4.7 SR&QA INSPECTION FUNCTION

The contractor shall provide the capability to perform the following services:

a. Perform destructive and nondestructive, physical, chemical, and metallurgical testing and analyses of raw materials, fasteners, and mechanical hardware/components. Fastener testing shall be conducted in accordance with the requirements of JSC 23642, ``JSC Fastener Integrity Testing Program.''

b. Perform Destructive Physical Analysis (DPA) for EEE parts, printed wiring boards, and assemblies; and perform electronic component screening and burn-in.

c. Provide support to the JSC Electrostatic Discharge (ESD) protection program as identified in JSCM 5300.1. This responsibility involves evaluation of ESD-protective materials, local JSC facility audits, and certification of the JSC facilities to ESD requirements.

d. Provide NDE testing, administered by ASNT certified Level III personnel, in the following methods: ultrasonics, magnetic particle, liquid penetrant, eddy current, and x-ray radiography. Provide testing in the acoustic emission method administered by personnel certifiable as Level II to the NASA NDE Program.

e. Develop and maintain certification courses for the following processes: hand soldering; crimping and wire-wrap; cable and harnesses; inspector recertification (soldering); lithium battery safety and handling; conformal coating, staking, and potting; fiber optic cable splicing; ESD control; and other process related courses as identified in the future. Provide a structured program for equipment proficiency training. In addition, provide NDE training for the methods in item ``d'' above that lead to a Level I and II certification following course completion.

f. Provide for a comprehensive training and cross training program for all personnel assigned to provide SR&QA Inspection services. The contractor shall conduct formal and informal training of personnel to maintain proficiency and permit maximum utilization of personnel for performing various SR&QA Inspection Services.

g. Perform testing and analyses of manufacturing techniques, processes, and procedures pertaining to welding, soldering, electrical wire certification, surface mount technology and printed wiring boards/circuits, heat treating, EEE and mechanical parts, interconnecting wiring, electrostatic discharge control, conformal coating and encapsulation, staking, bonding, and contamination control.

h. Perform tests to certify flight electrical wire and cabling to applicable specification requirements. These tests shall involve dimensional, dielectric strength, conductivity, and other metallic and nonmetallic property analyses.

i. Provide a Quality Assurance function that continuously ensures that tests and analyses are maintained at the required precision and accuracy, and retains full conformance to the JATL QA Manual.

j. Assure the A2LA and ISO accreditation is maintained current for all lab disciplines; secure other accreditation/certification as appropriate to meet JSC requirements.

k. Plan, coordinate, and manage the resources to perform SR&QA Inspection Services, in accordance with established baselines. In addition, the contractor shall maintain a prioritized long term list of equipment needs that ensures structured planning for growth in the SR&QA inspection services requirements.

l. Provide for the maintenance and improvement of the Laboratory Information Management System (LIMS). The LIMS, manufactured by Laboratory MicroSystems, Inc., is a personal computer resident data base that provides automated sample tracking, data collection, and report generation functions.

The contractor's responsibility with respect to the SR&QA inspection services includes the overall responsibility for continually assessing functionality and potential for improvement, and recommending changes as appropriate. Changes requiring replacement, upgrade, or addition of facilities items will be accomplished subject to G.15, ``Providing Facility Items.''

4.8 PRESSURE SYSTEMS

The contractor shall provide engineering and technical support for the JSC pressure systems certification program as outlined in JSCM 1710.1D, ``Design, Inspection, and Certification of Pressure Vessels and Pressurized Systems.'' The contractor shall:

a. Review and certify compliance of Pressure Vessel System (PV/S) designs.

b. Review and certify compliance of PV/S certification inspection and testing procedures.

c. Perform pressure vessel inspections (See DRD No. 12).

d. Monitor PV/S tests.

e. Maintain a computerized inventory/recall system to document, track, and schedule all PV/S tests and inspections.

Inspection personnel shall posses a commission from the National Board of Boiler and Pressure Vessel. Inspectors shall be certified by the American Welding Society to perform weld inspections. Copies of certifications/ commissions shall be provided to the COTR.

4.9 QUALITY ASSURANCE AND INSPECTION

The contractor shall provide inspection support to flight and flight-related systems to assure that quality assurance requirements are satisfied. The contractor shall:

a. Review and prepare quality assurance related documents.

b. Review work authorizing documents and recommend mandatory inspection points (MIP's).

c. Participate in JSC on-site material review board activities.

d. Perform physical inspections and witness tests in accordance with policies and quality plans. The contractor shall verify compliance with approved drawings, specifications, and procedures, and present findings. The contractor shall verify configuration control and configuration changes.

e. Maintain the Designated Verification (DV) program at JSC and ensure that all personnel receive the required training and certification to assure the program's efficient operation (JSC 25989).

f. Develop and monitor internal continuous improvement processes within each designated work area. The contractor shall provide metrics as required by events or schedules.

g. Support the JSC industrial safety effort through participation in the development and application of related training programs. The contractor shall monitor designated work areas and report safety deficiencies and/or violations to appropriate authority.

h. Operate JSC facility record centers.

4.10 GROUND SYSTEMS SOFTWARE

The contractor shall provide engineering assurance for software intensive ground systems residing at JS that support the design, development, and test of flight systems. This effort requires expertise in both hardware and software engineering assurance as well as expertise in the assurance disciplines of safety, reliability, and quality. The contractor shall:

a. Provide Mission Software Readiness Assurance (MSRA) for Shuttle flight software as defined in the MSRA plan (TIR 2K6110-144).

b. Provide Embedded Validation and Verification Assurance (EVVA) as required in NSTS 08271 and defined in the EVVA plan (TIR 2K6110-152).

c. Provide facility assurance support for the SAIL, Central Facility, JSC Avionics Engineering Laboratory (JAEL), Instrumentation Systems Laboratory (ISL), ground simulators, mission control centers, and integrated training facilities. The contractor shall:

(1) Perform shipping, receiving, inspection; coordinate official JSC acceptance documents; and maintain acceptance data packages of flight and ground software and facility hardware.

(2) Evaluate configuration management of facility hardware, software, and test articles.

(3) Review problems for process related causes, provide findings, and assist in assuring that corrective actions are taken.

(4) Review for compliance of software assurance plans, quality plans, procedures, processes, and reports; and report findings to JSC.

d. Complete JSCM 5212 QS - Software Assurance Manual.

e. Implement, apply, and update the Software Engineering and Assurance Standards.

f. Develop and implement MSRA for NASA programs as required.

g. Support JSC facility audits.

h. Review procurement documents for SR&QA software related requirements and provide findings and comments.

i. Support program milestone reviews such as Preliminary Design Reviews (PDR's), Critical Design Reviews (CDR's) by reviewing data packs and providing Review Item Dispositions (RID's) as necessary.

j. Support Prelaunch Assessment Reviews (PAR's) and Flight Readiness Reviews (FRR's) by providing assessment reports.

k. Support the preparation, review, and assurance of proper implementation of procedures, processes, inspection planning, and quality assurance requirements for JSC on-site ground systems.

l. Participate in test readiness reviews, design and requirement reviews, and acceptance reviews.

4.11 PROCUREMENT QUALITY SUPPORT

The contractor shall assist in preparation of quality assurance requirements for Government Source Inspection (GSI) at JSC prime contractors and other suppliers as necessary. This responsibility also involves supporting the monitoring and oversight functions of SR&QA related activities at JSC contractors and delegated source activities. The contractor shall:

a. Support the coordination and implementation of SR&QA requirements for various procurement activities with the appropriate procuring and technical organizations.

b. Provide input to assist in identifying the need for GSI and identifying the specific delegated requirements. Develop the letters of delegation for QA functions, and assist in the monitoring of the delegated responsibility.

c. Support the continuing oversight of contractual SR&QA requirements through participation in program and milestone reviews, the review of deliverable documents such as QA plans and procedures, and the coordination and resolution of SR&QA related issues associated with the contract.

d. Support QA survey/audit activities, maintain contract QA files, develop and maintain JSCM 5312 series Procurement Quality Assurance (PQA) related procedures in accordance with all JSC policies.

e. Maintain an employee training program in Government Procurement and QA activities.

f. Develop, analyze, and support the continuous improvement activities and develop PQA related metrics.

4.12 SAFETY AND HEALTH

The contractor will perform tasks to ensure the protection of personnel, property, equipment, and the environment in contractor products and activities generated in support of institutional and space flight program objectives. To ensure compliance with pertinent NASA policies and requirements and Federal, State, and local regulations for safety, health, environmental protection, and fire protection, the contractor will develop and implement a safety and health program in accordance with a safety and health plan as approved by NASA. The contractor shall develop and implement risk management techniques (including risk assessment) to be applied to hazards derived from analyses of activities and products for the purpose of eliminating or controlling hazards as specified in NASA policies and requirements for hazard reduction (DRD 22).

4.13 Test Safety Spt added (mod 63) 8/4/99 4.14 Test Safety Officers effective 10/1/1999 Notify to COE ?

5.0 SHUTTLE SAFETY AND MISSION ASSURANCE (S&MA) WORK

The contractor shall be responsible for providing technical and administrative support to the JSC S&MA Division as defined in this section. The Shuttle S&MA Division is responsible for the definition, implementation, and oversight of safety, reliability, and quality engineering programs for the Orbiter and GFE Project Office and other Space Shuttle project elements. This division also provides the necessary technical support and expertise to the JSC Space Shuttle SR&QA Office (Level II) for the definition and oversight of similar assurance programs for other Shuttle project elements. In addition to providing and overseeing these assurance functions, this division provides independent assessments to the JSC SR&QA Office and the Office of Safety and Mission Quality at NASA Headquarters of Shuttle program technical issues or problems.

5.1 TECHNICAL SUPPORT

5.1.1 Hazard Analyses

The contractor shall be responsible for supporting the JSC Shuttle S&MA Division in the conduct and evaluation of hazards analyses and hazard reports for the Space Shuttle program as defined below:

a. Review Shuttle program contractor or GFE design, test, assembly, and operational data, including the results of any special studies, to identify areas requiring detailed safety analyses.

b. Review Shuttle program hazard reports and hazard report change requests for technical accuracy, validity, completeness, and acceptability and provide recommendations to the System Safety Review Panel (SSRP).

c. Perform selected hazard analyses of systems and subsystems to identify potential risk conditions and recommend actions to eliminate or control hazards or formulate risk acceptance rationale. Prepare associated Program Change Information Notice (PCIN) as directed.

d. Review Shuttle program and Orbiter and GFE project documentation including, but not limited to, change requests, OMRSD RCN's, LCC's, waivers, and deviations for possible impact to baselined hazard controls or risk acceptance rationale and provide recommendations to the Shuttle S&MA Division.

5.1.2 Failure Modes and Effects Analysis and Critical Items List (FMEA/CIL)

The contractor shall be responsible for supporting the JSC Shuttle S&MA Division in the conduct and evaluation of FMEA/CIL's for the Space Shuttle program as defined below:

a. Review FMEA's, CIL's, and CIL change requests for technical accuracy, validity, completeness, and acceptability and provide recommendations to the appropriate JSC Shuttle S&MA Division focal point.

b. Perform failure modes and effects analysis and prepare critical items lists on selected systems, subsystems, and components and prepare associated PCIN as directed.

c. Develop and implement analytical techniques for conducting FMEA's.

d. Review program and project documentation including, but not limited to, change requests, OMRSD RCN's, waivers, and deviations for possible impact to, and compliance with, CIL retention rationale and recommend disposition to the appropriate JSC Shuttle S&MA Division or JSC Space Shuttle SR&QA Office board representative as applicable.

5.1.3 Certification

The contractor shall be responsible for supporting the JSC Shuttle S&MA Division in Orbiter and GFE certification activities as defined below:

a. Support, coordinate, and maintain JSC requirements for certification activity.

b. Review certification requirements for components and higher levels of assembly for adequacy and compatibility and provide recommendations to the JSC Shuttle S&MA Division as required.

c. Review hardware verification plans to ensure that appropriate methods are utilized to verify specification requirements compliance and provide findings.

d. Review certification data, including Certification Approval Requests (CAR's) and analysis and test reports, and provide findings and recommendations to the JSC Shuttle S&MA Division.

e. Support qualification site approvals at supplier facilities.

5.1.4 Reliability

The contractor shall support the JSC Shuttle S&MA Division in implementing and overseeing Shuttle reliability programs as defined below:

a. Recommend reliability requirements to be imposed on the Space Shuttle program, its element project offices, contractors, suppliers, payload organizations, and international suppliers and agencies.

b. Support the JSC Shuttle S&MA Division in coordinating reliability requirements with other SR&QA offices, the Space Shuttle Program Office and its element project offices, Shuttle program contractors, other NASA installations, and/or international agencies as required.

c. Identify any conflicts between Shuttle program reliability requirements and any other JSC, NASA, or Federal requirements, policies, or directives and recommend resolutions.

d. Recommend revisions to program and project reliability requirements as necessary to be compatible with changing program needs or emphasis.

e. Participate in the review of other contractor or agency documents to ensure implementation of, and compliance with, baselined program reliability requirements.

f. Review and provide findings of design specifications and changes to ensure that applicable reliability criteria are utilized in the design of hardware.

g. Review JSC Shuttle program contractor controls for limited life/storage life for compliance with contractual requirements and provide findings to the JSC Shuttle S&MA Division.

h. Support S&MA to ensure that sufficient remaining life of equipment is available for the mission to which it is assigned and ensure that adequate provisions exist for the replacement or refurbishment of hardware before its specified age, operating cycles, or operating time is exceeded.

i. Provide reliability expertise to JSC SR&QA Problem Investigation Teams (PIT's) in accordance with JSC 25119.

5.1.5 Systems Safety

The contractor shall support the JSC Shuttle S&MA Division in defining, implementing, and overseeing systems safety programs as defined below:

a. Recommend systems safety requirements to be imposed on the Space Shuttle program, its project offices, contractors, suppliers, payload organizations, and international suppliers and agencies based on NASA regulations, directives, and/or other applicable or appropriate publications.

b. Support the JSC Shuttle S&MA Division in coordinating project and program safety requirements with the JSC Space Shuttle SR&QA Office and Shuttle program and project offices and their associated contractors.

c. Identify any conflicts between Shuttle program and project safety requirements and other JSC, NASA, or Federal requirements, directives, or policies and recommend resolutions.

d. Recommend revisions to program and project safety requirements as necessary to be compatible with changing program needs or emphasis.

e. Review other contractor or agency documents including policies and manuals for implementation of, and compliance with, baselined safety requirements.

f. Provide systems safety expertise to JSC SR&QA PIT's in accordance with JSC 25119.

g. Provide technical support to the JSC Space Shuttle SR&QA Office in identifying and reviewing significant risks that require special program emphasis.

5.1.6 Quality Engineering

The contractor shall support the JSC Shuttle S&MA Division in defining, implementing, and overseeing Shuttle quality engineering activities as defined below:

a. Recommend design standards, production standards, and other quality engineering requirements to be imposed on the Space Shuttle program, its element project offices, contractors, suppliers, payload organizations, and international suppliers and agencies.

b. Support the JSC Shuttle S&MA Division in coordinating project and program quality engineering requirements with the JSC Space Shuttle SR&QA Office and Shuttle program and project offices and their associated contractors.

c. Identify any conflicts between Shuttle program and project quality engineering requirements and other JSC, NASA, or Federal requirements, directives, or policies and recommend resolutions.

d. Recommend revisions to program and project quality engineering requirements as necessary to be compatible with changing program needs or emphasis.

e. Review other contractor or agency documents including policies and manuals for implementation of, and compliance with, baselined quality engineering requirements.

f. Provide quality engineering expertise to JSC SR&QA PIT's in accordance with JSC 25119.

g. Review inspection rationale for items identified on the critical items list and provide any recommendations to the Shuttle S&MA Division.

h. Review hazard reports to ensure appropriate inspections necessary for hazard control are identified and in place.

i. Support the certification of facilities other than the OEM for Space Shuttle equipment maintenance and repair.

5.1.7 Analytical Support

5.1.7.1 Computer-Aided Engineering (CAE) Analysis

The contractor shall perform CAE analyses in the following areas to support the JSC Shuttle S&MA Division or PIT's in identifying and/or resolving Shuttle program hardware problems or concerns. The contractor shall also be responsible for evaluating and recommending new computer hardware and software codes and capabilities and reporting analysis results and recommendations via memoranda or other suitable means.

a. Linear and nonlinear, static and dynamic structural analysis including stress, displacement, stability, fatigue, and fracture of metallic and nonmetallic materials.

b. Linear and nonlinear, steady-state and transient thermal analysis.

c. Kinematic and dynamic analysis of mechanical systems and mechanisms.

d. Manufacturing tolerance build-up analysis.

5.1.7.2 Fault Tree Analysis

The contractor shall conduct selected fault tree analyses of Shuttle systems or subsystems to identify critical hardware, software, and procedural failure paths.

5.1.7.3 Probabilistic and Statistical Analysis

The contractor shall perform probabilistic and statistical analyses to support reliability and probabilistic risk assessments for Shuttle systems, subsystems, and components.

5.1.7.4 Sneak Circuit Analysis

The contractor shall perform critical circuit analyses through use of hardware sneak circuit techniques to identify latent circuit conditions, design concerns, and drawing errors.

5.1.8 Payload Safety

The contractor shall provide evaluation of the implementation of JSC and NASA payload safety requirements delineated in NSTS 1700.7 by performing the following tasks:

a. Participate in working group meetings and formal and informal reviews of payload phase documentation and data as described in NSTS 13830 to asses payload hardware compliance with applicable payload safety requirements.

b. Identify any problems, deficiencies, or concerns and provide recommendations/findings to the JSC Payload and Crew Equipment Branch.

5.1.9 ALERTS

The contractor shall provide technical evaluations of SAFE-ALERTS and GIDEP/ALERTS to determine any Orbiter or common-use hardware impacts and provide recommendations to the JSC Shuttle S&MA Division or other JSC SR&QA offices as appropriate.

5.1.10 Problem Reporting and Corrective Action (PRACA)

The contractor shall evaluate and recommend disposition of CFE, GSE, and GFE problems, including Corrective Action Records (CAR's), Failure Investigation Action Reports (FIAR's), and in-flight anomalies (IFA's) in accordance with NSTS 08126 (Level II) and JSC 24636 (Level III). The contractor shall:

a. For CFE and safety critical GSE for which JSC has design responsibility, participate in problem review team (PRT) activities to ensure

proper classification and disposition of problems. Support project and/or program level boards as required for IFA identification and closure/ disposition.

b. For GFE, review FIAR's to ensure appropriate problem investigation has occurred and acceptable remedial and/or corrective action is identified. Coordinate FIAR disposition with the appropriate JSC personnel.

5.1.11 Software Support

The contractor shall support the JSC Shuttle S&MA Division in Shuttle software safety and mission assurance activities as defined below:

a. Evaluate all software DR's for possible safety impact and participate in closure activities by recommending solutions and effective correction dates. Maintain a continuous status of discrepancies.

b. Perform software safety analyses and evaluation of software change requests. Identify any safety impacts and recommend change request modification, or initiate new change requests if necessary, to ensure or improve systems safety or reliability.

c. Develop, document, and implement a process for performing integrated software/hardware operational and performance assessments including integrated system-level fault tolerance and effects analysis.

d. Evaluate appropriate tools and methodologies for performing software and integrated software/hardware analyses and document evaluation results. Provide recommendation for tools and methodology selection and implement as directed. After implementation, document any discrepancies with selected tools and methodologies and recommend solutions.

e. Participate in requirements inspections to ensure that software requirements are complete, testable, and properly expressed as functional, performance, and interface requirements.

f. Evaluate software verification plans to ensure that proper requirements and criteria for accomplishment of reliability verification are in place. Evaluate verification results to ensure that reliability features and performance have been adequately demonstrated.

g. Evaluate each phase of the software life cycle and provide recommendations to ensure implementation of and compliance with reliability requirements.

h. Provide analysis of code related problems; e.g., patches, interrupts, timing, sequencing, and interfaces. Provide assessment of patch complexity and desirability. Provide findings of risk versus trade-offs for software patching versus flying as-is.

i. Participate in software control boards and review sessions including, but not limited to, Software Readiness Reviews and software mode teams and participate in the development of new evaluation techniques.

j. Recommend corrective actions to eliminate or control any identified hazards.

5.1.12 Other Technical Support

The contractor shall support the JSC Shuttle S&MA Division in other technical areas and tasks as defined below:

5.1.12.1 Mission Evaluation Room (MER)

The contractor shall provide support to the JSC/MER Safety console during Shuttle missions. The JSC/MER Safety console provides 24-hour real-time mission support from prelaunch through postlanding as described in JSC 24074. This support shall consist of three 9-hour shifts for all Shuttle and payload mission operation activities. Specifically, the contractor shall:

a. Identify any potential safety issues occurring during missions involving Shuttle systems, ground support systems, payloads, or mission operations and provide an independent assessment including recommendations for resolution, to SR&QA and Shuttle program management.

b. Serve as a data resource to the MER for SR&QA data bases, including certification data, hazard reports, failure histories, and FMEA/CIL's.

c. Support the SSRP in the review of all documented problems or ``funnies'' occurring during missions and development of positions for the PRCB for official baselining of IFA's.

5.1.12.2 SR&QA Survey Participation

The contractor shall provide technical support for SR&QA survey activities in accordance with NSTS 22579. This support shall include:

a. Assisting in the development of a presurvey questionnaire designed to help determine the effectiveness of SR&QA program implementation.

b. Participating in the conduct of surveys and documenting findings and observations as appropriate.

c. Providing any required followup to ensure acceptable closure of survey findings and observations.

5.1.12.3 Documentation Reviews and Board Support

The contractor shall provide for the review of Shuttle program (Level II) and Orbiter and GFE project (Level III) documentation and provide technical support to Shuttle program and Orbiter and GFE project level boards as defined below:

a. Review Space Shuttle program and project documentation including, but not limited to, change requests, flight rules, crew procedures, LCC's, OMRSD RCN's, OMRSD and vehicle waivers and exceptions, for any safety or mission assurance impact including hazard controls and CIL retention rationale. Provide recommendations and technical findings to the appropriate JSC Shuttle S&MA or JSC Space Shuttle SR&QA Office focal point or board representative. Prepare technical briefings delineating SR&QA position and recommendations for present to the cognizant JSC board.

b. Support in the identification and ranking of program risks to be included in the Management Safety Assessment (MSA) and provide recommended actions for resolution.

c. Participate in working group sessions and program and project design reviews including, but not limited to, PDR's and CDR's to assess systems, subsystems, hardware, and software for possible S&MA impacts. Coordinate findings with the appropriate JSC or other NASA personnel and write and resolve RID's as necessary.

d. Provide S&MA inputs for the preparation for certification of flight readiness endorsements and provide technical support to critical program and project milestone reviews including, but not limited to, vehicle acceptance reviews, rollout reviews, and flight readiness reviews in accordance with NSTS 22778.

e. Participate in and provide technical support to SR&QA reviews such as PAR-5's, PAR's, or others as directed.

f. Perform and/or review contractor-prepared trade studies or other analyses such as hardware trend studies and element interface failure analyses for S&MA impacts and provide recommendations.

g. Provide technical support to SR&QA board representatives at project and program level change boards and meetings including, but not limited to, CCB's, OER's, SIR's, and PRCB's. Evaluate and provide closure recommendations for action items for which SSP SR&QA is OPR.

h. Review and provide evaluations for NSRS reports as directed.

5.1.12.4 Field Engineering Support

The contractor shall provide engineering personnel onsite at KSC to provide direct support to JSC SR&QA engineers in the identification and resolution of engineering, system, subsystem, and integration issues by providing necessary data and KSC on-site expertise for Shuttle program elements and operations. This support shall also include participation in program, project, or SR&QA meetings as required.

5.2 EXECUTIVE SUPPORT

The contractor shall provide the following support to the JSC Shuttle S&MA Division:

a. Support the conduct of SSRP's, Level III PAR's, and other Shuttle S&MA meetings as required including scheduling, agenda preparation and distribution, taking and distributing meeting minutes, and action item coordination and closure activities.

b. Maintain project schedules as directed.

c. Support the JSC Shuttle S&MA Division for project milestones as required.

d. Provide administrative support for change paper processing. Ensure that change requests are reviewed by the appropriate Shuttle S&MA Division technical personnel and prepare summary information for the responsible SR&QA board member.

e. Prepare minutes for Level III meetings as directed.

f. Provide administrative support to JSC SR&QA personnel as directed in the conduct of Level III surveys of prime contractor or suppliers.

g. Maintain the office schedule on the JSC electronic mail system (PROFS) for the JSC Shuttle S&MA Division's Manager for Orbiter and GFE Projects.

h. Provide administrative support for the generation and publication of NSTS 22973.

i. Maintain the Shuttle S&MA library in building 45 and off-site SR&QA support contractor facilities.

j. Maintain the information contained in Shuttle S&MA data bases such as HCCM, RAIS, IFA, etc.

k. Provide administrative support to PIT's in accordance with JSC 25119.

l. Coordinate SSRP activities with project level boards and panels (OER, CCB, etc.), as required.

m. Provide technical writers to support the payload safety process.

n. Scan existing documentation onto a CD ROM system.

o. Provide administrative support to the payload safety review process.

Note: Section 6 of this SOW will not be effective unless paragraph F.3, Section F, is exercised.

6.0 SPACE STATION PROGRAM (SSP) SAFETY AND MISSION ASSURANCE (S&MA) SUPPORT

The contractor shall provide S&MA support for Space Station S&MA engineering tasks. These engineering tasks assure definition and implementation of

appropriate safety, reliability, maintainability, and quality programs. At a minimum, these engineering tasks include: performing analyses, assessments, audits, reviews, and evaluations; preparing and presenting reports and briefings to the Space Station S&MA Division; and participating in meetings and review boards. Tasks shall be accomplished through direct involvement with NASA and other prime contractor's personnel on Integrated Product Teams (IPT) and Analysis and Integration Teams as an integral part of the independent assessment function and activities.

6.1 REQUIREMENTS DEFINITION SUPPORT

a. The contractor shall support the review, definition, preparation, and evaluation of S&MA requirements and design criteria to be implemented by JSC, contractors, payload organizations, and suppliers. The contractor shall ensure that requirements are measurable, verifiable, and based on NASA regulations, directives, and related publications and are tailored to the product and the program phase.

b. The contractor shall support the review, definition, preparation, and evaluation of S&MA procedural standards to be implemented by JSC, Space Station contractors, payload organizations, and suppliers. The contractor shall ensure that procedural standards are based on NASA regulations, directives, and related publications and are tailored to the product and the program phase.

c. The contractor shall review design specifications and changes to ensure that applicable SRM&Q design criteria are used in all subsystem hardware and software designs.

6.2 ANALYSIS SUPPORT

6.2.1 Analysis and Risk Assessment Process

The contractor shall develop, document, and implement an analysis and risk assessment process utilizing appropriate tools and methodologies to provide a sequence of activities capable of providing a quantitative and integrated program risk assessment. The process shall include, but not be limited to, assessment of program satisfaction of mission needs, identification of risk contributor at each life cycle phase, and analysis of the likelihood and severity of risk contributor.

6.2.2 Analysis Tools and Methods

The contractor shall develop and maintain analytical tools and data bases for use in S&MA analyses and risk assessments. The contractor shall maintain existing tools and data bases.

6.2.3 Reliability, Maintainability, Safety, and Quality Assurance Analyses

The contractor shall perform safety, reliability, maintainability, and quality analyses and provide reports as required in support of program level technical issues. At a minimum, the contractor shall:

a. Evaluate FMEA/CIL's to assess subsystems design compliance to failure tolerance requirements.

b. Perform failure modes and effects analyses and prepare FMEA/CIL documents for selected JSC GFE.

c. Develop, document, and utilize approved methodologies for integration of hardware failure mode and effects analyses and software fault tolerance analyses to derive system level fault tolerance and effects. This analysis shall include evaluation of system level Fault Detection, Isolation, and Recovery.

d. Perform and review trade studies and other analyses, such as hardware trend studies, element interface failure analyses, hardware/software interface analyses, etc., for reliability and maintainability impacts and provide findings and recommendations.

e. Review Space Station program hazard reports, assess the safety risks in the design/operations and associated controls, and provide findings and recommendations.

f. Perform selected hazard analyses of systems and subsystems including control inputs, system sequencing, and operational timelines to identify potential risk conditions and recommend actions to eliminate or control hazards or support the formulation of risk acceptance rationale.

g. Review Space Station design, test, assembly, and operational data, including the results of special studies, to establish areas requiring detailed S&MA analyses.

h. Conduct system analyses as required/directed. These may include, but are not limited to, selected system fault tree analyses, complexity analyses, numerical reliability estimation and prediction, probabilistic risk assessments, probabilistic engineering analysis, Reliability Block Diagram Analyses, RMAT (maintenance demand) analyses, and sensitivity/trade analyses.

i. Develop and document the methodology for a combined systems (hardware/software) numerical reliability assessment.

j. Provide expertise to support the following analyses and studies:

1. Functional systems analyses including control inputs, system sequencing, and operational time lines.

2. Dynamic, kinematic, thermal, and structural analyses.

3. Manufacturing tolerance studies.

k. Support the development and implementation of Software Quality Assurance procedures for Space Station software.

6.3 TECHNICAL REVIEW AND ASSESSMENT SUPPORT

6.3.1 Data Deliverable Assessments

Reserved

6.3.2 Milestone Reviews

The contractor shall prepare Space Station Program S&MA work plans and status reports regarding mission build and subsystem activities. The contractor shall participate in milestone reviews of documentation and data for requirements, design, and acceptance reviews. The contractor shall review and assess design review data packages and generate reports or required documentation (e.g., Review Item Dispositions (RID)). The contractor shall:

a. Participate in working group sessions, informal and formal reviews of program milestone documentation, and reviews of data to assess systems for S&MA implications. Coordinate findings with the SSP S&MA Division and prepare RID's.

b. Provide inputs for preparation of statements of readiness in support of milestone reviews (vehicle acceptance reviews, rollout reviews, flight readiness reviews, etc.).

c. Prepare assessment of hardware and software in support of program milestone reviews.

6.3.3 Material Review

The contractor shall review drawings and specifications for flight and flight-related hardware. The review shall address, but not be limited to, tolerances, manufacturing procedures, processes, inspection techniques, and NDE. The contractor shall participate in JSC material review boards (MRB's) and present findings and recommendations.

6.3.4 Technical Assessment

a. The contractor shall establish, manage, and maintain a process for the receipt, distribution, and tracking of technical documents such as specifications, change requests, and waivers/deviations. The contractor shall provide the interface with appropriate organizations and personnel to transmit the results of review of these documents. The contractor shall provide periodic reports of the status of these reviews.

b. The contractor shall review technical documentation such as specifications, change requests, and waivers/deviations for compliance with S&MA and program requirements and provide findings.

c. The contractor shall provide technical support to Space Station program boards, including, but not limited to, the SSCB, SSAIT, S&MA, and AIT.

d. The contractor shall establish, manage, and maintain a process for tracking of Space Station Program action items for which SR&QA is the Office of Prime Responsibility (OPR). The contractor shall process, evaluate, and provide closure recommendations for action items as required.

e. Station/Shuttle Interface

1. The contractor shall assist the Space Station S&MA Division in identifying, coordinating, and resolving SR&QA issues concerning requirements involving the SSP/Space Station Integration.

2. The contractor shall review PSRP packages for Space Station Program hardware and provide technical support to PSRP's which address Space Station Program hardware.

3. The contractor shall provide technical and executive support to the JSC Space Shuttle SR&QA Office for Space Station Program activities which include, but are not limited to, the SSP/Space Station Program Joint Integration Management Panel (JIMP), the Joint Program Review Board (JPRB), and the preparation of SR&QA presentations as required.

f. The contractor shall assist the Space Station S&MA Division in evaluating IP element design and S&MA documents to identify and resolve SR&QA issues concerning requirements compliance (implementation).

g. The contractor shall participate in technical meetings in support of the Space Station Program. These meetings include, but are not limited to, Technical Interchange Meetings, IPT/AIT meetings, S&MA team meetings, and flight system software requirements mode team meetings.

6.4 SYSTEMS TEST AND VERIFICATION SUPPORT

6.4.1 Verification Test Requirements/Plans/Testing

The contractor shall:

a. Review Space Station Program verification requirements and provide findings.

b. Review program/project verification plans and development and acceptance test plans and provide findings. The contractor shall participate in test readiness reviews (TRR's).

c. Review development and acceptance test procedures and provide findings.

d. Monitor and evaluate selected development, acceptance, preinstallation, and prototype testing and support demonstrations.

e. Evaluate subsystem verification plans to ensure that appropriate methods are identified which will verify specification requirements compliance. The contractor shall review verification test results for compliance to test plan requirements.

f. Review and present findings and recommendations to NASA on the test requirements for environmental acceptance tests.

g. Review and provide an assessment report of the software test plans, software code walkthroughs, and reports. The contractor shall evaluate software verification plans and requirements to ensure proper preparation and criteria for accomplishment of verification of Safety, Reliability, Maintainability, and Quality Assurance requirements.

h. Assess spaceflight hardware and/or upgraded test hardware for reuse and provide findings.

i. Review and provide findings for hardware and software Acceptance Data Packages.

6.4.2 Certification Requirements/Plans/Testing

The contractor shall review certification plans and provide findings, participate in test readiness reviews, and review and provide findings to support recommendations to certification requirements documentation and certification test and analysis reports. The contractor shall support qualification site approvals at supplier facilities.

6.4.3 Maintainability Verification

The contractor shall review and evaluate maintainability verification plans and results and provide findings and recommendations. The contractor shall support the Weightless Environmental Training Facility (WETF) testing.

6.5 PRODUCTION (MANUFACTURING) SUPPORT

6.5.1 Inspection Planning Review

The contractor shall review and prepare assessment reports on contractor quality inspection planning. The contractor shall review and assist in the development of CIL inspection rationale. The contractor shall review hazard reports to ensure that hazard controls which require verification by inspection are identified. The contractor shall review work documents including, but not limited to, test preparation sheets and test procedures to establish mandatory inspection points.

6.5.2 Production Readiness Review

The contractor shall participate in production readiness reviews by providing technical expertise for assessing Space Station Program contractors capability to proceed with production.

6.5.3 Audits

The contractor shall provide technical support to the Space Station S&MA Division as required for the periodic assessment of the effectiveness of Space Station contractors for SR&QA programs. At a minimum, the contractor shall:

a. Conduct periodic assessments of the effectiveness of Space Station program contractor S&MA programs.

b. Develop preaudit questionnaire designed to determine effectiveness of program plan implementation.

c. Review questions and responses with Space Station program contractors and the Space Station Program S&MA to determine compliance with requirements.

d. Provide followup support to close any open findings from audits.

e. Evaluate Space Station contractor's implementation of contractual S&MA requirements and prepare assessment reports, as required.

f. Perform special assessments of problems as required and prepare a report on the findings.

6.6 PROBLEM REPORTING, INVESTIGATION, AND CORRECTIVE ACTION SUPPORT

The contractor shall provide technical evaluations of problems and shall assure timely resolution and corrective actions. At a minimum, the contractor shall:

a. Review failure reports and evaluate proposed recurrence control for S&MA related issues in accordance with assigned deadlines. The contractor shall provide analysis and prepare technical recommendations pertinent to Space Station failure reports.

b. Participate in selected failure analysis activities and special problems investigation teams. The contractor shall provide required support to appropriate boards and review teams.

c. Support failure analysis, investigations, and corrective actions both on site and at contractor and supplier facilities. When required, the contractor shall investigate problems which have occurred at fabrication, assembly, test, and launch facilities, and provide recommendations for solution to appropriate NASA personnel.

d. Review suspect anomalies with appropriate JSC engineers and specialists for the identification of anomalies to be documented as problems requiring recurrence control.

e. Develop and review trend analyses on failure and nonconformances. The contractor shall use the results of trend analyses in support of problem resolution reviews and in presentations to NASA milestone reviews.

6.7 OPERATIONS SUPPORT

6.7.1 Launch Preparation

a. The contractor shall provide support for the development and review of integrated operations scenarios, flight rules; FDF procedures, Payload Integration Plans (PIP); Mission Integration Plans (MIP); Test, Operations and Maintenance Requirements and Specifications (TOMRS), prelaunch processing requirements and program and project documentation requirements as they pertain to the Space Station Program.

b. The contractor shall support NASA in the certification of facilities other than the original equipment manufacturer for Space Station equipment maintenance and repair.

6.7.2 Readiness Reviews

The contractor shall prepare and present summary analyses/briefings covering technical issues and open work in support of Software Readiness Reviews, Prelaunch Assessment Reviews (PAR's), Flight Readiness Reviews (FRR's), and L-2 Reviews. The contractor shall review and track status of S&MA tasks to determine possible constraints to launch site flow and rollout reviews. The contractor shall provide evaluations for Cargo Integration Reviews (CIR's).

6.7.3 Operational Maintenance

The contractor shall review and present findings on maintenance strategies, crew maintenance procedures inspection requirements, manpower assessments, logistics, spares planning, and maintenance data collection plans. At a minimum, the contractor shall:

a. Maintain JSC guidelines for the preparation of maintainability analyses and maintainability analyses summaries. The contractor shall evaluate the maintainability analyses summaries submitted by contractors and prepare technical critiques.

b. Verify that adequate provisions exist for the replacement or refurbishment of hardware before a specified age, operating time, or operating cycle is exceeded.

7.0 SPACE SHUTTLE SR&QA OFFICE SUPPORT

The contractor shall provide technical and executive support to the JSC Space Shuttle SR&QA Office in the conduct of SR&QA responsibilities as described in NSTS 10681B for the Space Shuttle Program. The function of the JSC SSP SR&QA Office is to ensure implementation of NASA Headquarters program safety, reliability, maintainability, and quality assurance policies and directives by all Space Shuttle project elements and to provide, as applicable, reasonable guidelines for their application. This office responds to SSP action items and requests and acts as the interface between SSP and the SR&QA project office organizations.

7.1 MEETING AND BOARD SUPPORT

7.1.1 Program Meetings and Boards

The contractor shall provide the focal point for the JSC SSP SR&QA Office at PERB's, SIR's, Daily SPRCB's, PRCB's, and other program level boards or meetings. Specifically,

a. The contractor shall provide support to the applicable JSC SR&QA board by coordinating all prebriefings and requests, including preparation of briefing books, prior to the meeting or board as directed.

b. The contractor shall attend program level meetings and boards as directed and document and post results on the SR&QA electronic (PROFS) bulletin board.

7.1.2 SR&QA PAR Support

PAR = Prelaunch Assessment Review

The contractor shall support SR&QA PAR's as defined below:

a. Coordinate the scheduling and conduct of PAR teleconferences as directed with other NASA centers, Headquarters, and Shuttle program prime contractors as required.

b. Participate in PAR-5's to establish PAR agendas and data requirements.

c. Ensure that PAR charts and other materials, including those from other centers, are faxed or distributed to all PAR participating centers and organizations prior to the meeting.

d. Ensure that briefing charts displayed on the screens at JSC are consistent with the presentation being given.

e. Distribute action items list to appropriate personnel.

f. Participate in enhancement studies of PAR network and associated audio/video equipment.

g. The contractor shall maintain the status of SSP SR&QA tasks and action items in support of regular program and SR&QA milestone reviews including, but not limited to, launch site flow reviews, OPF roll-out reviews, PAR's, and FRR's.

h. Maintain and operate the PAR room.

i. Maintain the Prelaunch Communication Network System (PCNS).

j. Prepare charts and briefing book for the SSP SR&QA office's FRR and L-2 briefings at KSC.

7.1.3 PAR Conference Services

The offeror shall provide the capability to support the conduct of PAR's at the contractor's off-site local location. This capability is required to conduct PAR meetings between SR&QA personnel at JSC and other centers. The contractor shall also support directorate level SR&QA meetings and other work under this contract at the contractor's local off-site location.

a. The contractor shall provide the following capabilities utilizing PAR-dedicated Government-furnished property (GFP) to be provided at contract start (see reference item SRQ-29). Replacement and/or enhancement of PAR-dedicated GFP in the event of failure, obsolescence, or technology advancement shall be provided by the contractor in accordance with H.7, ``Providing Facility Items.''

1. Connection of three computer systems to the SR&QA Novell network with two of the PC's having a dedicated phone line attached to the modem.

2. Capability for simultaneously receiving and transmitting data faxes.

3. Laser and paint jet printing capability.

4. Voice recording capability with a talking clock and calendar.

5. A 4-wire phone system with a minimum of 14 speaker outlets.

6. Digital image handling capability.

b. The following are PAR requirements for which no GFE will be provided at contract start:

1. Capability for seating a minimum of 14 people at the conference table.

2. Capability to seat a minimum of 60 additional people in the room.

3. Slide projection (overhead rear projection) capability including a minimum of two screens.

4. Video recording and playback capabilities.

5. Electronic control and sound amplification capability.

6. A private courtesy phone area with a minimum of three courtesy phones.

7. Additional work table space.

8. Furniture necessary to accommodate the equipment.

7.1.4 Special Program Reviews

The contractor shall provide technical and executive support to the JSC SSP SR&QA Office during special program and project reviews such as PDR's, CDR's, or others as directed.

7.2 SR&QA DOCUMENTATION SUPPORT

The contractor shall maintain the Shuttle program documents for which the SSP SR&QA Office is assigned as the Office of Primary Responsibility (OPR), including but not limited to, the following:

a. NSTS 22778 Commit-To-Flight Assessment Review Process Operating Plan

b. NSTS 22579 SSP SR&QA Survey Program Plan

c. NSTS 10681 SSP SR&QA Program Plan

d. NSTS 22254 Methodology for Conduct of Space Shuttle Program Hazard Analyses

e. NSTS 22206 Space Shuttle Requirements for Preparation and Approval of FMEA and CIL.

f. NSTS 08399 NSTS CIL

g. NSTS 23538 Program Risk Summary

7.3 SSP JOINT SURVEY SUPPORT

The contractor shall maintain and support the implementation of the SSP Joint Survey Program as defined in NSTS 22579 and the conduct of program and project level surveys as described below:

a. The contractor shall support the monthly SSP Joint Survey Planning meetings.

b. The contractor shall maintain and distribute joint survey schedules and status of findings and observations.

c. The contractor shall participate in selected surveys and provide technical and executive support during the conduct of surveys.

d. The contractor shall maintain an up-to-date historical/ chronological file of SSP Joint Survey Program records, directives, plans, procedures, and checklists.

7.4 SPACE SHUTTLE SR&QA KSC FIELD OFFICE

The contractor shall maintain a field office at the KSC to support the SSP SR&QA Office in review and oversight of activities at KSC. Specifically, the contractor shall:

a. Monitor SSP activities at KSC.

b. Update final charts for the SSP SR&QA FRR and L-2 briefings at KSC.

c. Support FRR and L-2 milestone reviews at KSC.

d. Support special reviews at KSC.

e. Investigate problems and issues at KSC.

8.0 DOWNEY, CALIFORNIA, FIELD RESIDENT OFFICE WORK

The contractor shall support the resident JSC SR&QA office in the review and oversight of prime contractor's SR&QA operations at Rockwell-Downey, Rockwell-Palmdale, or other contractor off-site facilities. Specifically, the contractor shall:

a. Develop local field office SR&QA procedures commensurate with JSC policies.

b. Provide on-site institutional and systems safety support.

c. Provide support to the SR&QA office in the oversight activity onsite at NASA and contractor facilities to monitor the procurement, fabrication, assembly, testing, and acceptance of hardware.

d. Develop and maintain a library of selected books and documents for the QARSO to provide convenient access to relevant information for the conduct of resident office activities.

e. Provide SR&QA data to JSC and support JSC SR&QA survey activity as required.

f. Provide the direct NASA/contractor interface for EEE and mechanical parts activities conducted by the prime contractor.

g. Review the prime contractor's procurement packages to and provide findings relative to adequacy of flowdown of technical and quality requirements; assist in the development of NASA quality assurance inspection functions to be delegated to other Federal Government agencies.

h. Provide on-site participation in the resolution of nonconforming and unsatisfactory conditions including material review board (MRB) activities.

i. Participate in milestone reviews as required.

j. Provide IRM services to the QARSO as specified in Section 10.0.

9.0 WSTF RESIDENT OFFICE WORK

The contractor shall support the QARSO-WSTF office in the review and overview of the WSTF site contractor operations.

The contractor quality assurance representatives shall support the QARSO in the final acceptance of products, test readiness, and critical support services through establishment and verification of mandatory inspection points, process audit, surveillance, and evaluation. The contractor shall support QARSO-WSTF in establishing priority and developing and maintaining WSTF quality policy in accordance with ANSI/ASQC Q91 (ISO 9001) and applicable portions of NHB 5300.4 (1D-2). In addition, the contractor shall perform Hazard and System Safety analyses and support with Safety Policy interpretation and development in accordance with JSCM 1700 and Federal and state regulations. The contractor shall:

a. Support final acceptance of critical test activities and materials.

b. Perform process evaluation, audit, and surveillance of site functions.

c. Prepare documentation as required by NASA procedures including, but not limited to, failure histories, discrepancies, process evaluation, survey, audit reports.

d. Review and present findings to or certify test documentation associated with qualification, verification, or acceptance testing of NASA flight or WSTF critical hardware, related equipment, components, and materials.

e. Participate in QARSO-WSTF formal test and safety readiness reviews.

f. Ensure the implementation of corrective actions and recurrence controls.

g. Participate in the resolution of nonconforming and unsatisfactory conditions, including material review board (MRB) actions.

h. Provide measurement identification and statistical analysis of WSTF contractor-supplied test support and technical processes data including, but not limited to:

1. Test planning and development
2. Test preparation and set-up
3. Test data acquisition and reporting
4. Flight operations
5. Safety and occupational health processes
6. Environmental compliance
7. Chemical/material analysis processes
8. Nondestructive evaluation/inspection applications
9. Procurement

10. Metrology
11. Training and certification
12. Shipping, receiving, and storage (logistics) processes
13. Clean room, contamination control processes
14. Fabrication and manufacturing processes
15. Configuration management
16. Pressure system certification
17. Managerial, administrative, and support services

10.0 INFORMATION AND RESOURCES MANAGEMENT (IRM) WORK

The contractor shall provide IRM support for the SR&QA Office in accordance with NASA IRM guidelines, policies and procedures including, but not limited to, the SR&QA ``Information Strategy Plan.'' The contractor shall provide hardware, software, and support services to support systems planning and operations; information strategic planning, network management; maintenance, operations and training; applications development and support; and IRM support for the Downey Field Office and other remote locations as required.

10.1 HARDWARE AND SOFTWARE

The contractor shall provide commercially available computer hardware for the contractor's use in supporting SR&QA development or upgrade projects. The contractor shall also provide all operating system, language, network, program development, debugging, and software tools necessary to support the laboratory computers, networks, and miscellaneous software. This hardware and software shall be compatible with existing Government systems.

10.2 SUPPORT SERVICES

10.2.1 Systems Planning and Operations Support

The contractor shall support systems planning and operations to ensure that SR&QA IRM meets the needs of the SR&QA user community. Under this task, the contractor shall:

a. Provide configuration control for new and existing SR&QA FIP resources in accordance with JSC configuration management plans, policies, and procedures.

b. Provide security in accordance with the JSC Automated Information Systems (AIS) Security Plan requirements.

c. Ensure adherence to guidelines, policies, and procedures of the SR&QA Office.

d. Identify SR&QA connectivity information needs.

e. Implement service level agreements.

f. Support system definition and analysis of FIPR requirements.

g. Provide integrity of SR&QA user community data and information systems.

h. Provide data verification methods.

i. Provide FIP resource planning including assisting the Government with documentation preparation (e.g., FRDD).

10.2.2 Information Strategic Planning

The SR&QA ``Information Strategy Plan'' contains the IRM vision, strategic objectives, current system configuration and related activities, proposed future system configuration and a plan for achievement. The contractor shall develop, operate, and maintain the SR&QA information systems in accordance with the ``Information Strategy Plan.'' Under this task, the contractor shall: (see DRD 20)

a. Provide support for data modeling

b. Provide support for strategic planning

c. Implement the SR&QA technology architecture

d. Maintain the ``Information Strategy Plan'' and establish requirements for updating general IRM plans and schedules on an ongoing basis

10.2.3 Network Management

The contractor shall provide network management support for all on-site and off-site SR&QA information systems. This support shall include but not be limited to the management of the SR&QA LAN and associated hardware and software. Under this task, the contractor shall:

a. Provide connectivity with systems outside the SR&QA in accordance with the ``Information Strategy Plan''

b. Perform server configuration identification

c. Implement common user interface improvements

d. Support data distribution needs

10.2.4 Maintenance, Operations and Training

The contractor shall operate and maintain the existing SR&QA information systems including the SR&QA LAN and associated hardware and software. The contractor shall provide training for IRM system users for all active computer systems managed by the IRM organization.

Under this task, the contractor shall:

a. Support anticipated growth of SR&QA systems by upgrading, replacing, and modifying existing SR&QA hardware and software, as needed.

b. Evaluate hardware and software to support IRM system development objectives.

c. Provide hardware and software to support IRM system development or upgrade projects.

d. Provide help desk support for all active computer systems managed by the IRM organization.

e. Provide technical and system administration support including but not limited to the SR&QA UNIX workstations.

f. Perform preventative and emergency maintenance.

g. Perform backup and recovery.

h. Provide contingency/disaster recovery for SR&QA LAN, file servers, and workstations.

10.2.5 Applications Development and Support

The contractor shall support the implementation of applications development for engineering analysis tools and data base, communication, and network operating systems. Under this task, the contractor shall:

a. Develop, maintain, and operate a management information system for program management information.

b. Support and develop data base software for systems on a continuing basis as the operating system requirements evolve.

c. Support the planning and development of new hardware and software technology insertions.

d. Support DOS, UNIX, and Macintosh based applications development.

10.2.6 IRM Support to Downey Field Office

The contractor shall provide IRM support to the Downey field office. This support shall include network management; maintenance, operations, and training; and applications development and support.

11.0 SR&QA MANAGEMENT SUPPORT WORK

11.1 TRAINING AND CERTIFICATION

The contractor shall maintain a comprehensive training program. The contractor shall provide certification for individuals working in designated positions where certification is required. When certification by an outside organization is required, the SR&QA contractor shall arrange the required training associated with those certification cases. Specifically, the contractor shall: (see DRD 18)

a. Maintain a comprehensive training program.

b. Provide certification to meet individual position requirements.

c. Maintain a complete data base on training curricula, trainee certification, course schedules, and employee training requirements and plans.

11.2 WORK PLANNING

The contractor shall provide a work planning process that is available to the whole SR&QA organization for individual work planning, organizational work planning, or project work planning. Schedules or other work planning products that include milestones from selected outside organizations shall be provided on a routine basis. Specifically, the contractor shall:

a. Provide a weekly review of selected schedules or other work planning products. Update these products as directed.

b. Provide and maintain a work planning system that meets the needs of the user community (see the Information Strategy Plan, Section J, Reference Documents).

11.3 CORRESPONDENCE AND LIBRARY CENTER

The contractor shall maintain and operate the SR&QA library for present and future programs. Under this task, the contractor shall:

a. Operate and maintain the system for storage and retrieval of SR&QA data including specifications, procedures, reports, and correspondence utilizing digital/electronic and microfiche or hard copies, as necessary.

b. Maintain information on policies including, but not limited to, NASA handbooks and management directives.

11.4 SR&QA CONTINUOUS IMPROVEMENT PLAN

The contractor shall manage and support the approach and development of overall continuous improvement initiatives as outlined in various SR&QA continuous improvement documents (i.e., the SR&QA Vision Statement; SR&QA Mission, Goals, and Objectives; SR&QA Strategic Planning Process; and the SR&QA Operational Plan). The ultimate objective is the satisfaction of all SR&QA customers by working faster, better, and cheaper. Specifically, the contractor shall perform the following:

a. Develop, promote, and implement a comprehensive approach to continuous improvement.

b. Facilitate the development and deployment of strategic plans for all SR&QA organizations.

c. Provide measurements indicating results supporting the strategic goals and objectives.

d. Provide expertise in measurement, process analysis, and statistical applications.

e. Maintain the SR&QA continuous improvement documents.

f. Provide a record of continuous improvement activities and associated results.

12.0 CONTRACT MANAGEMENT AND ADMINISTRATION

The contractor shall perform all necessary management and administrative tasks in order to satisfy the requirements of this contract. These tasks include resources management, contract administration, technical management, and administration of assigned subcontracts. This also includes providing NASA management with contractor quality metrics (see DRD No. 27).

12.1 MANAGEMENT PLAN

The contractor shall provide and maintain a Management Plan which identifies how the contractor, including team members and subcontractors, will manage and administer the resources, staff, and materials necessary to satisfy the requirements of this contract (see DRD No. 23).

12.2 TECHNICAL MANAGEMENT

a. The contractor shall participate in status reviews with Government personnel as required to implement the requirements of the SOW.

b. The contractor shall provide status concerning FRDD's prepared for NASA procurements and updates. The contractor shall provide updates to the FRDD to request approval of planned FIPS resource acquisitions.

12.3 QUALITY MANAGEMENT SYSTEM

The contractor shall support JSC SR&QA development and implementation of an ISO 9000 compliant quality management system and subsequent third party registration of that system. This includes participating independently and with JSC personnel in preparing system level procedures and detailed work instructions for JSC approval. This also includes providing appropriate training for contractor personnel, and other related activities and coordination which may be required to support development and implementation of the required quality management system.

Modifications to SOW

(Please Note that Page C-43 was modified via Contract Modification 9)

2. This modification revises the Statement of Work 2.3 MANAGEMENT AND ADMINISTRATION to include the following:

2.3.1 Year 2000 Compliant

(a.) "Year 2000 compliant," as used herein, means that the information technology (hardware, software and firmware, including embedded systems or any other electromechanical or processor-based systems used in accordance with its associated documentation) accurately processes date and date-related data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, and the years 1999 and 2000 and leap year calculations, to the extent that other information technology, used in combination with the information technology being acquired, properly exchanges date and date-related data with it.

(b.) Any information technology provided, operated and or maintained under this contract must be Year 2000 compliant. To ensure this result, the Contractor shall provide documentation describing how the IT items or services demonstrate Year 2000 compliance, consisting of standard product literature or test reports for commercial items, and test procedures or certification for developmental IT.

(c.) Milestones for Renovation, Validation and Implementation: Any IT determined to be non-Year 2000 compliant shall be replaced, retired, or repaired in accordance with the following schedule:

- "Renovation" includes making and documenting software and hardware changes, developing replacement systems, and decommissioning systems to be retired. The Contractor must complete renovation of affected software, hardware and firmware by September 30, 1998.

- "Validation" includes unit, integration, system, and end-to-end testing for Year 2000 compliance. The Contractor must complete validation and testing of converted or replaced systems by January 31, 1999.

- "Implementation" includes acceptance testing and integration of converted and replaced systems into a production environment. The Contractor must complete implementation by March 31, 1999.

(d) At a minimum, the Contractor shall provide documentation, including project plans and status reports, which demonstrate that the Contractor is meeting the milestones listed above.

(e) SAIC shall not have any Year 2000 responsibilities or compliance liability under Contract NAS 9-19180, except any hardware, software, or firmware that may be delivered by SAIC under this contract.

Contract NAS 9-19180
Modification 63

4.13 TEST SAFETY SUPPORT

Contractor support for test safety operations shall include risk and hazards evaluation of spacecraft systems such as life support systems, space suits, medical research equipment, thermal control systems, explosives, and other state-of-the-art space systems as they are operated in ground test facilities. These systems are tested in various environments such as vacuum, extreme temperatures, underwater environments, vibration, and zero-gravity. Tests included are those performed in support of space flight and institutional research and development objectives conducted at JSC, SCTF and Ellington Field, and tests involving JSC personnel (including test subjects) or hardware at off-site (local and distant) contractors.

4.13.1 TEST SAFETY PRODUCTS AND TASKS

The principle product of test safety support is the safety assessment. Safety assessments shall be used for system man-rating, Astronaut training, development, certification, and flight acceptance testing.

4.13.2 Safety Assessments of Test Documentation. The contractor shall support design, planning, and readiness meetings concerning manned and unmanned hazardous tests at JSC including selected Astronaut training operations of a hazardous nature. Test documentation such as manned test plans, test procedures, test protocols, and supporting documentation such as hazard analyzes, etc., shall be reviewed. Prior to tests, recommendations for approval or disapproval of this documentation shall be processed as outlined in the current SR&QA ISO work instructions.

4.13.3 Safety Assessments of Test Operations. Selected tests shall be observed by certified test safety officers as part of the test team and safety observations and issues reported to the test director or equivalent as required by the rules of conduct identified for the specific test. All findings, issues, and instances of noncompliance with the safety features of the test shall be documented in accordance with the current SR&QA ISO work instructions. Assignment of test observers shall be made at the discretion of the contractor with test priority as follows (highest first):

4.13.3.a Manned tests (especially those involving Astronauts and those involving human research using test subjects)

4.13.3.b Hazardous unmanned tests involving flight or flight-like equipment

4.13.3.c All other hazardous unmanned tests

4.13.4 Human Research

4.13.4.a The contractor shall provide support to representatives of the Occupational Safety Group for human research investigations, protocols, and meetings. Human research protocols and procedures which subject personnel to medical procedures, etc., shall be reviewed by the contractor for safety implications. Safety implications shall normally cover the test safety disciplines described in JHB 1700.1, "JSC Requirements Handbook for Safety, Health, and Environmental Protection," latest version, and in accordance with JSC Institutional Review Board policies. These processes shall be documented in accordance with the current SR&QA ISO work instructions.

4.13.4.b The contractor shall prepare and present safety assessments as findings and recommendations to NASA after a review of pertinent documentation such as test and medical procedures, hazard analyses, investigation protocols, etc. These processes shall be documented in accordance with the current SR&QA ISO work instructions.

4.13.4.c Institutional Review Board – Support to representatives of Occupational Safety Group for human research investigations and protocols and meetings and may include review and resolution of action items.

4.13.5 Essential Test Facilities and Operations to be Supported

The contractor shall provide support for all test facilities listed below.

4.13.5.a Manned Test Facilities

4.13.5.b Building 7 – Vacuum and Man-rated chambers

4.13.5.c Building 32 – Vacuum, hyperbaric, hypobaric, and man-rated chambers

4.13.5.d Building 29 – Bioplex

4.13.5.e KC-135 aircraft based at Ellington Field – Tests involving human subjects

4.13.5.f Building 37 – Pre/post flight testing of human test subjects

4.13.5.g Building 266 – Pre/post flight testing of human test subjects

4.13.5.h Building 9 – Flight Crew training in flight simulators and mockups

4.13.5.i Sonny Carter Training Facility (SCTF) – Weightless environment testing in the Neutral Buoyancy Laboratory

4.13.5.j Russian Hydrolab

4.13.5.k Other locations as designated by the Contracting Officer

4.13.6 Unmanned Test Facilities

4.13.6.a Building 222 – Arc-jet

4.13.6.b KC-135 aircraft based at Ellington Field – Unmanned hazardous testing not involving human subjects

4.13.6.c Building 260 – Training and Test Facility (radiant heat testing)

4.13.6.d Building 300 Complex (Energy Systems Test Area) – propellants, explosives/pyrotechnics

4.13.6.e Building 7 – Flight crew equipment testing (high altitude and vacuum chambers)

4.13.6.f Building 31 – Hypervelocity Impact Laboratories

4.13.6.g Building 9 – Robotics testing and other simulators which are not defined as manned test (such as the Manipulator Development Facility (MDF), Six-Degrees-of-Freedom Dynamic Test System (SDTS), Air Bearing Floor (ABF), Automated Robotics Maintenance of Space Station (ARMSS – includes robotics simulators on gantry towers), various laboratories for robotics and virtual reality systems, Multi-use Remote Manipulator Development Facility (MRMDF)

4.13.6.h Building 33 – Space Environment Effects Laboratory

4.13.6.i Building 34 – Laboratory Support Facility

4.13.6.j Building 44 – Communications and Tracking Development Laboratory

4.13.6.k Building 14 – Antenna and Tracking Development Laboratory

4.13.6.l Building 16 – Avionics Systems Laboratory

4.13.6.m Building 13 – Structures and Mechanics Laboratory (static load testing)

4.13.6.n Building 49 – Vibration and Acoustic Test Facility

4.13.6.o Building 267 – Hypervelocity Impact Laboratories

4.13.6.p Building 31 – Petrology Laboratory

4.13.6.q Building 32A – Mobile Robot Laboratory

4.13.6.r Building 16A – 'Dome' Aft Cockpit Simulator (DACS)

4.13.6.s Other locations as designated by the Contracting Officer

4.13.7 Test Support Augmentation

The contractor is responsible for identifying to the COTR any other facilities or operations which include hazardous test.

4.14 Test Safety Officers (TSO's). Test Safety Officers (TSO's) shall have knowledge of manned and unmanned vacuum technology, cryogenics systems and operations, underwater operations as related to SCUBA diving, pressure suits, hypobaric and hyperbaric physiology, general aviation safety, explosive safety; and a general knowledge of mechanical, electrical, and chemical engineering practices. Test Safety Officers (TSO's) shall complete specialized training for their assigned areas which shall be documented in JHB 5312.7, and have knowledge of the requirements in 1.1.3.3 for Safety Engineers. Because each test area is unique, training certification requirements shall be developed on an individual assignment basis subject to approval of the Occupational Safety Group.

4.14.1 The contractor shall be responsible for establishing and operating a thorough, complete and accurate TSO training program covering the following:

4.14.1.a The qualification requirements consisting of education and experience as defined in the TSO's Training Guide, latest version.

4.14.1.b Formal classroom, self study, and on-the-job training unique for each defined test area as specified in the TSO Training Guide, latest version.

4.14.1.c Successful completion of a written exam for the area in which he/she is to be certified

4.14.1.d Specified area test safety certifications, which may require TSO's to maintain current Class III flight physicals, current physiological training, and NASA self-contained underwater breathing apparatus certification.

4.14.1.e Recertification of TSO's is required after inactive periods of 6 months or more and a complete initial certification is required if inactive for more than 1 year.