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NASA

National Aeronautics and
Space Administration

Langley Research Center
Hampton, Virginia 23681-0001

SOLICITATION

1-64-GGH.1684

REQUIREMENT: Systems Engineering for Research Facility Integrated Systems (SERFIS)

IMPORTANT NOTICES:

Your attention is directed to Section L, Provision L.15, Proposal Preparation and Submission -- Special Instructions, for important information on proposal preparation. For Evaluation Information see Section M.

The Government intends to award the contract resulting from this solicitation without discussions (See Section L provision entitled Contract Award, FAR 52.215-16 (Oct 1995) Alternate II (Oct 1995)). We would like to avoid situations where proposals include substantive exceptions to the proposed contract terms and conditions which might be unacceptable to the Government and therefore preclude award. Therefore, it is requested and strongly recommended that you bring to the Government's attention prior to the proposal due date any exceptions, questions, or additions you have to the proposed contract terms and conditions. This will allow the Government to comment to all Offerors on the acceptability or nonacceptability of these exceptions (e.g. additions, deletions, changes) prior to proposal receipt). The resolution of any exceptions to terms and conditions prior to proposal receipt will aid the Government in its intention to award without discussions and thus streamline the procurement process.

In the event that the Government later determines discussions are necessary, they will be conducted in accordance with NASA FAR Supplement 1815.610.

OMB APPROVAL #: 9000-0008

SOLICITATION, OFFER AND AWARD

1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)	RATING	PAGE OF PAGE(S)
	DO-C9	1

2. CONTRACT NO.	3. SOLICITATION NO.	4. TYPE OF SOLICITATION	5. DATE ISSUED	6. REQUISITION/PURCHASE NO.
	1-64-GGH.1684	☐ SEALED BID (IFB) ☒ NEGOTIATED (RFP)	12/17/97	REQUISITION

7. ISSUED BY	CODE	8. ADDRESS OFFER TO *(if other than item 7)*
National Aeronautics and Space Administration Langley Research Center Hampton, VA 23681-0001		NASA, Langley Research Center 9A Langley Boulevard, Building 1195B, Room 125 Hampton, VA 23681-0001

RCT 12-17-9

NOTE: In sealed bid solicitations "offer" and "Offeror" mean "bid" and "bidder."

SOLICITATION

9. Sealed offers in original and 8 copies for furnishing the supplies or services in the Schedule will be received at the place specified in item 8, or if handcarried, in the depository located in Building 1195B (9A Langley Blvd.), Room 125 until 4:00 PM *(Hour)* local time 1/21/98 *(Date)* CAUTION-LATE Submissions, Modifications, and Withdrawals: See Section L, Provisions No. 52.214-7 or 52.215-10. All offers are subject to all terms and conditions contained in this solicitation.

10. FOR INFORMATION CALL:	A. NAME	B. TELEPHONE (Include area code) (NO COLLECT CALLS):
	Charlotte T. Hardy	(757) 864-2526

11. TABLE OF CONTENTS

(√)	SEC.	DESCRIPTION	PAGE(S)	(√)	SEC.	DESCRIPTION	PAGE(S)
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X	B	SUPPLIES OR SERVICES AND PRICES/COSTS	2			PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS	
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OFFER (Must be fully completed by Offeror)

NOTE: Item 12 does not apply if the solicitation includes the provisions at 52.214-16, Minimum Bid Acceptance Period.

12. SEE PROVISION K.16, OFFER ACCEPTANCE PERIOD.

13. DISCOUNT FOR PROMPT PAYMENT *(See Section I, Clause No. 52.232-8)*	10 CALENDAR DAYS %	20 CALENDAR DAYS %	30 CALENDAR DAYS %	CALENDAR DAYS %

14. ACKNOWLEDGMENT OF AMENDMENTS (The Offeror acknowledges receipt of amendments to the SOLICITATION for Offerors and related documents numbered and dated)	AMENDMENT NO.	DATE	AMENDMENT NO.	DATE

15A. NAME AND ADDRESS OF OFFEROR	CODE	FACILITY	16. NAME AND TITLE OF PERSON AUTH. TO SIGN OFFER (Type or Print)

15B. TELEPHONE NO. *(Include area code)*	15C. CHECK IF REMITTANCE ADDRESS IS DIFFERENT FROM ABOVE - ENTER SUCH ADDRESSIN SCHEDULE	17. SIGNATURE	18. OFFER DATE

AWARD (To be completed by Government)

19. ACCEPTED AS TO ITEMS NUMBERED	20. AMOUNT	21. ACCOUNTING AND APPROPRIATION

22. AUTHORITY FOR USINGOTHER THAN FULL AND OPEN COMPETITION	23. SUBMIT INVOICES TO ADDRESS SHOWN IN *(4 copies unless otherwise specified)* ▶	ITEM
☐ 10 U.S.C. 2304(c) ( ) ☐ 41 U.S.C. 253(c) ( )		

24. ADMINISTERED BY (if other than item 7) CODE	25. PAYMENT WILL BE MADE BY
	Financial Management Office Langley Research Center, MS 175 Hampton, VA 23681-0001

26. NAME OF CONTRACTING OFFICER (Type or Print)	27. UNITED STATES OF AMERICA (Signature of Contracting Officer)	28. AWARD DATE

IMPORTANT - Award will be made on this Form, or on Standard Form 26, or by other authorized official written notice.

OMB APPROVAL #: 9000-0008

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PART I - THE SCHEDULE

SECTION B - SUPPLIES OR SERVICES AND PRICES/COSTS

6.1 SUPPLIES AND/OR SERVICES TO BE FURNISHED

The Contractor shall, to the extent specified herein, furnish all personnel, facilities, services, supplies, equipment and materials necessary to provide complete systems engineering of mechanical, fluid, and automation systems for research facilities, including design, development, fabrication, installation, integration, and activation as specified in Delivery Orders (DOs) issued pursuant to Clause G.6, entitled "Procedures for Issuing Delivery Orders." The types of work to be performed under such DOs is limited to the types of work incorporated by Clause C.1, Statement of Work

B.2 INDEFINITE DELIVERY CONTRACT

Pursuant to the Federal Acquisition Regulation (FAR) Parts 16.501-2 *and* 16.504, this contract *is* defined as an indefinite quantity type. The contract provides for an indefinite quantity, within stated limits, of supplies or services to be furnished during a fixed period, with deliveries or performance to be scheduled by placing orders with the Contractor. The total minimum and maximum dollar value of supplies or services to be acquired under the contract are set forth below:

Contract Minimum: The Government will issue DOs under this contract which provide for a minimum of $25,000 for the 5-year period of performance.

Contract Maximum: The Government issued DOs under this contract shall not exceed a maximum of $38,000,000.

B.3 CONTRACT FUNDING INFORMATION

Section I Clause 52.232.22, Limitation of Funds (APR 1984) may apply individually to Delivery Orders issued under this contract.

In accordance with the Limitation of Funds clause, each cost-type order shall specify the total amount allotted by the Government for purposes of payment of cost, exclusive of fee. In addition, each cost-type delivery order which includes fee shall specify an additional amount as obligated for payment of fee.

6.4 DELIVERY ORDER TYPE

Delivery order(s) will be issued on either a firm fixed price (FFP) basis or cost plus fixed fee (CPFF) basis.

B.5 CONSIDERATION

(a) The total fixed price will be set forth on individual FFP delivery orders.

(b) The total estimated cost and fixed fee will be set forth on individual CPFF delivery orders.

SECTION C - DESCRIPTION/SPECIFICATIONS/WORK STATEMENT

C.1 STATEMENT OF WORK - SYSTEMS ENGINEERING FOR RESEARCH FACILITY INTEGRATED SYSTEMS (SERFIS)

Part I - General

1.0 Background

Langley Research Center possesses a wide variety of unique aeronautical/ aerospace research facilities and systems. A continual rehabilitation program ensures that these facilities are well maintained and capable of providing state-of-the-art testing. New research equipment and systems are also periodically developed to expand the Center's test capabilities. Key elements of these activities are the development of enabling technologies and the adaptation of existing technologies to specialized mechanical, fluid, and automation components and subsystems and the integration of these subsystems into complete research systems. The integration frequently involves existing systems and facilities. The integrated systems must provide precise control of facility parameters, automation of normal operator functions, high reliability, and low maintenance cost.

2.0 Standards and Constraints

All designs, material selections, drawings, specifications, and other documentation produced under this contract shall conform to nationally accepted codes and standard practices. This shall include drawing requirements as contained in DOD-STD-100 and software requirements as contained in NASA-STD-2100-91. The Contractor shall provide all computer-generated drawings in AutoCAD, release 14 or later format.

Software development and assurance shall be in accordance with LHB 5300.4, Software Quality Assurance Handbook.

The Contractor shall visit the site as necessary to fully understand constraints and existing conditions for each DO and discuss the details of the work to be performed with the Contracting Officer's Technical Representative (COTR) and Technical Project Engineer (TPE).

Where appropriate, specific standards and constraints will be included in each DO.

Part II - Scope of Work

1.0 General

The Contractor shall provide complete systems engineering of mechanical, fluid, and automation systems for research facilities including design, development, fabrication, installation, integration, testing, and activation.

Specific requirements, including performance metrics, will be included in each DO. DOs will require complete engineering expertise and experience in order to accomplish work in the following areas:

1.1 Mechanical Equipment and Systems

The Contractor shall provide design and fabrication related engineering services for specialized mechanical research equipment and systems. Components include precision mechanisms and mechanical drives; hydraulic, pneumatic, and electric actuators; mechanical structures, including machine frames (plane and three-dimensional trussed); static and dynamic support structures for machinery; wailed structures; vacuum and pressure vessels; heat transfer devices; and integrated systems. Components will be subjected to a variety of environments including cryogenic and elevated temperatures (-450°F to 3500°F) which may require active heating or cooling subsystems. Additional

environments which require application of specialized knowledge include high pressures (up to 8000 psig), oxygen and hydrogen rich environments, specialty gases and fluids, high vibration and noise, and a full range of aerodynamic flow conditions ranging from low-subsonic to hypersonic speeds.

The Contractor shall provide fabrication of research equipment and related systems per completed final designs and applicable standards and constraints. Responsibilities will include purchase of materials, components, and subsystems; machining of structural and mechanical components; assembly of components and subsystems; quality assurance inspection of materials, components, subsystems, and systems; performance demonstration; and updates of design drawings to reflect as-built conditions.

The Contractor shall provide precision machining of complex contoured and mating surfaces, validation of contours and dimensions, weldment of structural and pressurized components, non-destructive examination of fabricated components and raw materials, and specialized processing such as plating, furnace brazing, surface hardening, and electro-forming. Materials will include common engineering materials as well as difficult to fabricate aerospace materials such as inconel, high strength maraging steels, precipitation hardening steels, titanium, and advanced composites. Completed components and systems will include model support, injection, and positioning systems; wind tunnels and components (e.g. nozzles, diffusers, screens, turning vanes, turbine blades, actuators, and test cells); flow survey devices; structural test systems, and robotics.

Critical components will require complete documentation of engineering design and analyses, material certification, fabrication procedures, verification of as-fabricated mechanical properties, testing, and demonstration of functional performance. When specified, the Contractor shall provide specialized design and analyses including solid modeling, finite element structural and thermal analysis, mechanism simulation, and fracture mechanics. The specialized design and analyses may require proficiency with the software programs FLUENT, FLUENT/UNS, PATRAN, NASTRAN, Pro/Engineer®, Pro/Mechanica, MathCAD®, Maple, Matlab®, and Mathmatica®, or equivalent.

1.2 Fluid Systems and Components

The Contractor shall provide design and fabrication of specialized research fluid systems and equipment. Components will include specialized valving, piping, heat exchangers, dryers, separators, compressors, filters, blowers, vacuum pumps, refrigeration systems, instrumentation, and control systems. Components and systems will handle hard vacuum to high pressures, cryogenic and elevated temperatures, and specialty gases (e.g. oxygen, hydrogen, pyrophoric gases, heavy gases, and corrosive and toxic gases and fluids). The design of components, systems, and fluids requires expertise knowledge in thermodynamics? fluid and gas mechanics, material compatibility, and safety precautions required for high energy systems. Completed equipment and systems will include high-speed and low-speed wind tunnels (closed circuit and blow down); plasma jets; thermal systems; high vacuum systems; cryogenic systems; high and low pressure gas systems; process heat exchangers and specialized cooling systems; heavy gas reclamation systems; research support utilities, such as high pressure steam; hydraulic and pneumatic systems; and associated control systems.

The contractor shall provide fabrication of equipment and related systems per completed final designs and applicable standards and constraints. Responsibilities will include specification and purchase of components and subsystems; fabrication of pressure vessels, heat exchangers, valve bodies and specialized components; assembly of all components and subsystems; subsystem checkout; and updates to drawings and documentation to reflect as-built and assembled configurations.

Critical components will require complete documentation of engineering design and analyses, material and component certification, fabrication and cleaning procedures, as-fabricated and assembled configuration, and demonstration of functional performance. When specified, the Contractor shall provide specialized analyses including computational fluid mechanics and process control simulation.

These analyses may require proficiency with the software programs CAESAR II, PULS, and AutoPIPE®, *or* equivalent.

1.3 Facility Automation Systems

The Contractor shall provide development of research facility automation systems, from concept through activation. Development includes system requirements specification and analysis; facility simulation, control strategy formulation and analysis; complete hardware/software specification and design; software implementation; system installation; hardware/software integration; system validation using facility simulations; on-site systems integration and checkout; and activation items including system tuning, acceptance testing, performance analysis, and facility personnel training. Efforts will require expertise in the following disciplines: Controls Engineering, Software Engineering, Computer Engineering, and Electrical / Electronics Engineering.

Systems will provide repeatable, precise, stable, multi-variable control of facility parameters and automation of normal operator functions. Typical systems involve operator workstations networked with embedded microcomputers that evoke responses in field equipment directly or through analog / digital controllers. These systems employ real-time operating systems at the microcomputer level to ensure deterministic responses to time-critical input events. In some cases, systems interface with Programmable Logic Controllers (PLCs) which provide primary safety functions or support automatic staging up and down of primary systems (such as fan drives) and auxiliary systems.

Facility simulation includes generation of linear and non-linear mathematical models of facility plant equipment using digital simulation programs such as Matlab® and Simulink®; validation of mathematical models using facility operational data; and characterization of facility processes. Related activities include development of control strategies based on conventional methods and newer technologies such as fuzzy logic and neural networks; implementation and verification of control algorithms suitable for the target hardware; and validation of actual hardware and software components prior to installation at the facility.

Software implementation will require using cross-development and self-hosted computer-based tools (e.g. compilers, linkers, loaders, debuggers, translators, graphical user interface builders, etc.) to create facility control and operator interface applications. At least two software development environments will be used: EPICS (Experimental Physics and Industrial Control System) and Labview®. EPICS is a software development and run-time environment originated by the Department of Energy. The Government will furnish the EPICS software to Contractors for DOs requiring its use. Labview® is a commercially-available, graphical programming environment which is compatible with EPICS. Software which supports automation of normal operator functions will involve prototyping and development of operator display layouts with special consideration for ease of use and visual ergonomics. Coding of controls application software in a high level language, such as C, C++, *or* FORTRAN will be required. The Contractor shall have specialized knowledge of real-time software development.

Part III - Contractor Tasks

1.0 Special Studies and Reports

The Contractor shall perform engineering analyses including feasibility studies, technology assessments, trade-off studies, third-party reviews, and failure analyses. The Contractor shall prepare reports which document studies and analyses and provide formal and informal briefings.

2.0 Requirements Definition and Analysis

The Contractor shall be responsible for derivation of system requirements from basic information supplied by researchers; analysis of system requirements with respect to subsystem and integrated systems concepts, cost, schedule, benefit, risk, feasibility, operability, maintainability, reliability,

and related considerations; and allocation of requirements to hardware and software. The Contractor may be required to participate in Preliminary Requirements Reviews.

3.0 Preliminary Engineering Reports

The Contractor shall prepare Preliminary Engineering Reports (PER) for designated projects. Such preparation shall include all necessary engineering activities to provide a formal NASA PER. Each PER shall provide the basis for preparing final design, specifications, and cost estimates for implementation of planned projects and shall conform to the NASA Facility Project Implementation Handbook.

4.0 Design

4.1 Conceptual Designs

The Contractor shall be responsible for obtaining data upon which to develop design concepts; performing preliminary analyses and studies; and preparing sketches, diagrams, layout plans, preliminary cost estimates, and preliminary development schedules. The Contractor may be required to participate in Conceptual Design Reviews.

4.2 Preliminary Designs

The Contractor shall be responsible for development of preliminary drawings and critical analyses; identification of long-lead procurement items; refined cost estimates and schedules; detailed plans for completion of final design; and initial plans for procurement, fabrication, installation, integrated systems testing, and activation of systems designed. The Contractor shall prepare and deliver presentations at Preliminary Design Reviews.

4.3 Final Designs

The Contractor shall be responsible for producing final designs based on the functional and technical requirements, while remaining within the project scope, schedule, and budgetary parameters. Final designs shall include all documents necessary for the system development, including engineering analyses, drawings, specifications, detailed cost estimates, fabrication and assembly schedules, and associated supporting documentation. Final designs shall conform to the NASA Facility Project Implementation Handbook.

The Contractor shall be responsible for furnishing complete automation system designs which integrate hardware and software elements to achieve required system functionality. System designs shall include new drawings; redlined facility drawings; device lists; control error analyses; timing analyses; descriptions which cover system theory of operation, subsystem interfaces, mode/state transition logic, operator screen layouts and functions; and supporting documentation. Hardware designs shall include architecture diagrams, arrangement diagrams, interconnection diagrams, wiring and cabling diagrams, parts lists, demolition diagrams, installation procedures, and supporting documentation. Software designs shall include requirements traceability matrices, architecture diagrams, data flow diagrams, control flow diagrams, module descriptions, and supporting documentation. Software designs involving PLC hardware shall include logic diagrams in lieu of data flow and control flow diagrams.

Drawings and specifications shall be completely detailed. The Contractor shall review all engineering calculations and drawings and shall indicate so on the respective documents. It shall be the responsibility of the Contractor to provide accurate, error-free final designs. The Contractor shall prepare and deliver presentations at Critical Design Reviews.

5.0 Development

5.1 Fabrication

The Contractor shall provide fabrication of research equipment and related systems per approved final designs and applicable standards and constraints. Responsibilities will include purchases of materials, components, and subsystems; machining of structural and mechanical components; assembly of all components needed for system validation; quality assurance inspection of materials, components, subsystems, and systems; and modifications to design drawings and affected facility drawings to reflect as-built conditions.

The Contractor shall provide electronic fabrication including purchase of components and subsystems; electronic systems integration; fabrication of control consoles; fabrication of cabling, assemblies, and all components needed for system interface to new and existing facility hardware; quality assurance inspection of components, assemblies, subsystems, and systems; and modifications to design drawings and affected facility drawings to reflect as-built conditions.

5.2 Software Implementation

The Contractor shall furnish all software necessary to provide fully operational research mechanical, fluid, and automation systems. Responsibilities include preparation of software implementation plans; purchase of operating systems, device drivers, network drivers, development tools, software configuration management tools, and diagnostic tools; development of applications for operator interfaces, automatic test sequencing, process control and monitoring, data acquisition and logging, inter-system data transfer, system performance monitoring, and troubleshooting aids; prototyping of operator screen layouts; integration of application software modules and programs; establishing appropriate priorities and execution speeds for application programs in order to achieve required data throughput, operator display update rates, and input response times; testing of software on both development system and target hardware for conformance to specifications; and documentation of source code and procedures required to rebuild, modify, and install application software.

5.3 Component I System Validation

The Contractor shall validate the operation of research equipment and related systems prior to installation. Responsibilities include tests which show compliance with requirements (e.g. power-on/off, emergency cutoff, load capacity, and range of motion); and demonstration of manual operation to facility users.

The Contractor shall validate target electronic hardware and software functions prior to installation. Responsibilities include system power-up; software installation on target hardware; validation testing using simulation hardware/software to confirm appropriateness of software / hardware design and control schemes; and demonstrations of operational interfaces and general system operations to facility personnel and research customers.

6.0 Installation

6.1 Installation Management

The Contractor shall provide technical support and coordination associated with installation. The Contractor shall coordinate with NASA project managers during the pre-installation and installation phases by reviewing and making appropriate recommendations regarding specifications and drawings, shop drawings, submittals, schedules, cost estimates, safety plans, engineering changes, and tests. The Contractor shall be responsible for preparing installation plans, coordinating site work with cognizant facility personnel, and maintaining up-to-date project-related drawings.

6.2 Site Work

The Contractor shall perform on-site construction as necessary to support installation of research equipment and systems in accordance with approved designs and standard practices.

6.3 System Installation and Checkout

The Contractor shall be responsible for removing existing equipment and associated wiring and cables; installation of new research mechanical, fluid, and automation equipment; interconnecting new mechanical, fluid, and automation equipment with power sources, field devices, and other research equipment; performing initial power-up of newly installed mechanical, fluid, and automation equipment; confirming proper operation of new research equipment and affected subsystems; and providing complete documentation of new systems including operator's manuals, software manuals, maintenance manuals, system test results, and as-built drawings. The Contractor may also be required to participate in a formal Integrated System Review.

7.0 System Integration and Activation

The Contractor shall perform integration, testing, and activation of research mechanical, fluid, and automation systems and components with new and existing systems.

7.1 Integrated System Testing

The Contractor shall plan, conduct, and document integrated system tests. Responsibilities will include developing comprehensive test procedures: performing system level checkout of all affected facility operations including tests throughout the facility envelope; diagnosing, correcting, and repeating failed test items; documenting test results in formal reports; and tuning control systems to achieve required system performance.

7.2 Activation

The Contractor shall provide research mechanical, fluid, and automation systems activation. Responsibilities will include preparing and conducting training for facility and maintenance personnel; collecting and analyzing system operational data in order to recommend performance enhancement measures; and providing technical support within 24-hours of notification of need. The Contractor may also be required to participate in a formal Operational Readiness Review.

8.0 Maintenance

The Contractor shall provide system maintenance. Responsibilities include maintaining and enhancing automation software; monitoring system performance; assessing wear and performance degradation; and retuning of mechanical, fluid, and control systems; troubleshooting; and providing on-site emergency maintenance/repair within 24-hours of notification of need.

SECTION D - PACKAGING AND MARKING

D.1 PACKING, PACKAGING AND MARKING

(a) The Contractor shall notify the Contracting Officer three work days prior to the shipment of any hardware. All hardware shall be packaged as to eliminate any possible damage that could occur during shipping. All shipments shall be conducted with a creditable firm that is capable of tracking and/or tracing the shipment in event that any hardware should become lost during shipment. The Contractor shall identify lifting points on the hardware and shall specify any special handling requirements.

(b) The Contractor shall preserve, pack, and mark for shipment all items deliverable under this contract in accordance with good commercial practices and in accordance with instructions that may be specified

by the Government in authorized delivery orders. Shipments shall be preserved, packed and market to ensure both acceptance by common carrier and safe transportation at the most economical rate(s).

(c) Markings for reports and other documentation shall be as set forth in Section J, Exhibit A, Contract Documentation Requirements.

(d) The Contractor's markings on shipping containers shall be clearly legible from a distance *of* 36 inches. The Contract may make by stencil, rubber stamp, or lacquer over a coated gummed label.

(e) The Contractor shall place identical requirements in all subcontracts.

SECTION E - INSPECTION AND ACCEPTANCE

E.I FINAL INSPECTION AND ACCEPTANCE--ALTERNATE I (LaRC 52.246-94) (OCT 1992)

Final inspection and acceptance of all items specified for delivery under this contract, including delivery orders, shall be accomplished by the Contracting Officer or his duly authorized representative at destination.

SECTION F - DELIVERIES OR PERFORMANCE

F.I F.O.B. DESTINATION (FAR 52.247-34) (NOV 1991)

(a) The term "f.o.b. destination," as used in this clause, means --

(1) Free of expense to the Government, on board the carrier's conveyance, at a specified delivery point where the consignee's facility (plant, warehouse, store, lot, or other location to which shipment can be made) is located; and

(2) Supplies shall be delivered to the destination consignee's wharf (if destination is a port city and supplies are for export), warehouse unloading platform, or receiving dock, at the expense of the Contractor. The Government shall not be liable for any delivery, storage, demurrage, accessorial, or other charges involved before the actual delivery (or "constructive placement" as defined in carrier tariffs) of the supplies to the destination, unless such charges are caused by an act or order of the Government acting in its contractual capacity. If rail carrier is used, supplies shall be delivered to the specified unloading platform of the consignee. If motor carrier (including "piggyback') is used, supplies shall be delivered to truck tailgate at the unloading platform of the consignee, except when the supplies delivered meet the requirements of Item 568 of the National Motor Freight Classification for "heavy or bulky freight." When supplies meeting the requirements of the referenced Item 568 are delivered, unloading (including movement to the tailgate) shall be performed by the consignee, with assistance from the truck driver, if requested. If the Contractor uses rail carrier or freight forwarded for less than carload shipments, the Contractor shall ensure that the carrier will furnish tailgate delivery, when required, if transfer to truck is required to complete delivery to consignee.

(b) The Contractor shall --

(1)(i) Pack and mark the shipment to comply with contract specifications; or

(ii) In the absence of specifications, prepare the shipment in conformance with carrier requirements;

(2) Prepare and distribute commercial bills of lading;

(3) Deliver the shipment in good order and condition to the point of delivery specified in the contract;

(4) Be responsible for any loss of and/or damage to the goods occurring before receipt of the shipment by the consignee at the delivery point specified in the contract;

(5) Furnish a delivery schedule and designate the mode of delivering carrier; and

(6) Pay and bear all charges to the specified point of delivery.

F.2 F.O.B.DESTINATION, WITHIN CONSIGNEE'S PREMISES (FAR 52.247-35) (APR 1984)

(a) The term "f.o.b. destination, within consignee's premises," as used in this clause, means free of expense to the Government delivered and laid down within the doors of the consignee's premises, including delivery to specific rooms within a building if so specified.

(b) The Contractor shall -

(1) (i) Pack and mark the shipment to comply with contract specifications; or

(ii) In the absence of specifications, prepare the shipment in conformance with carrier requirements;

(2) Prepare and distribute commercial bills of lading;

(3) Deliver the shipment in good order and condition to the point of delivery specified in the contract;

(4) Be responsible for any loss of and/or damage to the goods occurring before receipt of the shipment by the consignee at the delivery point specified in the contract;

(5) Furnish a delivery schedule and designate the mode of delivering carrier; and

(6) Pay and bear all charges to the specified point of delivery.

NOTE: THE USE OF THE F.1 OR F.2 CLAUSE WILL BE DETERMINED BY THE REQUIREMENTS SET FORTH IN THE INDIVIDUAL DOS. CONTRACT LEVEL DELIVERABLES ARE SUBJECT TO CLAUSE 52.247-34.

F.3 DELIVERY

The documentation, hardware and reports required by each DO produced under this contract shall be delivered in accordance with the schedule specified.

The reports and documentation required by Section J. Exhibit A, Contract Documentation Requirements, shall be delivered at the times and to the places specified therein.

F.4 PERIOD OF PERFORMANCE (LaRC 52.211-91) (AUG 1997)

The period of performance of this contract shall be 60 months from the effective date of the contract.

F.5 PERIOD OF PERFORMANCE - DELIVERY ORDERS

(a) Pursuant to Section I Clause 52.216-18 Ordering (Oct. 1995), orders may be issued from contract award through two weeks prior to the end of the contract term.

(b) Any delivery order issued prior to the expiration of the period for issuance of delivery orders shall be completed, provided that the Contractor will not be required to perform any work beyond six (6) months after the period for issuance of delivery orders.

F.6 PLACE OF DELIVERY (LaRC 52.211-92) (OCT 1992)

Delivery shall be f.o.b. destination:

As specified in delivery orders.

F.7 PLACE(S)OF PERFORMANCE (LaRC 52.211-98) (OCT 1992)

The place(s) of performance shall be:

The Contractor's and/or subcontractor's facility; and other sites as may be designated by the delivery order.

F.8 NOTICE OF DELAY

If, because of technical difficulties, the Contractor becomes unable to complete the delivery order work at the time specified, notwithstanding the exercise of good faith and diligent efforts in performing of the work called for under this delivery order, the Contractor shall give the Contracting Officer written notice of the anticipated delay and the reasons for it. The notice and reasons shall be delivered promptly after the condition creating the anticipated delay becomes known to the Contractor but in no event less than 10 days before the completion date specified in this delivery order, unless otherwise directed by the Contracting Officer. When notice is given, the Contracting Officer may extend the time specified in the Schedule for such period as is deemed advisable.

SECTION G - CONTRACT ADMINISTRATION DATA

G.1 DESIGNATION OF NEW TECHNOLOGY REPRESENTATIVE AND PATENT REPRESENTATIVE (NASA 1852.227-72) (JUL 1997)

(a) For purposes of administration of the clause of this contract entitled "New Technology" or "Patent Rights - Retention by the Contractor (Short Form)", whichever is included, the following named representatives are hereby designated by the Contracting Officer to administer such clause:

Title	Office Code	Address (including zip code)
New Technology Representative	212	NASA, Langley Research Center Hampton, VA 23681-0001
Patent Representative	212	NASA, Langley Research Center Hampton, VA 23681-0001

(b) Reports of reportable items, and disclosure of subject inventions, interim reports, final reports, utilization reports, and other reports required by the clause, as well as any correspondence with respect to such matters, should be directed to the New Technology Representative unless transmitted in response to correspondence or request from the Patent Representative. Inquiries or requests regarding disposition of rights, election of rights, or related matters should be directed to the Patent Representative. This clause shall be included in any subcontract hereunder requiring a "New Technology" clause or "Patent Rights - Retention by the Contractor (Short Form)" clause, unless otherwise authorized or directed by the Contracting Officer. The respective responsibilities and authorities of the above-named representatives are set forth in 1827.305-370 of the NASA FAR Supplement.

G.2 SUBMISSION OF REQUESTS FOR PROGRESS PAYMENTS (NASA 1852.232-82) (MAR 1989)

The Contractor shall request progress payments in accordance with the Progress Payments clause by submitting to the Contracting Officer an original and two copies of Standard Form (SF) 1443, Contractor's Request for Progress Payment, and the Contractor's invoice (if applicable). The Contracting Officer's office is the designated billing office for progress payments for purposes of the Prompt Payment clause.

NOTE: CLAUSE G.2 ABOVE IS APPLICABLE TO FIXED-PRICE DELIVERY ORDERS.

G.3 NASA CONTRACTOR FINANCIAL MANAGEMENT REPORTING (NASA 1852.242-73) (JUL 1997)

(a) The Contractor shall submit NASA Contractor Financial Management Reports on NASA Forms 533 in accordance with the instructions in NASA Policy Guidance (NPG) 9501.2, NASA Contractor Financial Management Reporting, and on the reverse side of the forms, as supplemented in the Schedule of this contract. The detailed reporting categories to be used, which shall correlate with technical and schedule

reporting, shall be set forth in the Schedule. Contractor implementation of reporting requirements under this clause shall include NASA approval of the definitions of the content of each reporting category and give due regard to the Contractor's established financial management information system.

(b) Lower level detail used by the Contractor for its own management purposes to validate information provided to NASA shall be compatible with NASA requirements.

(c) Reports shall be submitted in the number of copies, at the time, and in the manner set forth in the Schedule or as designated in writing by the Contracting Officer. Upon completion and acceptance by NASA of all contract line items, the Contracting Officer may direct the Contractor to submit Form 533 reports on a quarterly basis only, report only when changes in actual cost incur, or suspend reporting altogether.

(d) The Contractor shall ensure that its Form 533 reports include accurate subcontractor cost data, in the proper reporting categories, for the reporting period.

(e) If during the performance of this contract NASA requires a change in the information or reporting requirements specified in the Schedule, or as provided for in Paragraph (a) or (c) of this clause, the Contracting Officer shall effect that change in accordance with the Changes clause of this contract.

NOTE: CLAUSE G.3 ABOVE IS APPLICABLE TO COST TYPE DELIVERY ORDERS, SEE EXHIBIT A - CONTRACT DOCUMENTATION REQUIRMENTS.

G.4 CONTRACTOR REQUESTS FOR GOVERNMENT-OWNED EQUIPMENT (NASA 1852.245-70) (JUL 1997)

(a) "Equipment," as used in this clause, means commercially available items capable of stand-alone use, including those to be acquired for incorporation into special test equipment or special tooling.

(b)(1) Upon determination of need *for* any Government-owned equipment item for performance of this contract, the Contractor shall provide to the Contracting Officer a written request justifying the need for the equipment and the reasons why Contractor-owned property cannot be used, citing the applicable FAR or contract authority for use of Govemment-owned equipment. Equipment being acquired as a deliverable end item listed in the contract or as a component for incorporation into a deliverable end item listed in the contract is exempt from this requirement.

(2) The Contractor's request shall include a description of the item in sufficient detail to enable the Government to screen its inventories for available equipment or to purchase equipment. For this purpose, the Contractor shall (i) prepare a separate DD Form 1419, DOD Industrial Plant Equipment Requisition, or equivalent format, for each item requested and (ii) forward it through the Contracting Officer to the Industrial Property Officer at the cognizant NASA installation at least 30 days in advance of the date the Contractor intends to acquire the item. Multiple units of identical items may be requested on a single form. Instructions for preparing the DD Form 1419 are contained in NASA FAR Supplement 1845.7102. If a certificate of nonavailability is not received within that period, the Contractor may proceed to acquire the item, subject to having obtained Contracting Officer consent, if required, and having complied with any other applicable provisions of this contract.

(c) Contractors who are authorized to conduct their own screening using the NASA Equipment Management System (NEMS) and other Government sources of excess property shall provide the evidence of screening results with their request for Contracting Officer consent. Requests to purchase based on unsuitability of items found shall include rationale for the determined unsuitability

G.5 SUBMISSION AND PAYMENT OF VOUCHERS

A. Payment for Fixed-Price DOs

1. Public vouchers for fixed price delivery orders shall include a reference to this contract NAS1-_____ and the DO Number. The Contractor's taxpayer identification number shall be included on the invoice.

2. Individual DOs will provide for customary progress payments if the Contractor will not be able to bill for the first delivery of products, or other performance milestones. for four months, or more for small business, six months, or more for large business, or more and will make expenditures for

contract performance during the predelivery period that have a significant impact on the Contractor's working capital.

3. Pursuant to Section I Clauses 52.232-1 Payments (APR 1984) and 52.232-16 Progress Payments (JUL 1991) Aiternate 1 (AUG 1987), progress payments will be based on costs for the progress payment and liquidation rate indicated.

4. Requests for progress payments will be in accordance with Clause 1852.232-82 entitled "Submission of Requests for Progress Payments (MAR 1989) as set forth in G.2 above.

5. Payment for fixed price DOs for less than $100,000 for small business, $1,000,000 for large business will be made after delivery and acceptance of all deliverable items and completion of all delivery order requirements. Progress payments are not authorized. Partial payments may be authorized. Partial payments, if authorized will be made on no more than a monthly basis for partial delivery of supplies accepted during that month.

B. Payment for Cost Reimbursable DOs

1. Public vouchers for payment of cost and fee shall include a reference to this contract NASI-_____and the DO number. The Contractor's taxpayer identification number shall be included on the invoice.

2. Cost vouchers shall be submitted for approval through the cognizant DCAA office. Fee vouchers shall be submitted for approval through the Contracting Officer.

3. The Contractor shall prepare vouchers as follows:

(a) One original Standard Form (SF) 1034, SF 1035, or equivalent Contractor's attachment.

(b) Seven copies of SF 1034A, SF 1035A, or equivalent Contractor's attachment.

(c) The Contractor shall mark SF 1034A copies 1, 2, 3, 4, and such other copies as may be directed by the Contracting Officer by insertion in the memorandum block the names and addresses as follows:

(i) Copy 1 NASA Contracting Officer;
(ii) Copy 2 Auditor;
(iii) Copy 3 Contractor
(iv) Copy 4 Contract administration office; and
(v) Copy 5 Project management office (when required by the NASA Contracting Officer).

C. Invoice Address

The address as set forth below is the designated payment office for fixed-price, cost and fee vouchers for purposes of the Prompt Payment clause of this contract. The Contracting Officer's office is the designated billing office for fixed price progress payments for purposes of the Prompt Payment clause. Invoices shall be forwarded to the following address and marked with the contract number NAS1-_____and the specific DO number.

NASA, Langley Research Center
Attn: Financial Management Division, MIS 175
Hampton, VA 23681-0001

G.6 PROCEDURES FOR ISSUING DELIVERY ORDERS

A. Delivery Orders will be issued on an Optional Form 347 (or a facsimile thereof), or on any other appropriate contractual instruments and issued by the Contracting Officer.

B. Individual DOs may be either fixed price or cost plus fixed fee

C. For DOs issued under multiple delivery order contracts, each awardee shall be provided a fair opportunity to be considered for each DO in excess of $2,500 with the exceptions as specified in the following paragraph. (DOs for under $2,500 may be placed with any of the awardees without competition.) In selecting the awardee with whom to place orders, the Contracting Officer will consider past performance on earlier tasks under the multiple award contract, quality of deliverables, cost control, price, cost, or other factors the Contracting Officer believes are relevant to the award of the DO to an awardee under the contract. Other factors may be evaluated such as the technical understanding of the requirement and the ability to meet the required schedule. The selection criteria will be set forth in each solicitation issued.

Awardees need not be given an opportunity to be considered for a particular DO in excess of $2,500 under multiple DO contracts if the Contracting Officer determines that -

1. The agency need for such supplies or services is of such urgency that providing such opportunity would result in unacceptable delays;

2. Only one such Contractor is capable of providing such supplies or services required at the level of quality required because the supplies or services ordered are unique or highly specialized;

3. The DO should be issued on a sole-source basis in the interest of economy and efficiency as a logical follow-on to a DO already issued under the contract, provided that all awardees were given a fair opportunity to be considered for the original DO; or

4. It is necessary to place a DO to satisfy a minimum guarantee.

D. The Contracting Officer need not contact each of the multiple contract awardees before selecting a DO awardee if there is information available to ensure that each multiple awardee is provided a fair opportunity to be considered for each DO.

E. For those DOs which are competed among the multiple contract awardees, the Contracting Officer will provide a solicitation to each awardee and will request a quote or proposal by a common cut-off-date. The solicitation will include a Statement of Work or Specifications, including applicable drawings; required delivery date, any special instructions or provisions and selection criteria. The awardees will be requested to provide either a firm fixed price or estimated cost and fixed fee for the proposed DO (depending on whether the DO is to be fixed price or cost-type). For cost-type DOs, the awardees may be required to provide breakouts of the estimated labor hours or costs to perform the DO. In some cases, the awardees may be requested to provide a brief implementation plan for the DO.

F. Failure to perform certain DOs in accordance with the DO's terms may cause the Government to suffer damages. Conversely, early delivery on certain DOs may be of additional value to the Government. Such incentive/disincentive terms and liquidated damages will be specified in the solicitation for the DO.

G. In some cases, the Contracting Officer may issue delivery orders for conceptual designs to be performed by more than one awardee, with the selection for any subsequent DO for the detailed design to be based on the merits of the completed conceptual designs.

H. Delivery Orders may be issued orally, by facsimile or by electronic commerce methods.

I. No protest under FAR Subpart 33.1 is authorized in connection with the issuance or proposed issuance of a DO under this DO contract except for a protest on the grounds that the DO increases the scope, period, or maximum value of the contract. In accordance with FAR 16.505(b)(4), Dr. Belinda Adams has been designated as the DO Ombudsman responsible for reviewing complaints from Contractors on DO contracts.

G.7 CONTENTS OF DELIVERY ORDERS

A. Delivery Orders will contain, as a minimum, the following information:

1. Date of DO and contract number NAS1-_____
2. Statement or Work or Specifications including applicable drawings
3. Deliverables
4. Completion date and/or delivery schedule
5. Place of delivery and delivery instructions
6. Accounting and appropriation data
7. Estimated cost (for cost-type DOs)
8. Fixed fee (if applicable, for cost-type orders)
9. Incremental funding
   For Cost Type DOs
   (a) Amount allotted for cost
   (b) Additional amount obligated for payment of fee, if applicable
10. Fixed price (for fixed-price DOs)
11. Applicable special instructions or provisions
12. Government-furnished items

SECTION H - SPECIAL CONTRACT REQUIREMENTS

H.1 RIGHTS TO PROPOSAL DATA (TECHNICAL) (FAR 52.227-23) (JUN 1987)

Except for data contained on pages ____, it is agreed that as a condition of award of this contract, and notwithstanding the conditions of any notice appearing thereon, the Government shall have unlimited rights (as defined in the "Rights in Data - General" clause contained in this contract) in and to the technical data contained in the proposal dated _____, upon which this contract is based.

H.2 SECURITY PROGRAM/FOREIGN NATIONAL EMPLOYEE INVESTIGATIVE REQUIREMENTS (LaRC 52.204-91) (AUG 1997)

Prior to reporting to Langley Research Center (LaRC) to perform under a contract or grant, each Foreign National shall have approval for access to LaRC facilities from NASA Headquarters, Office of Space Science and Aeronautics (Code IS). A copy of the access authorization request shall be provided to the LaRC Chief of Security. Additionally, an investigation by the Government shall be completed on each Foreign National Contractor prior to reporting to LaRC to perform under a contract or grant. A properly executed "Name Check Request" (NASA Form 531) and a completed "applicant" fingerprint card shall be submitted to the LaRC Security Office, Mail Stop 182, for each Foreign National Contractor at least 75 days prior to the estimated entry on duty date. The NF 531 and fingerprint card may be obtained from the LaRC Security Office. If the access approval is obtained from NASA Headquarters prior to completion of the investigation, and the Contracting Officer requires a Foreign National to work on LaRC, an escort request may be considered by the LaRC Chief of Security.

H.3 WORK SCHEDULE--ON-SITE ONLY (LaRC 52.211-103) (JUL 1991)

In order that the necessary and proper inspection of the Contractor's work may be effectively accomplished, and to assure the availability of required Government interface, the Contractor shall schedule work performance hereunder so as to be compatible with the established workweek and hours of

work observed by the Government organization having cognizance over the work being performed, which is 7:00 a.m. to 3:30 p.m., Monday through Friday.

H.4 OBSERVATION OF REGULATIONS AND IDENTIFICATION OF CONTRACTOR'S EMPLOYEES (LaRC 52.211-104) (MAR 1992)

A. Observation of Regulations--In performance of that part of the contract work which may be performed at Langley Research Center or other Government installation, the Contractor shall require its employees to observe the rules and regulations as prescribed by the authorities at Langley Research Center or other installation.

B. Identification Badges--At all times while on LaRC property, the Contractor shall require its employees, subcontractors and agents to wear badges which will be issued by the NASA Contract Badge and Pass Office, located at 1 Langley Boulevard (Building No. 1228). Badges shall be issued only between the hours of 6:30 a.m. and 4:30 p.m., Monday through Friday. Contractors will be held accountable for these badges, and may be required to validate outstanding badges on an annual basis with the NASA LaRC Security Office. Immediately after employee termination or contract completion, badges shall be returned to the NASA Contract Badge and Pass Office.

H.5 INCORPORATION OF SECTION K OF THE PROPOSAL BY REFERENCE (LaRC 52.215-107) (MAR 1989)

Pursuant to FAR 15.406-1(b), the completed Section K of the proposal dated _____ is hereby incorporated herein by reference.

H.6 EVIDENCE OF INSURANCE

Prior to performing under this contract, the Contractor shall submit to the Contracting Officer evidence of the insurance coverage required by the Section I NASA Clause 1852.228-75 entitled "Minimum Insurance Coverage" (such as a Certificate of Insurance or other confirmation). If the Government extends the term of the contract, the Contractor shall present such evidence to the Contracting Officer prior to performing under the extension.

H.7 VIRGINIA AND LOCAL SALES TAXES (LaRC 52.229-92) (APR 1992)

To perform this contract, the Contractor must be knowledgeable of relevant state and local taxes when making purchases of tangible personal property. The Contractor shall refrain from paying nonapplicable taxes or taxes where an exemption exists, but shall pay applicable taxes that are reimbursable pursuant to FAR 31.205-41, Taxes. Even though title to property purchased under this contract may pass to the Government and the price is reimbursable under contract cost principles, such transactions do not in themselves provide tax immunity to the Contractor. Therefore, within 30 days after the effective date of this contract, the Contractor shall request from the Virginia State Tax Commission a ruling on any tax exemptions that may be applicable to purchases made under this contract. The Contractor shall provide all facts relevant to the situation and shall pursue an interpretation of the law that is most favorable to both the Contractor and the Government.

H.8 COMMERCIAL COMPUTER SOFTWARE AND SYSTEMS

The Contractor warrants that the items or services acquired under this contract are required to include accurate processing of the date and date-related data including, but not limited to, calculating, comparing, sequencing, and the manipulation of data with dates prior to, through, and beyond January 1, 2000. This capability must be included in all hardware and software products delivered under this contract, or used to perform services under this contract, individually and in combination, and shall be transparent to the user. Hardware and software products provided under this contract, and used to perform services under this contract, shall individually, and in combination, be able to successfully transition into the Year 2000 with the correct system date, including leap year calculations, without human

intervention. Such products shall also provide correct results when moving forward and backward in time across the Year 2000 and subsequent years.

H.9 TERMINATION

The FAR clauses 52.249-1, Termination for Convenience of the Government (Fixed-Price) (Short Form) (APR 1984), 52.249-2, Termination for Convenience of the Government (Fixed-Price) (SEP 1996), 52.249-6, Termination (Cost-Reimbursement (SEP 1996) and 52.249-8, Default (Fixed-Price Supply and Services)(APR 1984) apply to the contract as a whole and to each individual DO issued under this contract. Thus, an individual DO may be terminated either for default or for the convenience of the Government.

H.10 QUALITY MANAGEMENT SYSTEM (!SO-9000) REQUIREMENTS

No later than 12 months after award of the contract, the Contractor shall be certified by a third-party registrar as compliant with the requirements of the current version of the International Organization for Standardization's "ISO 9001" Standard Series or the American National Institute/American Society for Quality Control's "Q9001 Series" and associated documentation. The Contractor shall maintain its registration during the contract term.

NOTICE: THE FOLLOWING CLAUSES ARE APPLICABLE TO BOTH FIRM-FIXED PRICE DELIVERY ORDERS AND COST REIMBURSABLE DELIVERY ORDERS ISSUED UNDER THIS CONTRACT.

PART II - CONTRACT CLAUSES

SECTION I - CONTRACT CLAUSES

1.1 LISTING OF CLAUSES INCORPORATED BY REFERENCE:

NOTICE: The following solicitation contract clauses pertinent to this section are hereby incorporated by reference.

FEDERAL ACQUISITION REGULATION (48 CFR CHAPTER 1) CLAUSES

JSE NUMBER	TITLE AND DATE
52.202-1	Definitions (OCT 1995)
52.203-3	Gratuities (APR 1984)
52.203-5	Covenant Against Contingent Fees (APR 1984)
52.203-6	Restrictions on Contractor Sales to the Government (JUL 1995)
52.203-7	Anti-Kickback Procedures (JUL 1995)
52.203-8	Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity (JAN 1997)
52.203-10	Price or Fee Adjustment for Illegal or Improper Activity (JAN 1997)
52.203-12	Limitation on Payments to Influence Certain Federal Transactions (JUN 1997)
52.2044	Printing/Copying Double-Sided on Recycled Paper (JUN 1996)
52.209-6	Protecting the Government's Interest when Subcontracting with Contractors Debarred, Suspended, or Proposed for Debarment (JUL 1995)
52.211-5	Material Requirements (OCT 1997)
52.211-15	Defense Priority and Allocation Requirements (SEP 1990)
52.215-2	Audit and Records--Negotiation (AUG 1996)
52.215-26	Integrity of Unit Prices (JAN 1997)
52.215-27	Termination of Defined Benefit Pension Plans (MAR 1996)
52.215-33	Order of Precedence (JAN 1986)

52.215-42	Requirements for Cost and Pricing Data or Information Other Than Cost or Pricing Data - Modifications (JAN 1997)
52.219-8	Utilization of Small, Small Disadvantaged, and Women-Owned Small Business Concerns (JUN 1997)
52.219-9	Small, Small Disadvantaged, and Women-Owned Small Business Subcontracting Plan (AUG 1996) Alternate II (MAR 1996)
52.219-16	Liquidated Damages--Subcontracting Plan (OCT 1995)
52.222-1	Notice to the Government of Labor Disputes (FEB 1997)
52.222-20	Walsh-Healy Public Contracts Act (DEC 1996)
52.222-26	Equal Opportunity (APR 1984)
52.222-28	Equal Opportunity Preaward Clearance of Subcontracts (APR 1984)
52.222-35	Affirmative Action for Special Disabled and Vietnam Era Veterans (APR 1984)
52.222-36	Affirmative Action for Handicapped Workers (APR 1984)
52.222-37	Employment Reports on Special Disabled Veterans and Veterans of the Vietnam Era (JAN 1988)
52.223-2	Clean Air and Water (APR 1984)
52.223-5	Pollution Prevention and Right-To-Know Information (MAR 1997)
52.223-6	Drug-Free Workplace (JAN 1997)
52.223-14	Toxic Chemical Release Reporting (OCT 1996)
52.225-9	Buy American Act - Trade Agreements - Balance of Payments Program (JAN 1996)
52.225-11	Restrictions on Certain Foreign Purchases (OCT 1996)
52.227-1	Authorization and Consent (JUL 1995)--Alternate I (APR 1984)
52.227-2	Notice and Assistance Regarding Patent and Copyright Infringement (AUG 1996)
52.227-11	Patent Rights--Retention by the Contractor (Short Form) (JUN 1989)--as modified by NASA FAR Supplement 1852.227-11
52.232-9	Limitation on Withholding of Payments (APR 1984)
52.232-17	Interest (JUN 1996)
52.232-23	Assignment of Claims (JAN 1986)
52.232-25	Prompt Payment (JUN 1997)
52.232-33	Mandatory Information for Electronic Funds Transfer Payment (AUG 1996)
52.233-1	Disputes (OCT 1995)--Alternate I (DEC 1991)
52.233-3	Protest After Award (AUG 1996)
52.237-2	Protection Of Government Buildings, Equipment, And Vegetation (APR 1984)
52.242-13	Bankruptcy (JUL 1995)
52.244-5	Competition in Subcontracting (DEC 1996)
52.244-6	Subcontracts for Commercial Items and Commercial Components (OCT 1995)
52.246-24	Limitation of Liability--High-Value Items (FEB 1997)
52.248-1	Value Engineering (MAR 1989)
52.253-1	Computer Generated Forms (JAN 1991)

NASA FAR SUPPLEMENT (48 CFR CHAPTER 18) CLAUSES

CLAUSE NUMBER	TITLE AND DATE
1852.208-81	Restrictions on Printing and Duplicating (AUG 1993)
1852.219-74	Use of Rural Area Small Businesses (SEP 1990)
1852.219-75	Small, Small Disadvantaged, and Women-Owned Small Business Subcontracting Reporting (JUL 1997)
1852.219-76	NASA 8 Percent Goal (JUL 1997)
1852.223-70	Safety and Health (MAR 1997)
1852.223-74	Drug and Alcohol-Free Workforce (MAR 1996)
1852.227-70	New Technology (JUL 1995)

1852.227-86	Commercial Computer Software--Licensing (DEC 1987)
1852.228-75	Minimum Insurance Coverage (OCT 1988)
1852.243-71	Shared Savings (MAR 1997)

1.2 CLAUSES IN FULL TEXT

The clauses listed below follow in full text:

52.211-11	Liquidated Damages--Supplies, Services, or Research and Development (APR 1984)
52.216-18	Ordering (OCT 1995)
52.216-19	Order Limitations (OCT 1995)
52.216-22	Indefinite Quantity (OCT 1995)
52.223-3	Hazardous Material Identification and Material Safety Data (NOV 1991) Alternate I (JUL 1995)
52.223-11	Ozone Depleting Substances (JUN 1996)
52.227-14	Rights in Data - General (JUN 1987) Alternate II (JUN 1987) and Alternate III (JUN 1987)—as modified by NASA FAR Supplement 1852.227-14
52.252-2	Clauses Incorporated by Reference (JUN 1988)
52.252-6	Authorized Deviations in Clauses (APR 1984)
1852.204-76	Security Requirements for Unclassified Automated Information Resources (SEP 1993)
1852.215-84	Ombudsman (OCT 1996)
1852.245-73	Financial Reporting of Government-Owned/Contractor-Held Property (JUL 1997)
1852.246-72	Material Inspection and Receiving Report (JUN 1995)

1.3 LIQUIDATED DAMAGES - SUPPLIES, SERVICES, OR RESEARCH AND DEVELOPMENT (FAR 52.211-11) (APR 1984)

(a) If the Contractor fails to deliver the supplies or perform the services within the time specified in this contract, or any extension, the Contractor shall, in place of actual damages, pay to the Government as fixed, agreed, and liquidated damages, for each calendar day of delay the sum of TBD.
(b) Alternatively, if delivery or performance is so delayed, the Government may terminate this contract in whole or in part under the Default-Fixed-Price Supply and Service clause in this contract and in that event, the Contractor shall be liable for fixed, agreed, and liquidated damages accruing until the time the Government may reasonably obtain delivery or performance of similar supplies or services. The liquidated damages shall be in addition to excess costs under the Termination clause.
(c) The Contractor shall not be charged with liquidated damages when the delay in delivery or performance arises out of causes beyond the control and without the fault or negligence of the Contractor as defined in the Default-Fixed-Price Supply and Service clause in this contract.

NOTE: THE ABOVE CLAUSE MAY APPLY TO CERTAIN DOs IN ACCORDANCE WITH FAR 11.502.

1.4 ORDERING (FAR 52.216-18) (OCT 1995)

(a) Any supplies and services to be furnished under this contract shall be ordered by issuance of delivery orders or task orders by the individuals or activities designated in the Schedule. Such orders may be issued from contract award date through two weeks prior to the end of the contract term.
(b) All delivery orders or task orders are subject to the terms and conditions of this contract. In the event of conflict between a delivery order or task order and this contract, the contract shall control.
(c) If mailed, a delivery order or task order is considered "issued" when the Government deposits the order in the mail. Orders may be issued orally, by facsimile, or by electronic commerce methods only if authorized in the Schedule.

1.5 ORDER LIMITATIONS (FAR 52.216-19) (OCT 1995)

(a) *Minimum order*. When the Government requires supplies or services covered by this contract in an amount of less than $1,000, the Government is not obligated to purchase, nor is the Contractor obligated to furnish, those supplies or services under the contract.

(b) *Maximum order*. The Contractor is not obligated to honor--

(1) Any order for a single item in excess of 51,500,000;

(2) Any order for a combination of items in excess of $5,000,000; or

(3) A series of orders from the same ordering office within 30 days that together call for quantities exceeding the limitation in subparagraph (1) or (2) above.

(c) If this is a requirements contract (i.e., includes the Requirements clause at subsection 52.216-21 of the Federal Acquisition Regulation (FAR)), the Government is not required to order a part of any one requirement from the Contractor if that requirement exceeds the maximum-order limitations in paragraph (b) above.

(d) Notwithstanding paragraphs (b) and (c) above, the Contractor shall honor any order exceeding the maximum order limitations in paragraph (b), unless that order (or orders) is returned to the ordering office within 5 days after issuance, with written notice stating the Contractor's intent not to ship the item (or items) called for and the reasons. Upon receiving this notice, the Government may acquire the supplies or services from another source.

1.6 INDEFINITE QUANTITY (FAR 52.216-22) (OCT 1995)

(a) This is an indefinite-quantity contract for the supplies or services specified, and effective for the period stated, in the Schedule. The quantities of supplies and services specified in the Schedule are estimates only and are not purchased by this contract.

(b) Delivery or performance shall be made only as authorized by orders issued in accordance with the Ordering clause. The Contractor shall furnish to the Government, when and if ordered, the supplies or services specified in the Schedule up to and including the quantity designated in the Schedule as the "maximum." The Government shall order at least the quantity of supplies or services designated in the Schedule as the "minimum."

(c) Except for any limitations on quantities in the Order Limitations clause or in the Schedule, there is no limit on the number of orders that may be issued. The Government may issue orders requiring delivery to multiple destinations or performance at multiple locations.

(d) Any order issued during the effective period of this contract and not completed within that period shall be completed by the Contractor within the time specified in the order. The contract shall govern the Contractor's and Government's rights and obligations with respect to that order to the same extent as if the order were completed during the contract's effective period; *provided,* that the Contractor shall not be required to make any deliveries under this contract after 6 months after period for issuance of DOs.

I.7 HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA (FAR 52.223-3) (JAN 1997)

(a) "Hazardous material," as used in this clause, includes any material defined as hazardous under the latest version of Federal Standard No. 313 (including revisions adopted during the term of the contract).

(b) The Offeror must list any hazardous material, as defined in Paragraph (a) of this clause, to be delivered under this contract. The hazardous material shall be properly identified and include any applicable identification number, such as National Stock Number or Special Item Number. This information shall also be included on the Material Safety Data Sheet submitted under this contract.

Material [If none, insert ***None]***

_____

_____

_____

Identification No

_____

_____

(c) This list must be updated during performance of the contract whenever the Contractor determines that any other material to be delivered under this contract is hazardous.

(d) The apparently successful Offeror agrees to submit, for each item as required prior to award, a Material Safety Data Sheet, meeting the requirements of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous material identified in Paragraph (b) of this clause. Data shall be submitted in accordance with Federal Standard No. 313, whether or not the apparently successful Offeror is the actual manufacturer of these items. Failure to submit the Material Safety Data Sheet prior to award may result in the apparently successful Offeror being considered nonresponsible and ineligible for award.

(e) If, after award, there is a change in the composition of the item(s) or a revision to Federal Standard No. 313, which renders incomplete or inaccurate the data submitted under Paragraph (d) of this clause, the Contractor shall promptly notify the Contracting Officer and resubmit the data.

(f) Neither the requirements of this clause nor any act or failure to act by the Government shall relieve the Contractor of any responsibility or liability for the safety of Government. Contractor, or subcontractor personnel or property.

(g) Nothing contained in this clause shall relieve the contractor from complying with applicable Federal, State, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.

(h) The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

(1) To use, duplicate, and disclose any data to which this clause is applicable. The purposes of this right are to--

(i) Apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials;

(ii) Obtain medical treatment for those affected by the material; and

(iii) Have others use, duplicate, and disclose the data for the Government for these purposes.

(2) To use, duplicate, and disclose data furnished under this clause, in accordance with Subparagraph (h)(1) of this clause, in precedence over any other clause of this contract providing for rights in data.

(3) The Government is not precluded from using similar or identical data acquired from other sources.

1.8 OZONE-DEPLETING SUBSTANCES (FAR 52.223-11) (JUN 1996)

(a) Definition. "Ozone-depleting substance", as used in this clause, means any substance designated as Class I by the Environmental Protection Agency (EPA) (40 CFR Part 82), including but not limited to chlorofluorocarbons, halons, carbon tetrachloride, and methyl chloroform; or any substance designated as Class II by EPA (40 CFR Part 82), including but not limited to hydrochlorofluorocarbons.

(b) The Contractor shall label products which contain *or* are manufactured with ozone-depleting substances in the manner and to the extent required by 42 U.S.C. 7671j (b), (c), and (d) and 40 CFR Part 82, Subpart E, as follows:

Warning:

Contains (or manufactured with, if applicable) *_____, a substance(s) which harm(s) public health and environment by destroying ozone in the upper atmosphere.

* The Contractor shall insert the name of the substance(s)

1.9 RIGHTS IN DATA - GENERAL (FAR 52.227-14) (JUN 1987) ALTERNATE II (JUN 1987) AND ALTERNATE III (JUN 1987) AS MODIFIED BY NASA FAR SUPPLEMENT 1852.227-14

(a) Definitions.

"Computer software," as used in this clause, means computer programs, computer data bases, and documentation thereof.

"Data," as used in this clause, means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such *as* financial, administrative, cost or pricing, or management information.

"Form, fit, and function data," as used in this clause, means data relating to items, components, *or* processes that are sufficient to enable physical and functional interchangeability, as well as data identifying source, size, configuration, mating, and attachment characteristics, functional characteristics, and performance requirements; except that for computer software it means data identifying source, functional characteristics, and Performance requirements but specifically excludes the source code, algorithm, process, formulae, and flow charts of the software.

"Limited rights," as used in this clause, means the rights of the Government in limited rights data as set forth in the Limited Rights Notice of subparagraph (g)(2) if included in this clause.

"Limited rights data," as used in this clause, means data (other than computer software) that embody trade secrets or are commercial or financial and confidential *or* privileged, to the extent that such data pertain to items, components, or processes developed at private expense, including minor modifications thereof.

"Restricted computer software," as used in this clause, means computer software developed at private expense and that is a trade secret; is commercial or financial and is confidential or privileged; or is published copyrighted computer software; including minor modifications of such computer software.

"Restricted rights," as used in this clause, means the rights of the Government in restricted computer software, as set forth in a Restricted Rights Notice of subparagraph (g)(3) if included in this clause, or as otherwise may be provided in a collateral agreement incorporated in and made part of this contract, including minor modifications of such computer software.

"Technical data," as used in this clause, means data (other than computer software) which are of a scientific *or* technical nature.

"Unlimited rights," as used in this clause, means the right of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have *or* permit others to do so.

(b) Allocation of rights.

(1) Except as provided in paragraph (c) of this clause regarding copyright, the Government shall have unlimited rights in -

(i) Data first produced in the performance of this contract;

(ii) Form, fit, and function data delivered under this contract;

(iii) Data delivered under this contract (except for restricted computer software) that constitute manuals or instructional and training material for installation, operation, or routine maintenance and repair of items, components, **or** processes delivered or furnished for use under this contract; and

(iv) All other data delivered under this contract unless provided otherwise for limited rights data or restricted computer software in accordance with paragraph (g) of this clause.

(2) The Contractor shall have the right to -

(i) Use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, unless provided otherwise in paragraph (d) of this clause;

(ii) Protect from unauthorized disclosure and use those data which are limited rights data or restricted computer software to the extent provided in paragraph (g) of this clause;

(iii) Substantiate use of, add or correct limited rights, restricted rights, or copyright notices and to take other appropriate action, in accordance with paragraphs (e) and (9of this clause; and

(iv) Establish claim to copyright subsisting in data first produced in the performance of this contract to the extent provided in subparagraph (c)(1) of this clause.

(c) Copvright.

(1) Data first Droduced in the performance of this contract. Unless provided otherwise in paragraph (d) of this clause, the Contractor may establish, without prior approval of the Contracting Officer, claim to copyright subsisting in scientific and technical articles based on or containing data first produced in the performance of this contract and published in academic, technical or professional journals, symposia proceedings or similar works. The prior, express written permission of the Contracting Officer is required to establish claim to copyright subsisting in all other data first produced in the performance of this contract. When claim to copyright is made, the Contractor shall affix the applicable copyright notices of 17 U.S.C. 401 or 402 and acknowledgment of Government sponsorship (including contract number) to the data when such data are delivered to the Government, as well as when the data are published or deposited for registration as a published work in the U.S. Copyright Office. For data other than computer software the Contractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable worldwide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government. For computer software, the Contractor grants to the Government and others acting in its behalf, a paid-up nonexclusive, irrevocable worldwide license in such copyrighted computer software to reproduce, prepare derivative works, and perform publicly and display publicly by or on behalf of the Government.

(2) Data not first Droduced in the performance of this contract. The Contractor shall not, without prior written permission of the Contracting Officer, incorporate in data delivered under this contract any data not first produced in the performance of this contract and which contains the copyright notice of 17 U.S.C. 401 or 402, unless the Contractor identifies such data and grants to the Government, or acquires on its behalf, a license of the same scope as set forth in subparagraph (c)(1) of this clause; provided, however, that if such data are computer software the Government shall acquire a copyright license as set forth in subparagraph (g)(3) of this clause if included in this contract or as otherwise may be provided in a collateral agreement incorporated in or made part of this contract.

(3) Removal of copyright notices. The Government agrees not to remove any copyright notices placed on data pursuant to this paragraph (c), and to include such notices on all reproductions of the data.

(d) Release, publication and use of data.

(1) The Contractor shall have the right to use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, except to the extent such data may be subject to the Federal export control or national security laws or regulations, or unless otherwise provided in this paragraph of this clause or expressly set forth in this contract.

(2) The Contractor agrees that to the extent it receives or is given access to data necessary for the performance of this contract which contain restrictive markings, the Contractor shall treat the data in accordance with such markings unless otherwise specifically authorized in writing by the Contracting Officer.

(3) The Contractor agrees not to establish claim to copyright nor to publish or release to others any computer software first produced in the performance of this contract without the prior written permission of the Contracting Officer.

(e) Unauthorized markinq of data.

Notwithstanding any other provisions of this contract concerning inspection or acceptance, if any data delivered under this contract are marked with the notices specified in subparagraph (g)(2) or (g)(3) of this clause and use of such is not authorized by this clause, or if such data bears any other restrictive or limiting markings not authorized by this contract, the Contracting Officer may at any time

either return the data to the Contractor, or cancel or ignore the markings. However, the following procedures shall apply prior to canceling or ignoring the markings.

(i) The Contracting Officer shall make written inquiry to the Contractor affording the Contractor 30 days from receipt of the inquiry to provide written justification to substantiate the propriety of the markings;

(ii) If the Contractor fails to respond or fails to provide written justification to substantiate the propriety of the markings within the 30-day period (or a longer time not exceeding 90 days approved in writing by the Contracting Officer for good cause shown), the Government shall have the right to cancel or ignore the markings at any time after said period and the data will no longer be made subject to any disclosure prohibitions.

(iii) If the Contractor provides written justification to substantiate the propriety of the markings within the period set in subdivision (e)(1)(i) of this clause, the Contracting Officer shall consider such written justification and determine whether or not the markings are to be cancelled or ignored. If the Contracting Officer determines that the markings are authorized, the Contractor shall be so notified in writing. If the Contracting Officer determines, with concurrence of the head of the contracting activity, that the markings are not authorized, the Contracting Officer shall furnish the Contractor a written determination, which determination shall become the final agency decision regarding the appropriateness of the markings unless the Contractor files suit in a court of competent jurisdiction within 90 days of receipt of the Contracting Officer's decision. The Government shall continue to abide by the markings under this subdivision (e)(1)(iii) until final resolution of the matter either by the Contracting Officer's determination becoming final (in which instance the Government shall thereafter have the right to cancel or ignore the markings at any time and the data will no longer be made subject to any disclosure prohibitions), or by final disposition of the matter by court decision if suit is filed.

(2) The time limits in the procedures set forth in subparagraph (e)(1) of this clause may be modified in accordance with agency regulations implementing the Freedom of Information Act (5 U.S.C. 552) if necessary to respond to a request thereunder.

(3) This paragraph (e) does not apply if this contract is for a major system or for support of a major system by a civilian agency other than NASA and the U.S. Coast Guard agency subject to the provisions of Title III of the Federal Property and Administrative Services Act of 1949.

(4) Except to the extent the Government's action occurs as the result of final disposition of the matter by a court of competent jurisdiction, the Contractor is not precluded by this paragraph (e) from bringing a claim under the Contract Disputes Act, including pursuant to the Disputes clause of this contract, as applicable, that may arise as the result of the Government removing or ignoring authorized markings on data delivered under this contract.

(f) Omitted or incorrect markings.

(1) Data delivered to the Government without either the limited rights or restricted rights notice as authorized by paragraph (g) of this clause, or the copyright notice required by paragraph (c) of this clause, shall be deemed to have been furnished with unlimited rights, and the Government assumes no liability for the disclosure, use, or reproduction of such data. However, to the extent the data has not been disclosed without restriction outside the Government, the Contractor may request, within 6 months (or a longer time approved by the Contracting Officer for good cause shown) after delivery of such data, permission to have notices placed on qualifying data at the Contractor's expense. and the Contracting Officer may agree to do so if the Contractor -

(i) Identifies the data to which the omitted notice is to be applied;

(ii) Demonstrates that the omission of the notice was inadvertent;

(iii) Establishes that the use of the proposed notice is authorized; and

(iv) Acknowledges that the Government has no liability with respect to the disclosure, use, or reproduction of any such data made prior to the addition of the notice or resulting from the omission of the notice.

(2) The Contracting Officer may also (i) permit correction at the Contractor's expense of incorrect notices if the Contractor identifies the data on which correction of the notice is to be made, and demonstrates that the correct notice is authorized, or (ii) correct any incorrect notices.

(g) Protection of limited rights data and restricted computer software.

(1) When data other than that listed in subdivisions (b)(1)(i), (ii), and (iii) of this clause are specified to be delivered under this contract and qualify as either limited rights data or restricted computer software, if the Contractor desires to continue protection of such data, the Contractor shall withhold such

data and not furnish them to the Government under this contract. As a condition to this withholding, the Contractor shall identify the data being withheld and furnish form, fit, and function data in lieu thereof. Limited rights data that are formatted as a computer data base for delivery to the Government are to be treated as limited rights data and not restricted computer software.

(2) Notwithstanding subparagraph (g)(1) of this clause, the contract may identify and specify the delivery of limited rights data, or the Contracting Officer may require by written request the delivery of limited rights data that has been withheld or would otherwise be withholdable. If delivery of such data is so required, the Contractor may affix the following "Limited Rights Notice" to the data and the Government will thereafter treat the data, subject to the provisions of paragraphs (e) and (f) of this clause, in accordance with such Notice:

LIMITED RIGHTS NOTICE (JUN 1987)

(a) These data are submitted with limited rights under Government Contract No. ____ (and subcontract _____, if appropriate). These data may be reproduced and used by the Government with the express limitation that they will not, without written permission of the Contractor, be used for purposes of manufacture nor disclosed outside the Government; except that the Government may disclose these data outside the Government for the following purposes, if any, provided that the Government makes such disclosure subject to prohibition against further use and disclosure:

(b) This Notice shall be marked on any reproduction of these data, in whole or in part.

(End of notice)

(3) (i) Notwithstanding subparagraph (g)(1) of this clause, the contract may identify and specify the delivery of restricted computer software, or the Contracting Officer may require by written request the delivery of restricted computer software that has been withheld or would otherwise be withholdable. If delivery of such computer software is so required, the Contractor may affix the following "Restricted Rights Notice" to the computer software and the Government will thereafter treat the computer software, subject to paragraphs (e) and (f) of this clause, in accordance with the Notice:

RESTRICTED RIGHTS NOTICE (JUN 1987)

(a) This computer software is submitted with restricted rights under Government Contract No. _____ (and subcontract _____, if appropriate). It may not be used, reproduced, or disclosed by the Government except as provided in paragraph (b) of this Notice or as otherwise expressly stated in the contract.

(b) This computer software may be -

(1) Used or copied for use in or with the computer or computers for which it was acquired, including use at any Government installation to which such computer or computers may be transferred;

(2) Used or copied for use in a backup computer if any computer for which it was acquired is inoperative;

(3) Reproduced for safekeeping (archives) or backup purposes;

(4) Modified, adapted, or combined with other computer software, provided that the modified, combined, or adapted portions of the derivative software incorporating restricted computer software are made subject to the same restricted rights;

(5) Disclosed to and reproduced for use by support service Contractors in accordance with subparagraphs (b)(1) through (4) of this clause, provided the Government makes such disclosure or reproduction subject to these restricted rights; and

(6) Used or copied for use in or transferred to a replacement computer.

(c) Notwithstanding the foregoing, if this computer software is published copyrighted computer software, it is licensed to the Government, without disclosure prohibitions, with the minimum rights set forth in paragraph (b) of this clause.

(d) Any other rights or limitations regarding the use, duplication, or disclosure of this computer software are to be expressly stated in, or incorporated in, the contract.

(e) This Notice shall be marked on any reproduction of this computer software, in whole or in part.

(End of notice)

(ii) Where it is impractical to include the Restricted Rights Notice on restricted computer software, the following short-form Notice may be used in lieu thereof:

RESTRICTED RIGHTS NOTICE SHORT FORM (JUN 1987)

Use, reproduction, or disclosure is subject to
restrictions set forth in Contract No. _____
(and subcontract _____, if appropriate) with
_____ (name of Contractor and subcontractor).

(End of notice)

(iii) If restricted computer software is delivered with the copyright notice of 17 U.S.C. 401, it will be presumed to be published copyrighted computer software licensed to the Government without disclosure prohibitions, with the minimum rights set forth in paragraph (b) of this clause, unless the Contractor includes the following statement with such copyright notice: "Unpublished – rights reserved under the Copyright Laws of the United States."

(h) Subcontracting. The Contractor has the responsibility to obtain from its subcontractors all data and rights therein necessary to fulfill the Contractor's obligations to the Government under this contract. If a subcontractor refuses to accept terms affording the Government such rights, the Contractor shall promptly bring such refusal to the attention of the Contracting Officer and not proceed with subcontract award without further authorization.

(i) Relationship to patents. Nothing contained in this clause shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Government.

1.10 CLAUSES INCORPORATED BY REFERENCE (FAR 52.252-2) (JUN 1988)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

1.11 AUTHORIZED DEVIATIONS IN CLAUSES (FAR 52.252-6) (APR 1984)

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.

(b) The use in this solicitation or contract of any NASA/FAR Supplement (48 CFR Chapter 18) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

1.12 SECURITY REQUIREMENTS FOR UNCLASSIFIED AUTOMATED INFORMATION RESOURCES (NASA 1852.204-76) (SEP 1993)

(a) In addition to complying with any functional and technical security requirements set forth in the schedule and the clauses of this contract, the Contractor shall initiate personnel screening checks and

obtain user responsibility agreements, as required by this clause, for each Contractor employee requiring unescorted or unsupervised physical access or electronic access to the following limited or controlled areas, systems, programs and data:

_____

_____

(1) The Contractor shall submit a personnel security questionnaire (NASA Form 531, Name Check Request, for National Agency Check (NAC) investigations and Standard Form 85P, Questionnaire for Public Trust Positions, for specified sensitive positions) and a Fingerprint Card (FD-258 with NASA overprint in Origin Block) to the installation Security Officer for each Contractor employee who requires access. The required forms may be obtained from the installation security office. Employees may have finger-prints taken at the NASA Contract Badge and Pass Office, located at 1 Langley Boulevard (Building No. 1228), only between the hours of 6:30 a.m. and 4:30 p.m., Monday through Friday, or at any police department.

(i) Several months may be required for completion of complex personnel screening investigations. Background screening may not be required for employees with recent or current Federal Government investigations.

(ii) When employee access is necessary prior to completion of personnel screening, each Contractor employee requiring access may be considered for escorted access. The installation Security Officer will establish the eligibility of proposed escorts.

(2) The Contractor shall ensure that each Contractor employee requiring access executes any user responsibility agreements required by the Government prior to access. The Contractor shall provide signed copies of the agreements to the installation Security Officer for inclusion in the employee's security file. Unauthorized access is a violation of law and punishable under the provisions of 18 U.S.C. 1029, 18 U.S.C. 1030 and other applicable statutes.

(3) The Contractor shall notify the installation AIS Manager no later than the end of the day of the termination for cause of an authorized employee's access. The Contractor shall notify the COTR no later than 10 days after an authorized employee no longer requires access for any other type of termination. Verbal notifications shall be confirmed in writing within 30 days.

(b) The Contractor shall incorporate this clause in all subcontracts where the requirements identified in paragraph (a) of this clause are applicable to performance of the subcontract.

1.13 OMBUDSMAN (NASA 1852.215-84) (OCT 1996)

An ombudsman has been appointed to hear and facilitate the resolution of concerns from offerors, potential offerors, and Contractors during the preaward and postaward phases of this acquisition. When requested, the ombudsman will maintain strict confidentiality as to the source of the concern. The existence of the ombudsman is not to diminish the authority of the Contracting Officer, the Source Evaluation Board, or the selection official. Further, the ombudsman does not participate in the evaluation of proposals, the source selection process, or the adjudication of formal contract disputes. Therefore, before consulting with an ombudsman, interested parties must first address their concerns, issues, disagreements, and/or recommendations to the Contracting Officer for resolution. If resolution cannot be made by the Contracting Officer, interested parties may contact the installation ombudsman, Belinda Adams, direct inquiries to Sandra S. Ray at (757) 864-2428. Concerns, issues, disagreements, and recommendations which cannot be resolved at the installation may be referred to the NASA ombudsman, the Deputy Administrator for Procurement, Thomas S. Luedtke, at 202-358-2090. Please do not contact the ombudsman to request copies of the solicitation, verify offer due date, or clarify technical requirements. Such inquiries shall be directed to the Contracting Officer or as specified elsewhere in this document.

NOTE: The Ombudsman at the delivery order level is as stated in the G clause entitled, "Procedures for Issuing Delivery Orders."

1.14 FINANCIAL REPORTING OF NASA PROPERTY IN THE CUSTODY OF CONTRACTORS (NASA 1852.245-73)(SEP 1996)

(a) The Contractor shall submit annually a NASA Form 1018, NASA Property in the Custody of Contractors, in accordance with 18-45.505-14, the instructions on the form, and subpart 1845-71. Subcontractor use of NF 1018 is not required by this clause; however, the Contractor shall include data on property in the possession of subcontractors in the annual NF 1018.

(b) If administration of this contract has been delegated to the Department of Defense, the original of NASA Form 1018 shall be submitted to the NASA, LaRC Financial Management Officer, Mail Stop 175 and three copies shall be sent concurrently through the DOD Property Administrator to the address below. If the contract is administered by NASA, the original of NF 1018 shall be submitted to the LaRC Financial Management Office and three copies shall be sent concurrently and directly to the following office:

ATTN: INDUSTRIAL PROPERTY OFFICE
NASA LANGLEY RESEARCH CENTER
MAIL STOP 377
HAMPTON VA 23681-0001

(c) The annual reporting period shall be from October 1 of each year to September 30 of the following year. The report shall be submitted by October 31. The information contained in these reports is entered into the NASA accounting system to reflect current asset values for agency financial statement purposes. Therefore, it is essential that required reports be received no later than October 31. The Contracting Officer may, in the Government's interest, withhold payment until a reserve not exceeding $25,000 or 5 percent of the amount of the contract, whichever is less, has been set-aside. If the Contractor fails to submit annual NF 1018 reports when due, such reserve shall be withheld until the Contracting Officer has determined that the required reports have been received by the Government. The withholding of any amount or the subsequent payment thereof shall not be construed as a waiver of any Government right.

(d) A final report is required within 30 days after disposition of all property subject to reporting when the contract performance period is complete.

1.15 MATERIAL INSPECTION AND RECEIVING REPORT (NASA 1852.246-72)(JUN 1995)

(a) At the time of each delivery to the Government under this contract, the Contractor shall furnish a Material Inspection and Receiving Report (DD Form 250 series) prepared in five copies, an original and four copies.

(b) The Contractor shall prepare the DD Form 250 in accordance with NASA FAR Supplement 18-46.672-1. The Contractor shall enclose the copies of the DD Form 250 in the package or seal them in a waterproof envelope which shall be securely attached to the exterior of the package in the most protected location.

(c) When more than one package is involved in a shipment, the Contractor shall list on the DD Form 250, as additional information, the quantity of packages and the package numbers. The Contractor shall forward the DD Form 250 with the lowest numbered package of the shipment and print the words "CONTAINS DD FORM 250" on the package.

NOTICE: THE FOLLOWING CLAUSES ARE APPLICABLE ONLY TO THE FIRM-FIXED PRICE ORDERS ISSUED UNDER THIS CONTRACT.

PART II - CONTRACT CLAUSES

SECTION I - CONTRACT CLAUSES

1.16 LISTING OF CLAUSES INCORPORATED BY REFERENCE:

NOTICE: The following solicitation contract clauses pertinent to this section are hereby incorporated by reference.

FEDERAL ACQUISITION REGULATION (48 CFR CHAPTER 1) CLAUSES

CLAUSE NUMBER	TITLE AND DATE
52.228-5	Insurance - Work on a Government Installation (JAN 1997)
52.229-3	Federal, State and Local Taxes (JAN 1991)
52.229-5	Taxes - Contracts Performed in U.S. Possessions or Puerto Rico (APR 1984)
52.232-1	Payments (APR 1984)
52.232-8	Discounts for Prompt Payment (MAY 1997)
52.232-11	Extras (APR 1984)
52.232-16	Progress Payments (JUL 1991)
52.232-16	Progress Payments (JUL 1991) Alternate I (AUG 1987)
52.242-15	Stop-Work Order (AUG 1989)
52.242-17	Government Delay Of Work (APR 1984)
52.243-1	Changes--Fixed-Price (AUG 1987)
52.244-1	Subcontracts (Fixed-Price Contracts) (FEB 1995) Alternate I (APR 1984)
52.245-2	Government Property (Fixed-Price Contracts) (DEC 1989)
52.246-2	Inspection of Supplies--Fixed-Price (AUG 1996)
52.246-4	Inspection *of* Services--Fixed-Price (AUG 1996)
52.246-16	Responsibility for Supplies (APR 1984)
52.249-1	Termination for Convenience of the Government (Fixed-Price) (Short Form) (APR 1984)
52.249-2	Termination for Convenience of the Government (Fixed-Price) (SEP 1996)
52.249-8	Default (Fixed-Price Supply and Service) (APR 1984)

NASA FAR SUPPLEMENT (48 CFR CHAPTER 18) CLAUSES

CLAUSE NUMBER	TITLE AND DATE
1852.232-82	Submission of Requests for Progress Payments (MAR 1989)

NOTICE: THE FOLLOWING CLAUSES ARE APPLICABLE ONLY TO THE COST REIMBURSEMENT ORDERS ISSUED UNDER THIS CONTRACT.

PART II -CONTRACT CLAUSES

SECTION I - CONTRACT CLAUSES

I.17 LISTING OF CLAUSES INCORPORATED BY REFERENCE:

NOTICE: The following solicitation contract clauses pertinent to this section are hereby incorporated by reference.

FEDERAL ACQUISITION REGULATION (48 CFR CHAPTER 1) CLAUSES

CLAUSE NUMBER	TITLE AND DATE
52.215-30	Facilities Capital Cost of Money (SEP 1987)
52.216-7	Allowable Cost and Payment (MAR 1997)
52.216-8	Fixed Fee (MAR 1997)
52.228-7	Insurance - Liability to Third Persons (MAR 1996)
52.230-2	Cost Accounting Standards (APR 1996)
52.230-3	Disclosure and Consistency of Cost Accounting Practices (APR 1996)
52.230-6	Administration of Cost Accounting Standards (APR 1996)
52.232-22	Limitation of Funds (APR 1984)
52.242-1	Notice of Intent to Disallow Costs (APR 1984)
52.242-3	Penalties for Unallowable Costs (JAN 1997)
52.242-4	Certification of Indirect Costs (OCT 1995)
52.242-15	Stop-Work Order (AUG 1989) Alternate I (APR 1984)
52.243-2	Changes—Cost-Reimbursement (AUG 1987)
52.244-2	Subcontracts (Cost-Reimbursement and Letter Contracts) (FEB 1997) Alternate I (AUG 1996)
52.245-5	Government Property (Cost-Reimbursement, Time-and-Material, or Labor-Hour Contracts) (JAN 1986) (DEVIATION) (JUL 1995)
52.246-3	Inspection of Supplies - Cost-Reimbursement (APR 1984)
52.246-5	Inspection of Services - Cost-Reimbursement (APR 1984)
52.249-6	Termination (Cost-Reimbursement) (SEP 1996)
52.249-14	Excusable Delays (APR 1984)

NASA FAR SUPPLEMENT (48 CFR CHAPTER 18) CLAUSES

CLAUSE NUMBER	TITLE AND DATE
1852.216-75	Payment of Fixed Fee (DEC 1988)
1852.216-89	Assignment and Release Forms (JUL 1997)
1852.242-70	Technical Direction (SEP 1993)
1852.242-73	NASA Contractor Financial Management Reporting (JUL 1997)

1.18 CLAUSES IN FULL TEXT

The clauses listed below follow in full text:

52.222-2 Payment for Overtime Premiums (JUL 1990)

1.19 PAYMENT FOR OVERTIME PREMIUMS (FAR 52.222-2) (JUL 1990)

(a) The use of overtime is authorized under this contract if the overtime premium cost does not exceed $0 or the overtime premium is paid for work -

(1) Necessary to cope with emergencies such as those resulting from accidents, natural disasters, breakdowns of production equipment, or occasional production bottlenecks of a sporadic nature;

(2) By indirect-labor employees such as those performing duties in connection with administration, protection, transportation, maintenance, standby plant protection, operation of utilities, or accounting;

(3) To perform tests, industrial processes, laboratory procedures, loading or unloading of transportation conveyances, and operations in flight or afloat that are continuous in nature and cannot reasonably be interrupted or completed otherwise; or

(4) That will result in lower overall costs to the Government.

(b) Any request for estimated overtime premiums that exceeds the amount specified above shall include all estimated overtime for contract completion and shall -

(1) Identify the work unit; e.g., department or section in which the requested overtime will be used, together with present workload, staffing, and other data of the affected unit sufficient to permit the Contracting Officer to evaluate the necessity for the overtime;

(2) Demonstrate the effect that denial of the request will have on the contract delivery or performance schedule;

(3) Identify the extent to which approval of overtime would affect the performance or payments in connection with other Government contracts, together with identification of each affected contract; and

(4) Provide reasons why the required work cannot be performed by using multishift operations or by employing additional personnel.

PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS

SECTION J - LIST OF ATTACHMENTS

Exhibit A	Contract Documentation Requirements, 5 pages
Exhibit B	Subcontracting Plan, 199, pages

The following are located after the last section of this solicitation:

Attachment 1	Standard Form 1448, Contract Pricing Proposal Coversheet
Attachment 2	Relevant Experience and Past Performance Evaluation Instructions/Questionnaire, 4 pages
Attachment 3	Offerors Library Information
Attachment 4	List of companies that responded to the Sources Sought Synopsis and Draft Solicitation
Attachment 5	Summary of Significant Comments/Questions Received from Industry Including Government Responses

EXHIBIT A - CONTRACT DOCUMENTATION REQUIREMENTS

I. DOCUMENTATION PREPARATION/SUBMISSION INSTRUCTIONS

A. Monthly DO Status--The Contractor shall submit monthly technical letter reports for each delivery order. Delivery Orders may be summarized in one letter report unless otherwise stipulated in individual DOs. Reports shall be in narrative form, brief and informal in content. These reports shall include:

1. DO Number, current modification number and date

2. DO Title

3. NASA DO Monitor

4. Contractor DO Leader

5. A narrative statement of work accomplished during the report period

6. A statement of current and potential problem areas and proposed corrective action

7. Estimated Completion Date

8. A discussion of work to be performed during the next report period

The monthly progress report shall be submitted within 10 days after the end of each calendar monthly report period.

B. Financial Management Reports--

1. The Contractor shall submit a monthly financial management report as provided by the Section I clause entitled "NASA Contractor Financial Management Reporting." This report shall be submitted utilizing NASA Form 533M, Monthly Contractor Financial Management Report, in accordance with submission instructions contained on the reverse side of the form. (Columns 8a and 8b, 533M, shall contain estimates for the following two successive months for the reporting a. and c. of paragraph 2. below.)

2. For this indefinite delivery contract a 533M shall be provided for the reporting levels identified below:

a. Each Authorized Cost Type DO

b. Contract Total (Includes the sum of all authorized cost-type DO's)

c. Due not later than the 10th operating day following the close of the Contractor's accounting period being reported.

d. Each 533M shall include a narrative explanation for variances exceeding five percent between planned hours/dollars and actual hours/dollars for each reporting category (at the total contract level only).

3. In addition, cost detail associated with the following elements shall be included in each of the above, if applicable.

a. Direct Labor Hours
b. Other Direct Hours
C. Direct Labor Dollars
d. Other Direct Labor
e. Premium Dollars:
f. Travel
g. Consultants
h. Subcontract
ı. Material
j. Overhead
k. G&A
l. Total Estimated Cost
m. Total Fee
n. Total Estimated Cost Plus Fee

NOTE: **The** above cost details may be revised to be consistent with the selected Offeror(s) accounting system.

C. Quarterly Financial Management Report--The Contractor shall submit a financial report at the contract level as well as broken down by DO detailed by categories specified in paragraph 3. above on NASA Form 533Q at times and in accordance with the instructions contained on the reverse side of the form. The initial report shall be due 10 operating days after the award of the contract.

D. Property in the Custody of Contractors (NASA Form 1018)--The Contractor shall submit the NASA Form 1018 no later than October 31 of each year in accordance with the Section G clause entitled "Financial Reporting of NASA Property in the Custody of Contractors."

E. Safety Plan--Within 30 calendar days after the effective date of the contract, the Contractor shall submit a detailed safety plan showing how the Contractor intends to protect the life, health, and well being of NASA and Contractor employees as well as property and equipment. This plan, as approved by the Contracting Officer, should contain, as a minimum the following:

1. Points of Contact and Responsibility--Organizationalflow chart and description of responsibilities of each employee in your organization for safety.

2. Employee Safety Training, Certification and Programs--Detailed information on type of training required, parties responsible for certification, and outline of applicable regulations. Detail company programs which emphasize personal safety and motivate employees to be safety conscious.

3. LaRC Safety Policies/Procedures--Recognition of applicable LaRC safety policies and procedures such as Langley Handbook 1710.10, LaRC Red Tag System.

4. Accident Investigation and Reporting–Procedures for investigating and reporting accidents/incidents including immediate notification to the NASA LaRC Safety Manager of all injuries and damage to equipment or facilities.

5. Hazardous Operations--

(a) Description of hazardous operations involved in contract performance.

(b) Plans for apprising employees of all hazards to which they may be exposed.

(c) Proper conditions and precautions for safe use and exposure to hazardous operations. Include recognition of LHB 1710.12, Potentially Hazardous Materials.

6. People with Disabilities--In accordance with the Americans with Disabilities Act, the plans should specify that prior to assigning a person with disabilities to this contract, the Contractor shall contact the Disability Program Manager at (757) 864-7718.

7. Other Safety Considerations--Any other safety considerations unique to your operation.

F. Subcontracting Reports--The Contractor shall submit Standard Form 294, Subcontracting Report for Individual Contracts, Standard Form 295, Summary Subcontractor Report, and in accordance with the instructions on the reverse of the form.

In addition to the instructions on the reverse of the SF 295, the Contractor is required to comply with Clause 1852.219-75, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Reporting.

Pursuant to the contract clause entitled "Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan" (FAR 52.219-9 and 19.704(a)(5)), you are required to submit a letter progress report on a monthly basis. The "Monthly Progress Report for Socioeconomic Goals" shall be limited to the monthly data only (excluding cumulative data from beginning of Subcontract Plan) as required for Lines 10A, 10B, 10C, 11, and 12 of the Standard Form 294. Letter progress reports may be signed by the Contract Administrator or equivalent organizational level, and each report is due by the 10th calendar day of the month following the close of the reporting period.

G. Monthly Progress Report for Socioeconomic Goals - - The Contractor shall submit a monthly report which provides the following information:

1.	Small Business Concerns: (include disadvantaged)	$_____
2.	Large Business Concerns:	$_____
3.	Total (sum of Sm & Lg Bus):	$_____
4.	Small Disadv. Bus. Concerns:	$_____
5.	Woman-Owned Small Business : (include as part of 3 & 4 above)	$_____
6.	Historical Black Colleges/Univ and/or: Minority Institutions (include as part of 3 & 4 above)	$_____

H. Federal Contractor Veterans Employment Report–In compliance with Clause 52.222-37, Employment Reports on Special Disabled Veterans and Veterans of the Vietnam Era, the Contractor shall submit the Federal Contractor Veterans Employment Report (VETS-100) as required by this clause.

I. Evidence of Insurance--The Contractor shall submit evidence of the insurance coverage, required by the NASA Clause 1852.228-75 in Section I entitled "Minimum Insurance Coverage" (i.e., a Certificate of Insurance or other confirmation), to the Contracting Officer prior to performing under this contract.

J. Quality Plan--Within 30 calendar days after the effective date of the contract, the Contractor shall submit a quality plan which addresses how contract quality requirements will be met. The plan and subsequent revisions will be reviewed and approved by the Contracting Officer or the designated representative.

II. DOCUMENT DISTRIBUTION REQUIREMENTS

A. Unless otherwise specified elsewhere in this contract, reports and other documentation shall be submitted f.o.b. destination as specified below, addressed as follows:

National Aeronautics and Space Administration
Langley Research Center
Attn: _____, Mail Stop ___
Contract NAS1-
Hampton, VA 23681-0001

B. The following letter codes designate the recipients of reports and other documentation which are required to be delivered to Langley Research Center by the Contractor:

A--Contract Administrator, Mail Stop 126

B--Contracting Officer Technical Representative, Mail Stop ___

C--New Technology Representative, Mail Stop 212

D--Patent Counsel, Mail Stop 212

E--Cost Accounting, Mail Stop 135 (via Mail Stop 175)

F--Safety Officer, Mail Stop 429

G--Property Administrator

H--According to instructions on Form

I--Small Business Specialist, Mail Stop 144

J—Security Officer, Mail Stop 411

C. The following are the distribution requirements for reports and other documentation required to be delivered f.o.b. destination. The numeral following the letter code specifies the number of copies to be provided:

DOCUMENT	LETTER CODE AND DISTRIBUTION
Monthly DO Status	A-1, B-2
Financial Management Report	A-1, B-2, E-2
New Technology or Patent Rights Reports	A-1, B-2, C-1, D-1
Report of Government-Owned/Contractor-Held Property (NASA Form 1018)	*G-4*
Safety Plan	B-2, F-1
Subcontracting Report for Individual Contracts (Standard Form 294)	A-1, I-1

Summary Subcontractor Report (Standard Form 295)	H-1
Monthly Progress Report for Socioeconomic Goals	A-1, I-1
Federal Contractor Veterans Employment Report (VETS-100)	H-1
Evidence of Insurance	A-1, B-1
Quality Plan	A-1, B-1
NASA Form 531 and Standard Form 85P (Ref. Clause 1852.204-76)	A-1, J-1

D. When the Contract Administrator (A) is not designated **above** to receive a copy of a report or document, the Contractor shall furnish a copy of the report/document transmittal letter to the Contract Administrator. The Contractor shall also furnish a copy of the transmittal letter and a copy of each Financial Management Report ***to*** the delegated Administrative Contracting Officer of the cognizant DoD (or other agency) contract administrative services component.

PART IV - REPRESENTATIONS AND INSTRUCTIONS

SECTION K - REPRESENTATIONS. CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS

K.1 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (FAR 52.203-2) (APR 1985)

(a) The Offeror certifies that -

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other Offeror or competitor relating to (i) those prices, (ii) the intention to submit an offer, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this offer have not been and will not be knowingly disclosed by the Offeror, directly or indirectly, to any other Offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the Offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory -

(1) Is the person in the Offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above _____ (insert full name of person(s) in the Offeror's organization responsible for determining the prices offered in this bid or proposal and the title of his or her position in the Offeror's organization);

(ii) As an authorized agent does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the Offeror deletes or modifies subparagraph (a)(2) above, the Offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

K.2 CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (FAR 52.203-11) (APR 1991)

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The Offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief, that on or after December 23, 1989, -

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this

solicitation, the Offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontracts at any tier and require that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

K.3 TAXPAYER IDENTIFICATION (FAR 52.204-3) (JUNE 1997)

(a) Definitions.

"Common parent," as used in this solicitation provision, means thatcorporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

"Corporate status," as used in this solicitation provision, means a designation as to whether the offeror is a corporate entity, an unincorporated entity (e.g., sole proprietorship or partnership), or a corporation providing medical and health care services.

"Taxpayer Identification Number (TIN)," as used in this solicitation provision, means the number required by the IRS to be used by the offeror in reporting income tax and other returns.

(b) All offerors are required to submit the information required in paragraphs (c) through (e) of this solicitation provision in order to comply with reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M and implementing regulations issued by the Internal Revenue Service (IRS). If the resulting contract is subject to the reporting requirements described in FAR 4.903, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) Taxpayer Identification Number (TIN).

☐ TIN:_____

☐ TIN has been applied for.

☐ TIN is not required because:

☐ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the U.S. and does not have an office or place of business or a fiscal paying agent in the U.S.;

☐ Offeror is an agency or instrumentality of a foreign government;

☐ Offeror is an agency or instrumentality of a Federal, state, or local government;

☐ Other. State basis._____

(d) Corporate Status.

☐ Corporation providing medical and health care services, or engaged in the billing and collecting of payments for such services;

☐ Other corporate entity;

☐ Not a corporate entity:

☐ Sole proprietorship

☐ Partnership

☐ Hospital or extended care facility described in 26 CFR 501(c)(3) that is exempt from taxation under 26 CFR 501(a).

(e) Common Parent.

☐ Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this provision.

☐ Name and TIN of common parent:

Name_____

TIN_____

K.4 WOMEN-OWNED BUSINESS (FAR 52.204-5) (OCT 1995)

(a) *Representation,* The Offeror represents that it [ ] is, [ ] is not a women-owned business concern.

(b) *Definition.* "Women-owned business concern," as used in this provision, means a concern which is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

K.5 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (FAR 52.209-5) (MAR 1996)

(a)(1) The Offeror certifies, to the best of its knowledge and belief, that -

(i) The Offeror and/or any of its Principals -

(A) Are ( ) are not ( ) presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have ( ) have not ( ), within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(C) Are ( ) are not ( ) presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(ii) The Offeror has ( ) has not ( ), within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

K.6 TYPE OF BUSINESS ORGANIZATION (FAR 52.215-6) (JUL 1987)

The Offeror or Quoter, by checking the applicable box, represents that -
(a) It operates as ( ) *a* corporation incorporated under the laws of the State of _____
( ) an individual, ( ) a partnership, ( ) a nonprofit organization, or ( ) a joint venture; or
(b) If the Offeror or Quoter is a foreign entity, it operates as ( ) an individual, ( ) a partnership, ( ) a nonprofit organization, ( ) a joint venture, or ( ) a corporation, registered for business in _____
country

K.7 AUTHORIZED NEGOTIATORS (FAR 52.215-11) (APR 1984)

The Offeror or Quoter represents that the following persons are authorized to negotiate on its behalf with the Government in connection with this request for proposals or quotations: (list names, titles, and telephone numbers of the authorized negotiators).

_____

_____

K.8 PLACE OF PERFORMANCE (FAR 52.215-20) (APR 1984)

(a) The Offeror or Quoter, in the performance of any contract resulting from this solicitation, ( ) intends, ( ) does not, intend (check applicable block), to use one or more plants or facilities located at a different address from the address of the Offeror or Quoter as indicated in this proposal or quotation.
(b) If the Offeror or Quoter checks "intends" in paragraph (a) above, it shall insert in the spaces provided below the required information:

Place of Performance (Street Address, City, County, State, Zip Code)	Name and Address of Owner and Operator of the Plant or Facility if Other than Offeror or Quoter
_____	_____
_____	_____
_____	_____

K.9 SMALL BUSINESS PROGRAM REPRESENTATIONS (FAR 52.219-1) (JAN 1997)

(a)(1) The standard industrial classification (SIC) code for this acquisition is _8711_ *(insert SIC code).*
(2) The small business size standard is _$2.5 million_ *(insert SIC standard).*
(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.
(b) Representations. (1) The Offeror represents as part of its offer that it is: ( ) a small business concern, ( ) not a small business concern.
(2) (Complete only if Offeror represented itself as a small business concern in Block (c)(1) of this section.) The Offeror represents as part of its offer that it ( ) is, ( ) is into a small disadvantaged business concern.
(3) (Complete only if Offeror represented itself as a small business concern in Block (b)(1) of this section.) The Offeror represents as part of its offer that it ( ) is, ( ) is not a women-owned small business concern.
(c) Definitions.
"Joint venture," for purposes of a small disadvantaged business (SDB) set-aside or price evaluation preference (as prescribed at 13 CFR 124.321), is a concern that is owned and controlled by one or more socially and economically disadvantaged individuals entering into a joint venture agreement with one or more business concerns and is considered to be affiliated for size purposes with such other

concern(s). The combined annual receipts or employees of the concerns entering into the joint venture must meet the applicable size standard corresponding to the SIC code designated for the contract. The majority of the venture's earnings must accrue directly to the socially and economically disadvantaged individuals in the SDB concern(s) in the joint venture. The percentage of the ownership involvement in a joint venture by disadvantaged individuals must be at least 51 percent.

"Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and size standard in Paragraph (a) of this provision.

"Small disadvantaged business concern," as used in this provision, means a small business concern that (1) is at least 51 percent unconditionally owned by one or more individuals who are both socially and economically disadvantaged, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more socially and economically disadvantaged individuals, and (2) has its management and daily business controlled by one or more such individuals. This term also means a small business concern that is at least 51 percent unconditionally owned by an economically disadvantaged Indian tribe or Native Hawaiian Organization, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more of these entities, which has its management and daily business controlled by members of an economically disadvantaged Indian tribe or Native Hawaiian Organization, and which meets the requirements of 13 CFR Part 124.

"Woman-owned small business concern," as used in this provision, means a small business concern--

(1) Which is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(d) Notice. (1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C.645(d), any person who misrepresents a firm's status as a small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to sections 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall --

(i) Be punished by imposition of a fine, imprisonment, or both;

(ii) Be subject to administrative remedies, including suspension and debarment; and

(iii) Be ineligible for participation in programs conducted under the authority of the Act.

K.10 CERTIFICATION OF NONSEGREGATED FACILITIES (FAR 52.222-21) (APR 1984)

(a) "Segregated facilities", as used in this provision, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise.

(b) By the submission of this offer, the Offeror certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Offeror agrees that a breach of this certification is a violation of the Equal Opportunity clause in the contract.

(c) The Offeror further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will -

(1) Obtain identical certifications from proposed subcontractors before the award of subcontracts under which the subcontractor will be subject to the Equal Opportunity clause;

(2) Retain the certifications in the files; and

(3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract under which the subcontractor will be subject to the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually.

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

K.11 PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (FAR 52.222-22) (APR 1984)

The Offeror represents that -
(a) It ( ) has, ( ) has not, participated in a previous contract or subcontract subject either to the Equal Opportunity clause of this solicitation, the clause originally contained in Section 310 of Executive Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114;
(b) It ( ) has, ( ) has not, filed all required compliance reports; and
(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

K.12 CLEAN AIR AND WATER CERTIFICATION (FAR 52.223-1) (APR 1984)

The Offeror certifies that -
(a) Any facility to be used in the performance of this proposed contract ( ) is, ( ) is not, listed on the Environmental Protection Agency List of Violating Facilities;
(b) The Offeror will immediately notify the Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the Environmental Protection Agency, indicating that any facility that the Offeror proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and
(c) The Offeror will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

K.13 CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (FAR 52.223-13) (OCT 1996)

(a) Submission of this certification is a prerequisite for making or entering into this contract imposed by Executive Order 12969, August 8, 1995.

(b) By signing this offer, the Offeror certifies that—

(1) As the owner or operator of facilities that will be used in the performance of this contract that are subject to the filing and reporting requirements described in section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023) and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106), the Offeror will file and continue to file for such facilities for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of EPCRA and section 6607 of PPA; or

(2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facility is exempt for at least one of the following reasons: (Check each block that is applicable.)

☐ (i) The facility does not manufacture, process, or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);

☐ (ii) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

☐ (iii) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C.11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

☐ (iv) The facility does not fall within Standard Industrial Classification Code (SIC) designations 20 through 39 as set forth in section 19.102 of the Federal Acquisition Regulation; or

☐ (v) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

K.14 BUY AMERICAN ACT - TRADE AGREEMENTS - BALANCE OF PAYMENTS PROGRAM CERTIFICATE (FAR 52.225-8) (JAN 1994)

(a) The Offeror hereby certifies that each end product, except those listed in paragraph (b) of this provision, is a domestic end product (as defined in the clause entitled "Buy American Act - Trade Agreements - Balance of Payments Program") and that components of unknown origin have been considered to have been mined, produced, or manufactured outside the United States, a designated country, a North American Free Trade Agreement (NAFTA) country, or a Caribbean Basin country, as defined in section 25.401 of the Federal Acquisition Regulation.
(b) Excluded End Products:

Line Item Number	Country of Origin
_____	_____
_____	_____
_____	_____

(List as necessary)

(c) Offers will be evaluated by giving certain preferences to domestic end products, designated country end products, and Caribbean Basin country end products over other end products. In order to obtain these preferences in the evaluation of each excluded end product listed in paragraph (b) of this provision, Offerors must identify and certify below those excluded end products that are designated or NAFTA country end products or Caribbean Basin country end products. Products that are not identified and certified below will not be deemed designated country end products, NAFTA country end products, or Caribbean Basin country end products. Offerors must certify by inserting the applicable line item numbers in the following:

(1) The Offeror certifies that the following supplies qualify as "designated or NAFTA country end products" as those terms are in the clause entitled "Buy American Act - Trade Agreements Act - Balance of Payments Program":

_____

(Insert line item numbers)

(2) The Offeror certifies that the following supplies qualify as "Caribbean Basin country end products" as that term is defined in the clause entitled "Buy American Act - Trade Agreements - Balance of Payments Program":

_____

(Insert line item numbers)

(d) Offers will be evaluated in accordance with Part 25 of the Federal Acquisition Regulation.

K.15 PAYMENT INFORMATION (LaRC 52.232-98) (JUN 1988)

The following is the address to which payment must be sent, if payment is made by check.

_____

_____

_____

K.16 OFFER ACCEPTANCE PERIOD (LaRC 52.215-110) (JUN 1992)

In compliance with the solicitation, if this offer is accepted within 90 calendar days from the date specified in the solicitation for receipt of offers, the Offeror agrees to furnish any or all items on which prices are offered at the price set opposite each item, delivered at the designated point(s), within the time specified in the Schedule.

SECTION L - INSTRUCTIONS. CONDITIONS AND NOTICES TO OFFERORS

L.1 LISTING OF PROVISIONS INCORPORATED BY REFERENCE

NOTICE: The following solicitation provisions pertinent to this section are hereby incorporated by reference.

FEDERAL ACQUISITION REGULATION (48 CFR CHAPTER 1) PROVISIONS

PROVISON NUMBER	TITLE AND DATE
52.204-6	Contractor Identification Number - Data Universal Numbering System (DUNS) Number (DEC 1996)
52.214-34	Submission of Offers in the English Language (APR 1991)
52.214-35	Submission of Offers in U.S. Currency (APR 1991)
52.215-5	Solicitation Definitions (JUL 1987)
52.215-7	Unnecessarily Elaborate Proposals or Quotations (APR 1984)
52.215-8	Amendment to Solicitations (DEC 1989)
52.215-9	Submission of Offers (MAR 1997)
52.215-10	Late Submissions, Modifications, and Withdrawals of Proposals (JUN 1997)
52.215-13	Preparation of Offers (APR 1984)
52.215-14	Explanation to Prospective Offerors (APR 1984)
52.215-15	Failure to Submit Offer (MAY 1997)
52.215-30	Facilities Capital Cost of Money
52.216-27	Single or Multiple Award (OCT 1995)
52.222-24	Preaward On-Site Equal Opportunity Compliance Review (APR 1984)
52.232-13	Notice of Progress Payments (APR 1984)
52.237-1	Site Visit (APR 1984) NOTE: Site Visits will be held on an individual delivery order basis.

NASA FAR SUPPLEMENT (48 CFR CHAPTER 18) PROVISIONS

PROVISION NUMBER	TITLE AND DATE
1852.215-75	Expenses Related to Offeror Submissions (DEC 1988)
1852.227-84	Patent Rights Clauses (Dec 1989)

L.2 NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE (FAR 52.211-14) (SEP 1990)

Any contract awarded as a result of this solicitation will be ( ) DX rated order; (X) DO rated order certified for national defense use under the Defense Priorities and Allocations System (DPAS) (15 CFR 700). and the Contractor will be required to follow all of the requirements of this regulation.

L.3 CONTRACT AWARD (FAR 52.215-16) (OCT 1995)--ALTERNATE II (OCT 1995)

(a) The Government will award a contract resulting from this solicitation to the responsible Offeror whose offer conforming to the solicitation will be most advantageous to the Government, cost or price and other factors, specified elsewhere in this solicitation, considered.
(b) The Government may (1) reject any or all offers if such action is in the public interest, (2) accept other than the lowest offer, and (3) waive informalities and minor irregularities in offers received.
(c) The Government intends to evaluate proposals and award a contract without discussions with Offerors (except communications conducted for the purpose of minor clarification). Therefore, each initial offer should contain the Offeror's best terms from a Cost or price and technical standpoint. However, the Government reserves the right to conduct discussions if later determined by the Contracting Officer to be necessary.
jd) The Government may accept any item or group of items of an offer, unless the Offeror qualifies the offer by specific limitations. Unless otherwise provided in the Schedule, offers may be submitted for quantities less than those specified. The Government reserves the right to make an award on any item for a quantity less than the quantity offered, at the unit cost or prices offered, unless the Offeror specifies otherwise in the offer.
(e) A written award or acceptance of offer mailed or otherwise furnished to the successful Offeror within the time for acceptance specified in the offer shall result in a binding contract without further action by either party. Before the offer's specified expiration time, the Government may accept an offer (or part of an offer, as provided in paragraph (d) above), whether or not there are negotiations after its receipt, unless a written notice of withdrawal is received before award. Negotiations conducted after receipt of an offer do not constitute a rejection or counteroffer by the Government.
(f) Neither financial data submitted with an offer, nor representations concerning facilities or financing, will form a part of the resulting contract. However, if the resulting contract contains a clause providing for price reduction for defective cost or pricing data, the contract price will be subject to reduction if cost or pricing data furnished is incomplete, inaccurate, or not current.
(g) The Government may determine that an offer is unacceptable if the prices proposed are materially unbalanced between line items or subline items. An offer is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated in relation to cost for other work, and if there is a reasonable doubt that the offer will result in the lowest overall cost to the Government, even though it may be the low evaluated offer, or it is so unbalanced as to be tantamount to allowing an advance payment.
(h) The Government may disclose the following information in post-award debriefings to other Offerors; (1) the overall evaluated cost or price and technical rating of the successful Offeror; (2) the overall ranking of all Offerors, when any ranking was developed by the agency during source selection; (3) a summary of the rationale for award; and (4) for acquisitions of commercial end items, the make and model of the item to be delivered by the successful Offeror.

L.4 REQUIREMENTS FOR COST OR PRICING DATA OR INFORMATION OTHER THAN COST OR PRICING DATA (FAR 52.215-41) (JAN 1997) ALTERNATE IV (OCT 1995)

(a) Submission of cost or pricing data is not required

(b) Provide information described in provision L.15, Paragraph D.I.c.

L.5 TYPE OF CONTRACT (FAR 52.216-1) (APR 1984)

The Government contemplates award of an indefinite delivery, indefinite quantity contract(s) with orders being placed on a fixed price and cost plus fixed fee basis resulting from this solicitation.

L.6 SERVICE OF PROTEST (FAR 52.233-2) (AUG 1996)

(a) Protests, as defined in Section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from Head, Acquisition Support Office A .
(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

L.7 AUTHORIZED DEVIATIONS IN PROVISIONS (FAR 52.252-5) (APR 1984)

(a) The use in this solicitation of any Federal Acquisition Regulation (48 CFR Chapter 1) provision with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the provision.
(b) The use in this solicitation of any NASA FAR Supplement (48 CFR Chapter 18) provision with an authorized deviation **is** indicated by the addition of "(DEVIATION)" after the name of the regulation.

L.8 SUBCONTRACTING PLAN FOR SMALL, SMALL DISADVANTAGED, AND WOMEN-OWNED SMALL BUSINESS CONCERNS

The offeror (except small businesses) shall include a proposed subcontracting plan for small, small disadvantaged, and women-owned small business concerns for consideration in the source evaluation and selection process. The planned subcontracting amounts should be broken out and provided for each contract period, for a total contract duration of 5 years. This plan must comply with the Section I clause entitled, "Small, Small Disadvantaged, and Women-Owned Small Business Subcontracting Plan," and should provide for the small disadvantaged business goal that is equal to or greater than the goal referenced in L.10.

NOTE: Your proposed subcontracting goal to small disadvantaged business concerns shall include any planned subcontract awards to small disadvantaged business concerns as defined in FAR Clause 52.219-8 and Women-Owned Businesses, Historically Black Colleges and Universities, and other Minority Educational Institutions as defined in NASA FAR Supplement Clause 1852.219-76.

L.9 SMALL, SMALL DISADVANTAGED, AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN

(a) This provision is not applicable to small business concerns.
(b) The contract expected to result from this solicitation will contain FAR clause 52.219-9 Alternate II, "Small, Small Disadvantaged, and Women-Owned Small Business Subcontracting Plan." Each Offeror must submit the complete plan with its initial proposal.

L.10 SMALL DISADVANTAGED BUSINESS *(SDB)* PARTICIPATION GOAL

Offerors are advised that, in keeping with Congressionally-mandated goals, NASA seeks to place a fair portion of its contract dollars, where feasible, with small disadvantaged business concerns as defined in 52.219-8 of the FAR and 18-52.219-76 of the NASA FAR Supplement. For this procurement, the Contracting Officer has established a goal of 8 percent for SDB participation. The goal is stated as a percentage of the total contract value, including all options, and not as a percentage of the total planned subcontracting dollars. SDB participation includes participation by small business concerns owned and controlled by women, Historically Black Colleges and Universities and other minority educational institutions.

NASA encourages all offers to propose to meet or exceed this goal to the maximum extent practicable and to continue to encourage small disadvantaged business development throughout the contract period. Proposals will be evaluated on proposed SDB participation in comparison with the 8 percent goal, and on the methods proposed for achieving the goal.

L.11 PROTESTS TO NASA (1852.233-70) (MAR 1997)

Potential bidders or Offerors may submit a protest under 48 CFR Part 33 (FAR Part 33) directly to the Contracting Officer. As an alternative to the Contracting Officer's consideration of a protest, a potential bidder or Offeror may submit the protest to the Deputy Associate Administrator for Procurement, who will serve as or designate the official responsible for conducting an independent review. Protests requesting an independent review shall be addressed to Deputy Associate Administrator for Procurement, NASA Code H, Washington, DC 20546-0001.

L.12 COMMUNICATIONS REGARDING THIS SOLICITATION (LaRC 52.204-95) (OCT 1993)

Any communications in reference to this solicitation shall cite the solicitation number and be directed to the following Government representative:

Name:	Charlotte T. Hardy
Phone:	(757) 864-2526 (COLLECT CALLS NOT ACCEPTED)
Facsimile:	757-864-7709
E-mail:	c.t.hardy@larc.nasa.gov
Address:	National Aeronautics and Space Administration Langley Research Center Attn: Charlotte T. Hardy, Mail Code 126 Hampton, VA 23681-0001

Any written communications must include the mail code on the envelope or on the telex.

L.13 SOURCES FOR REFERENCE PUBLICATIONS

DOD STD-100:
Standardization Document
Order Desk Building 4, Section D
700 Robbins Avenue
Philadelphia, PA 19111-5094

Facsimile No. (215) 697-2978

LHB 5300.4 - Software Quality Assurance Handbook
Available on the Internet at: http://missbss20.larc.nasa.gov/LDMS/ldmshome.html

NASA Standard - 2100-91:
Available on the Internet at: http://standards.nasa.gov/masterlist.htm#2000

Facility Project Implementation Handbook:
Available on the Internet at: http://nodis.hq.nasa.gov/Library/Directives/NASA-WIDE/Procedures/Program_Management/N_PG_8820_2B.html

L.14 FACSIMILE TRANSMISSION--BIDS OR PROPOSALS (LaRC 52.204-100) (APR 1996)

(a) Definition. "Facsimile transmission," as used in this solicitation, means a submittal, via electronic equipment that communicates and reproduces both printed and handwritten material, for a modification of a bid or proposal or withdrawal of a bid or proposal that is submitted to and received by the Government, or an acknowledgment of amendment(s) to the solicitation.
(b) OFFERORS MAY NOT SUBMIT FACSIMILE BIDS OR PROPOSALS AS RESPONSES TO THIS SOLICITATION. Facsimile bids or proposals will not be considered.

L.15 PROPOSAL PREPARATION AND SUBMISSION--SPECIAL INSTRUCTIONS

A. General Information

1. Requirement for Special Technical Capabilities--It is NASA policy to obtain maximum practicable competition consistent with the nature of each procurement. However, to prevent unnecessary expense associated with preparation and submission of a proposal, only firms with demonstrated experience and background in technical capabilities listed in Section C, Statement of Work are encouraged to respond to this request.

2. Number of Proposals, Time and Place of Submission--The Offeror shall submit the original and eight copies of each volume of his proposal to the address shown in Block 8 of the Standard Form (SF) 33 (face page of this solicitation), *or* if hand carried, to the depository listed in Block 9 of the SF 33. Offers must be received at the place indicated on or before the date and hour shown in Block 9 of the SF 33.

3. Proposal Clarity--Your proposal should be specific, complete, and concise. The Offeror is urged to examine this solicitation in its entirety and to assure that his proposal contains all the necessary information, provides all required documentation and is complete in all respects since evaluation of the proposal will be based on the actual material presented and not on the basis of what is implied. You should ensure that your cost proposal is consistent with your technical proposal in all respects since the cost proposal may be used as an aid to determine the Offeror's understanding of the technical requirements. Discrepancies may be viewed as a lack of understanding.

B. Proposal Format and Content

1. PROPOSAL PAGE LIMITATIONS (NASA 1852.215-81) (JAN 1994)

(a) The following page limitations are established for each portion of the proposal submitted in response to this solicitation.

Proposal Section	Page Limit
Volume I - Technical Proposal	75

(b) A page is defined as one side of a sheet, 8 1/2" x 11", with at least one inch margins on all sides, using not smaller than 12 characters per inch (or equivalent) type. Foldouts count as an equivalent number of 8 1/2" x 11" pages. The metric standard format most closely approximating the described standard 8 1/2" x 11" size may also be used.

(c) Title pages and tables of contents are excluded from the page counts specified in paragraph (a) of this provision. In addition, the Cost section of your proposal is not page limited. However, this section is to be strictly limited *to* responses to Factors 2 and 3, the executed Section K, Representation, Certifications, and Other Statement of Offerors, and the executed contractual document representing your offer. (See Section L, L.15.D.2). The cost information required as a response to the sample delivery order under Factor 1 shall be submitted with Volume 1 - Technical Proposal. The Small and Small Disadvantaged Business Subcontracting Plan will be considered part of the contract offer, and

should not be included with the response to Volume I, QEC 4 - Offerors Approach to Meeting the 8% Small Disadvantaged Business (SDB) Participation Goal, and thus, will not count against the Volume I page limitation. The response to Volume 1, QEC 4 will count against Volume I page limitation. Information that can be construed as belonging in one of the other sections of the proposal will be so construed and counted against that section's page limitation.

(d) If Best and Final Offers (BAFOs) are requested, separate page limitations will be specified in the Government's request for that submission.

(e) Pages submitted in excess of the limitations specified in this provision will not be evaluated by the Government and will be returned to the offeror.

2. Proposals must be submitted in two (2) volumes: Volume I, Technical Proposal, and Volume II, Business Proposal. No cost information shall be presented in the Technical Proposal.

3. Any work functions which the Offeror expects to obtain through subcontracting and/or consulting agreements should be described and explained. Such features as the rationale for this arrangement, the qualifications of the subcontractor, magnitude of effort, facilities/equipment and commitment of parties providing such goods and/or services should be addressed.

4. The 75 page limitation of the Technical Proposal (Volume I) is inclusive of charts, graphs, tables, diagrams, photographs, and figures, but exclusive of the ISO-9000 Compliance Plan (Ref. C. 1.e below).

5. The Business Proposal (Volume II) is not page limited. However, the Business Proposal is to be strictly limited to responses to Factors 2 and 3, and the executed Section K, Representations, Certifications, and Other Statements of Offerors. Information which can be construed as belonging in the Technical Proposal (Voiume I) will be counted against the page limitation described in paragraph 1 above.

6. Each volume should be specific and complete. Each volume should include the detailed information outlined below in order that it can be evaluated in accordance with the Rating System set forth in Section M, M.3. You should structure each volume to the Factor and QEC headings listed below:

C. TECHNICAL PROPOSAL - VOLUME 1

1. FACTOR 1 - QUALITATIVE MERIT

The Offeror shall propose its approach to satisfying the Government's technical requirements as set forth in Section C, Statement of Work, through the responses to the 5 Qualitative Evaluation Criteria (QEC) listed below. The QEC's will be used by the Government to evaluate the qualitative merit of your technical proposal. Subcontracting and/or teaming arrangement must be identified along with the role each team member will play in work performance:

a. QEC-1: Understanding the Requirements and Approach

This QEC has two parts. The first part is a sample delivery order to which the Offeror shall respond as stated in the proposal requirements for the delivery order. The second part is a set of questions (not related to the delivery order) to which the Offeror shall respond.

1. Sample Delivery Order

NASA has a requirement to design, furnish, and install a new model support cart for a new wind tunnel. The contractor has been issued a delivery order to provide a fully operational cart within 18 months.

A. Summary Requirements

1. The cart, which weighs approximately 60,000 lbs, shall be 16 feet wide, 20 feet long, and 10 feet high. When lifted into place, the top surface of the cart becomes the floor of the wind tunnel test section.

2. The cart shall surround an 8-foot turntable whose surface is flush with the cart surface. The center of the turntable aligns with the center of the cart A model support system shall be mounted at the center of the turntable. The turntable must be rotated to provide a yaw range of -180 to +180 degrees at a speed of 1.0 degree per second. The model support system shall have a vertical translation range of 0 inches to +91 inches at a speed of 1.5 inches per second. The system shall have a pitch range of -14 to +14 degrees at a speed of 1.0 degree per second. All equipment needed to actuate and accurately position the pitch, yaw, and vertical translation mechanisms shall be located on the cart.

3. The model support system shall have a mating surface which supports a 2-foot long model sting, weighing 5000 lbs, mounted along the cart longitudinal centerline. A model weighing up to 1000 lbs shall be affixed to the end of the sting. The gross weight of the fully-loaded cart, including model support system, model sting assembly, model, and all components and equipment, is 80,000 lbs.

4. The model support system shall support the following dynamic loads: normal 4000 lbs and side force 3500 lbs. Cart surface pressure shall be 50 pounds per square foot. Tunnel conditions in the following ranges are expected: 0 to 0.31 Mach number, atmospheric pressure, and 30 to 150 degrees Fahrenheit.

5. An operator console in the tunnel control room shall interface with the model support mechanisms on the cart. To reduce test setup time in the tunnel, a duplicate operator console in a nearby storage and model preparation facility shall interface with the model support mechanisms. Additionally, a hand-held unit shall provide reduced speed control of each mechanism during model setup at the storage facility. The model support cart shall be designed for transportation from the model preparation facility to the tunnel test section. Assume that the operator consoles in the tunnel control room and storage facility shall interface to the cart mechanisms identically.

B. Assumptions

1. The operator console is a workstation-class computer with a 21" monitor, keyboard, and mouse or equivalent. The computer has sufficient memory and disk storage capability. It provides setpoint entry and displays for all model control parameters.

2. All materials can be obtained in 90 days. However, fabrication of the cart structure shall require 360 days.

3. The project budget is $1.5 million. Material and fabrication costs shall be $800,000. The non-fabrication labor effort is 6000 hours.

C. Proposal Requirements

The Offeror shall respond to this part of the QEC by addressing the following items with respect to the sample delivery order summary requirements and assumptions:

1. Develop a project plan which describes your approach to providing the required deliverable(s). Your plan shall include:

a. a project level schedule which addresses the applicable contractor tasks discussed in the Statement of Work

b. direct labor hours and costs by skill, and

c. a summary cost estimate which includes indirect costs (overhead and G&A), other costs, and a 6% fixed fee.

2. Identify your top three technical issues. Provide your rationale.

3. Identify your top three management issues. Provide your rationale.

2. Questions

In this part, the Offeror shall provide a response to each question. Some of the questions include brief scenarios.

A. Describe your approach to developing system requirements with respect to mechanical, fluid, and automation systems.

B. Describe your software development process for an automation system requiring the equivalent of 100,000 lines of source code.

C. Describe your approach to cost estimating. What percentage of the time are your estimates within budget? Please provide rationale for your answer.

D. Describe your approach to providing design products. How does your approach address completeness, consistency, and accuracy?

E. What techniques do you employ to track progress on a project?

F. Assume you have developed an installation plan as part of a fixed price delivery order. Installation must be completed in six weeks. Everything is on schedule. However, a representative of the facility where installation shall occur informs you two weeks prior to the start of installation that their customer requires an additional two weeks of testing. Thus, the start of installation must be delayed two weeks. Discuss the actions you would take to mitigate the impact on the Government. Explain the rationale behind your decisions.

G. A new test section must be designed, fabricated, and installed for an existing wind tunnel. You are issued a delivery order to perform the work. The detailed requirements have been developed by NASA. Six weeks into the design phase, NASA indicates that based on a recent aerodynamic analysis of the flow contours, the proposed test section shape must be modified. Describe how this new information affects your design process.

b. QEC-2: Adequacy *of* Resources

(1) Technical Competencies: The Offeror shall include a matrix of all technical specialties and skill levels to be used. The matrix shall indicate the number of individuals proposed for each skill category, the minimum skill qualifications, and years of experience for each category. The offeror shall discuss the approach to providing a stable work force.

(2) Facilities and Equipment: A description of the proposed facilities shall be provided in terms of the number of square feet devoted to engineering, manufacturing, inspection, computer and networking systems, and any other necessary functions. The description shall include a detailed floor plan which depicts the overall facility layout. The submission of an inventory of proposed

manufacturing, inspection, and engineering equipment and computer systems which identifies type, accuracy, capability, capacity, and other parameters such as age and condition shall also be included.

c. QEC-3: Manasement and Operations

(1) Organization: Describe all Government-Contractor (including team partnerships)-Subcontractor interfaces, reporting requirements, and potential problem areas and solutions.

(2) Work Planning/Integration and Control: Explain any work functions which the Offeror expects to obtain through joint ventures, teaming, subcontracting, and/or consulting agreements.

Include in your explanation how the functions will be integrated to achieve an efficient, manageable operation. Discuss how problems will be resolved. Discuss how costs will be managed on CPFF DOS.

d. QEC-4: Approach to Meeting the 8% Small Disadvantaged Business (SDB) Participation Goal

While small businesses are not required to submit a subcontracting plan in accordance with FAR 52.219-9 and NASA FAR Supplement (NFS) 1852.219-73, small business as well as large businesses are subject to the 8 percent small disadvantaged business (SDB) participation goal for this procurement. Offerors shall make an independent assessment of subcontracting opportunities and the SDB participation goal - expressed as a percentage of the total contract dollar value rather than as a percentage of subcontracting dollars (see L.10) - and shall propose methods for achieving this goal. Offerors shall include in their proposal a discussion of the types and amount of work (in dollars) that will be performed by SDB's, and should identify the specific SDB(s) to be utilized and the work each will be performing. Any proposed participation in the NASA Mentor-Protege Program shall also be addressed. An initial proposal will not be rejected as unacceptable solely as a result of an offeror proposing a goal that is less than the 8 percent goal specified by this RFP.

e. QEC-5: ISO 9000 Compliance Plan

(1) If the Offeror is third-party registered as compliant with the requirements of the current version of ISO 9001, the Offeror shall provide a copy of its registration certificate.

(2) Offerors that are not third-party registered as compliant with the requirements of ISO 9001, the Offeror shall submit an implementation plan which conveys their approach and ability *to* securing a registration certificate within 12 months of award. This plan shall include a detailed schedule of activities, a resource plan, and a cost estimate for securing the registration certificate by the required date. Other details. such as consultants or subcontractors to be utilized, the identity of the certified third party registrar that will perform the ISO audit shall be included in the plan

D. BUSINESS PROPOSAL - VOLUME II

1. FACTOR 2 - COST

Under requirements of the Federal Acquisition Regulation (FAR), the Contracting Officer is responsible for determining reasonableness of prices. It is expected that this contract will be awarded based upon a determination that there is adequate price competition; however, to establish cost realism and the extent to which prices reflect performance addressed in the Technical Proposal, each offeror is required to submit cost or pricing information with its proposal pursuant to FAR 52.215-41, Alternate IV.

a. Standard Form (SF) 1448 Instructions

(1) In submitting the cost proposal, the offeror shall submit a completed SF 1448, Contract Pricing Proposal Cover Sheet, a copy of which is included as Attachment 1 of this solicitation. The cost proposal, as represented by the SF 1448, should be prepared in a manner consistent with your current accounting system and Cost Accounting Standards Disclosure Statement, if applicable. Each subcontract expected to exceed $500,000 shall also be supported by a SF 1448. Prospective subcontractors may submit proprietary cost information under separate cover directly to the Government pursuant to the SF 33 instructions for receipt of offers for this RFP.

(2) The offeror shall fully comply with the requirements set forth in Table 15-3, Instructions for Submission of a Contract Pricing Proposal, of FAR 15.804-6(b)(2). Include in your cost proposal sufficient detail to support and explain all costs proposed, giving figures and narrative explanation. A complete and timely evaluation of your proposal cannot be performed without this information being submitted with your proposal.

b. Computerized Cost Proposal Input Instructions

(1) The Government intends to use a personal computer with Windows **95** and LOTUS 1-2-3 software to aid in the evaluation of the cost proposal. The offerors and subcontractors providing direct labor are requested to submit cost data on floppy diskettes, two copies, 3-1/2 inch, formatted under MS DOS. Computerized cost data must be the identical data and format as that submitted in the paper proposal. In the event of any inconsistency between the diskettes and the paper proposal, the paper proposal will be considered the intended version. Any questions related to the computerized cost proposal shall be directed to Jeanne D. Covington at (757) 864-2545.

(2) If diskettes are provided, affix an external label indicating the name of the offeror and the RFP number to each one and provide all data under one file with no external links.

ALL DISKETTE SUBMISSIONS SHALL BE TRUE SELF-CALCULATING SPREADSHEETS. Any "absolute values" must be explained and supported.

c. Price and Cost Detail Instructions

(1) The five-year proposed cost shall be based on the information set forth below. These estimates are for proposal and selection purposes only and are not a guarantee for any contract which may be awarded. **For proposal purposes only,** the Offeror shall:

(a) Assume 55,000 direct labor hours and $2,500,000 of wholesale materials will be required annually for each Offeror awarded a contract under this RFP.

(b) Assume 30,000 cost-plus-fixed-fee (CPFF) hours and 25,000 firm-fixed-price (FFP) hours annually apportioned among the representative labor categories listed below:

(i) Management
(ii) Engineering
(iii) Technician
(iv) Administrative/Clerical

The skill mix shall be extrapolated from the eight representative tasks in the Offerors Library and the sample DO.

(c) Correlate the above labor categories with comparable categories in your estimating system, explaining major differences such as split or combined functions.

(d) Provide fully loaded annual rates, both CPFF and FFP, for each labor category for each contract year. Itemized and support all components of each rate, i.e., the applicable labor rate for each labor category, any composite details, indirect expenses/rates, other direct costs, fee, profit, escalation, and any other component.

(e) Provide fully loaded rates, for both CPFF and FFP, by contract year for each dollar of material required *to* be procured under this contract. Itemize and support all components of each rate, including indirect expenses/rates, fee, profit, escalation, and any other component.

(9 Facilities Capital Cost of Money (FCCOM) - Enter FCCOM if you choose to include it in your proposal (ref. FAR 52.215-30). If you do not propose FCCOM, Clause 52.215-31, Waiver of Facilities Capital Cost of Money (SEPT 1987) will be included in the contract. As required by NASA FAR Supplement 18-15.970-3, when facilities capital cost of money is included as an item of cost in the Contractor's proposal, a reduction in the profit objectives shall be made in an amount equal to the amount of facilities capital cost of money allowed in accordance with FAR 31.205-10(a).

(2) For each indirect pool, identify the rates and basis used to determine the proposed costs. The nature of any contract(s) awarded as a result of this RFP is such that indirect rates could vary significantly, depending on the volume of work issued on any one contract. Assume the issued work total could range from $1,000,000 to $38,000,000 over the life of the contract, spread equally over the 5-year contract life. Discuss the effects of this on your indirect rates.

(3) Compare the time required for your company *to* complete work with that which is typical *for* the industry. Discuss in detail such issues as personnel skills, experience, efficiencies of approach, and sophistication of equipment. For example (1) does your company use state-of-the-art equipment with a higher per hour machine charge rate with a shorter production time or does your company use less sophisticated equipment with a lower hourly rate but a longer production time? (2) Discuss how personnel skills and labor rates are appropriate for the equipment used. Discuss the effect these issues have on your cost proposal.

2. Contract Offer

The offeror shall submit three copies of its contract offer, each with original signatures, with the original of its business proposal (but not with the eight copies). A "contract offer" shall consist of Solicitation Sections A through K ("A" is the Standard Form 33), including the Exhibits referenced in Section J, but not the attachments. All properly acknowledged amendments will be considered a part of your contract offer, and hard copies of each amendment will be attached to the executed contract of the successful offeror. All items in Sections A through K that require information to be filled in shall be completed by the Contractor. The Small and Small Disadvantaged Business Subcontracting Plan shall be included as "Exhibit B" to the contract offer. Should the Government select a Contractor based on initial offers, the Contracting Officer will execute the award by countersigning the three copies of the "contract offer" on the Standard Form 33.

E. FACTOR 3 - RELEVANT EXPERIENCE AND PAST PERFORMANCE

Each Offeror will be evaluated on its relevant experience and past performance, and that of significant subcontractors or teaming partners, if any, under existing or prior contracts for similar products or services. Past performance information will be used to assess the extent to which contract objectives (including technical, management, cost and small and small disadvantaged subcontracting goals) have been achieved on related efforts. Relevant experience is the accomplishment of work which is comparable or related *to* the work or effort required by this RFP. This factor includes the evaluation of overall corporate or Offeror experience and past performance, but not the experience and performance of individuals who are proposed to be involved with work pursuant to this RFP. For newly formed businesses having little or no company experience, the relevant experience and past performance of **a** predecessor firm, the company's principal owner(s) or corporate officer(s) will be considered, You are

cautioned that omissions or an inaccurate or inadequate response to this evaluation factor will have a negative effect on your overall evaluation.

The Form REPP -- Relevant Experience and Past Performance (Form REPP), included in Attachment 2 to this RFP, will be used to collect information concerning the relevant experience and past performance of the Offeror and any subcontractor and/or teaming partner. The Offeror shall select three of its customers and three customers for each subcontractor and/or teaming partner, for which it has performed relevant work within the past three years and forward copies of the Form REPP to those agencies and/or firms for completion and submission to the Contract Specialist for this solicitation. Your customers should return or fax this form to the Contract Specialist no later than the closing date of the solicitation. The address and fax number are listed at the bottom of the second page of the Form REPP. Offerors shall include in their proposal the written consent of their proposed significant subcontractors to **allow** the Government to discuss the subcontractors' past performance evaluation with the Offeror.

Offerors shall include with their proposal a list of the firms that will submit evaluation forms. The Offeror shall also include a list of other contracts it has held and any significant subcontractors and/or teaming partners have held within the past five years for requirements similar to those being solicited in this acquisition. Other references, aside from those provided by the Offeror, may be contacted and their comments considered during the source selection process. The information submitted may be verified by the Government through discussions with the references provided. While the Government may elect to consider data obtained from other sources, the burden of providing relevant references that the Government can readily contact rests with the Offeror.

Offerors shall prepare short narrative explanation on each contract listed or for which a Form REPP will be received that identifies its customers and briefly describes the contract, including the objectives achieved and any cost growth or schedule delays encountered. Your summary should include the following for each related contract:

a. Contract Number

b. Contracting Agency

c. Points of contact in the program and contracting offices, including telephone numbers (Please insure that this information is current and correct.)

d. Contract type

e. Contract beginning and end dates

f. Description of the contract work and explanation of its relevance to this solicitation

You should also describe the original cost/price and delivery terms in the contract and the cost/price and delivery actually experienced, and explain any differences. For award fee contracts, separately state in dollars the base fee and award fee available and the award fee actually received, on a contract year basis.

L.16 DETERMINATION OF FINANCIAL RESPONSIBILITY

The successful Offeror may be required to demonstrate its responsibility for award and/or, if appropriate, the responsibility of its proposed subcontractors. Accordingly, you are hereby advised that if you are the selected Offeror you may be requested to provide additional information pertaining to your and your subcontractors(s) financial resources after notification of selection for negotiation/award (See FAR 9.104-1)

L.17 OFFERORS LIBRARY

Several tasks which are representative of the type of work to be performed under any resulting contract(s) are included in Attachment 3. The following is a list of the tasks included.

1. Design replacement settling chamber and nozzle for the 20-Inch Mach 6 Tunnel

2. Design exhaust line, modifications to second minimum and diffuser section, modified components in the tunnel circuit, and pitch/yaw arc sector for the existing injection/projection system for the 20-Inch Supersonic Wind Tunnel.

3. Perform conceptual design for the 8-Foot High Temperature Tunnel including: new elevator cylinder, elevator subsystem, pitch subsystem, and radiant pre-heater subsystem.

4. Perform conceptual design to investigate alternate energy sources and heater types to replace the two existing heaters in the 20-Inch Mach-6 CF4 Tunnel with a single, more reliable, efficient, and environmentally compatible heater, with no sacrifice in performance.

5. Perform implementation, installation, checkout, and documentation of Automation System Communications Upgrade for the National Transonic Facility.

6. Design, furnish, and install Mach Number Measurement System for the National Transonic Facility.

7. Replace Programmable Logic Controller System for the National Transonic Facility.

8. Perform control system design for the 14 x 22 Subsonic Wind Tunnel.

SECTION M - METHOD OF EVALUATION

M.1 BEST VALUE SELECTION

The proposals submitted in response to the solicitation shall be evaluated using Best Value Selection procedures. The Offeror(s) selected will be the one(s) whose proposal(s) is/are determined to provide the best combination of cost, qualitative merit (QEC's), and relevant experience and past performance. Qualitative merit relative to the Offeror's technical proposal will be determined by evaluating the Offeror's response to the Qualitative Evaluation Characteristics (QEC's). Best Value Selection is based on the premise that, if all Offerors are approximately equal in qualitative merit and relevant experience and past performance, award will be made to the one with the lowest proposed cost or Government-determined probable cost. However, the Government may award to an Offeror with higher cost if the Offeror has higher rated qualitative merit and/or relevant experience and past performance, provided the cost differential is commensurate with the added value. Conversely, the Government may award to an Offeror whose proposal has lower rated qualitative merit and/or relevant experience and past performance, if the cost differential between it and other proposals warrants doing so.

M.2 SUMMARY OF EVALUATION PROCEDURES

1. Initially, the members of the evaluation team will review each technical and business proposal in sufficient depth to identify any proposals that are considered to be unacceptable, as set forth in NASA FAR Supplement (NFS) 1815.608-70. The Offerors submitting proposals that are determined to be unacceptable will be notified and will be eliminated from further evaluation,

2. Each team member will then review in depth each technical proposal documenting strengths and weaknesses (indicating major and minor where applicable) for each QEC. Each team member will assign a rating from Provision M.3 below to each QEC for each Offeror.

3. Upon completion of the review of individual proposals, the evaluation team will convene and collectively discuss each technical proposal. A team consensus on the proposal strengths and weaknesses will be developed for each QEC. A consensus rating from Provision **M.3** below will be assigned to each QEC for each Offeror.

4. The evaluation team will conduct an analysis of each Offeror's cost proposal to determine its reasonableness, its acceptability, and the extent to which it reflects performance addressed in the technical proposal. If the cost analysis impacts the assigned ratings for any of the Offeror's QEC's, the reason for the change will be documented by the evaluation team. A probable cost will be developed for each offer.

5. The information provided by the Contractor regarding relevant experience and past performance will be assessed to determine the extent to which contract objectives (including technical, management, schedule, and cost) have been achieved on related efforts. For newly formed businesses, having little or no company experience, the relevant experience and past performance of a predecessor firm, the company's principal owner(s), or corporate officer(s) will be evaluated. Independent verification will be made as needed. The evaluation team will assign one of the following ratings for relevant experience and past performance: Excellent, Very Good, Good, Fair or Poor. The definitions for the relevant experience and past performance ratings are included in **M.3,** below.

6. At the completion of the foregoing, the evaluation team will present their findings to the Selection Official. The evaluation team's documentation will include a summary of the ratings assigned to each QEC, and to relevant experience and past performance and the proposed and probable cost. Based on the findings, the Selection Official may elect to do any of the following:

a. Select the successful Offeror(s) in accordance with **M.1** without further discussions, provided that it can be clearly demonstrated that **(1)** selection of an initial offer or offers will result in the best value for the Government, considering cost, qualitative merit, and relevant experience and past performance data; and **(2)** discussions with other acceptable Offerors are not anticipated to change the outcome of the initial evaluation relative to the Offeror(s) deemed to offer the best value.

b. Select a competitive range, limited to those Offerors having a reasonable chance of being selected for award, with which to conduct written and/or oral discussions. The purpose of discussions, if held, will be to assist the evaluation team in fully understanding each finalist's proposal and to assure that the intent and the points of emphasis of the solicitation have been adequately conveyed to the finalists so that all are competing equally on the basis intended by the Government. Any discussions that are conducted will be in accordance with FAR **15.610** and **NFS 1815.610.**

7. If a competitive range is selected for the purpose of conducting discussions those offerors that are excluded from the competitive range will be immediately notified. The evaluation team will debrief any offeror excluded from the competitive range that submits a written request, either immediately following the competitive range selection or following the award selection, at the option of the offeror. Information on the composition of the competitive range and relative standing of the offerors will not be available for release until AFTER contract award.

8. When discussions are conducted, each Offeror in the competitive range will be afforded an equal opportunity to revise his/her proposal. A common cutoff date will be established for submission of the revised proposals. The evaluation team will reconvene to determine if changes need to be made to the evaluation team's assigned ratings or probable costs. The basis for any changes will be documented. The evaluation team will update and resubmit the documentation initially presented to the Selection Official. The Selection Official will then select the successful Offeror from the competitive range in accordance with **M.1.**

9. The rationale for selection of the successful Offeror(s) will be recorded in a selection statement that succinctly records the basis upon which selection was made.

10. The evaluation team will debrief any successful or unsuccessful Offeror submitting a written request. (See also Paragraph 7 above.)

M.3 RATING SYSTEM

A. Qualitative Evaluation Characteristics: Each Qualitative Evaluation Characteristic for each Offeror will be assigned one of the following ratings.

Exceeds Requirement:

A comprehensive and thorough proposal of exceptional merit. The technical superiority is clearly demonstrated.

Meets Requirement:

A proposal that meets all the essential requirements of the **QEC.** Overall competence is demonstrated.

Fails to Meet Requirements:

A proposal that contains deficiencies in either approach or understanding, or does not address all the essential requirements of the QEC. This includes approaches that are not technically feasible to perform, or could not be technically acceptable without substantial rewriting or submission of a new approach.

B. The Source Evaluation Team will assign one of the following ratings for Relevant Experience and Past Performance for each Offeror:

EXCELLENT - Exemplary performance of exceptional merit in a timely, efficient, and economical manner; very minor (if any) deficiencies with no adverse effect on overall performance. (Experience is highly relevant to this procurement.)

VERY GOOD - Very efficient performance, fully responsive to contract requirements accomplished in a timely, efficient, and economical manner for the most part; only minor deficiencies. (Experience is very relevant to this procurement.)

GOOD - Effective performance; fully responsive to contract requirements; reportable deficiencies, but with little identifiable effect on overall performance. (Experience is relevant to this procurement.)

FAIR - Meets or slightly exceeds minimum acceptable standards; adequate results; reportable deficiencies with identifiable, but not substantial, effects on overall performance. (Experience is somewhat relevant to this procurement.)

POOR - Does not meet minimum acceptable standards in one or more areas; remedial action required in one or more areas; deficiencies in one or more areas which adversely effects overall performance. (Experience is not relevant to this procurement.)

Firms without a past performance record shall be given a neutral rating by assigning an adjective rating of Good.

M.4. RELATIVE IMPORTANCE OF QUALITATIVE MERIT (QEC's), COST/PRICE AND REPP

Overall, in the selection of an Offeror for contract award, qualitative merit, and relevant experience and past performance will be of essentially equal importance. Cost/Price will be of less importance than each of the other two factors. All evaluation factors other than cost, when combined, are significantly more important than cost

PROPOSAL COVER SHEET
(Cost or Pricing Data Not Required)

1. SOLICITATION/CONTRACT/MODIFICATION NUMBER

OMB NO.: 9000-0013

ires:

suggestions

2a NAME OF OFFEROR		3a. NAME OF OFFEROR'S POINT OF CONTACT	3c. TELEPHONE	
2b FIRST LINE ADDRESS		3b TITLE OF OFFEROR'S POINT OF CONTACT	AREA CODE	NUMBER
2c. STREET ADDRESS				
	2e. STATE / 2f. ZIP CODE			

5. TYPE OF CONTRACT *(Check)*

☐ FFP ☐ CPFF ☐ CPIF ☐ CPAF
☐ FPI ☑ OTHER *(Specify)*

	A. NEW CONTRACT		D LETTER CONTRACT
	B. CHANGE ORDER		E. UNPRICED OPTION
	C. PRICE REVISION/ REDETERMINATION		F. OTHER *(Specify)*

PLACE(S)		PERIOD(S)	
a.		a.	
b.		b.	
c.		c.	

a. LINE ITEM NO.	b. IDENTIFICATION	c. QUANTITY	d. TOTAL PRICE	e. PROP. REF. PAGE

(If mailable)

NAME OF CONTRACT ADMINISTRATION OFFICE			NAME OF AUDIT OFFICE		
STREET MDRESS			STREET ADDRESS		
CITY	STATE	ZIP CODE	CITY	STATE	ZIP CODE
TELEPHONE ▶ AREA CODE	NUMBER		TELEPHONE ▶ AREA CODE	NUMBER	

9a. NAMEOFOFFEROR *(Typed)*	10. NAMEOFFIRM

I I. SIGNATURE	12. DATE OF SUBMISSION

Table 15-3 INSTRUCTIONS FOR SUBMISSION OF INFORMATION
OTHER THAN COST OR PRICING DATA

SF 1448 is a cover sheet for use by offerors to submit information to the Government when cost or pricing data are not required but the contracting officer has requested information to help establish price reasonableness or cost realism. Such information is not considered cost or pricing data, and shall not be certified in accordance with 15.8044.

1. The information submitted shall be at the level of detail described in the solicitation or specified by the contracting officer. The offeror's own format is acceptable unless the contracting officer determines that use of a specific format is essential.

A. If adequate price competition is expected, the information may include cost or technical information necessary to determine the cost realism and adequacy of the offeror's proposal, e.g., information adequate to validate that the proposed costs are consistent with the technical proposal, or cost breakdowns to help identify unrealistically priced proposals.

B. If the offer is expected to be at or below the cost or pricing data threshold, and adequate price competition is not expected, the information may consist of data to permit the contracting officer and authorized representatives to determine price reasonableness, e.g., information to support an analysis of material costs (when sufficient information on labor and overhead rates is already available), or information on prices and quantities at which the offeror has previously sold the same or similar items.

2. Any information submitted must support the price proposed. Include sufficient detail or cross references to clearly establish the relationship of the information provided to the price proposed. Support any information provided by explanations or supporting rationale as needed to permit the contracting officer and authorized representatives to evaluate the documentation.

ATTACHMENT 2

RELEVANT EXPERIENCE AND PAST PERFORMANCE

Evaluation Instructions - Form REPP

Send the completed form directly to the address or fax number listed at the bottom of page 2. Some space is provided in Item VII for comments. Please use additional pages where necessary; **additional comments would be particularly appreciated where ratings of "excellent" or "poor" are given.** The adjective ratings to be **used** in completing the form REPP are defined-as follows:

- **EXCELLENT -** Exemplary performance of exceptional merit in a timely, efficient, and economical manner; very minor (if any) deficiencies with no adverse effect on overall performance.

- **VERY GOOD -** Very effective performance, fully responsive to contract requirements accomplished in a timely, efficient, and economical manner for the most part; only minor deficiencies.

- **GOOD -** Effective performance; fully responsive to contract requirements; reportable deficiencies, but with little identifiable effect on overall performance.

- **FAIR -** Meets or slightly exceeds minimum acceptable standards; adequate results; reportable deficiencies with identifiable, but not substantial, effects on overall performance.

- **POOR -** Does not meet minimum acceptable standards in one or more areas; remedial action required in one or more areas; deficiencies in one or more areas which adversely effect overall performance.

ATTACHMENT 2

FORM REPP – RELEVANT EXPERIENCE AND PAST PERFORMANCE
Solicitation No. 1-64-GGH.1684
Systems Engineering for Research Facility Integrated Systems (SERFIS)

I. CONTRACT INFORMATION

A. Name of Company Being Evaluated: _____

B. Address: _____

C. Contract Number: _____ D. Contract Type: _____

E. Contract Value: _____

F. Period of Performance: **From:** _____ To: _____

II. DESCRIPTION OF **CONTRACT:** _____
_____
_____
_____
_____

During the contract performance being evaluated, this firm was the:
_____ Prime Contractor; _____ Significant Subcontractor; _____ Team Member;
_____ Other (describe)
_____
_____

Does a corporate or business relationship exist between the firm being evaluated and your organization?
___ Yes, ___ No. If so, please describe. _____
_____

III. EVALUATOR

Name: _____

Title: _____

Organization: _____

Address: _____
_____

Telephone No.: _____ **Fax** No.: _____

SEND TO: ATTN: 126/Charlotte T. Hardy **TO BE OPENED BY ADDRESSEE ONLY**
NASA LANGLEY RESEARCH CENTER
9A LANGLEY BOULEVARD
HAMPTON VA 23681-0001
TELEPHONE: 757-864-2526
FAX: 757-864-7898

This form contains Source Selection Information when completed. See FAR 3.104.

IV. OVERALL PERFORMANCE

How would you rate the Contractor in the following areas (Circle One):

A.	Local Management Authority	E	VG	G	F	P	N/A
B.	Contract Compliance	E	VG	G	F	P	N/A
C.	Subcontract Administration	E	VG	G	F	P	NIA
D.	Responsiveness to Technical Direction	E	VG	G	F	P	N/A
E.	Responsiveness to Change Orders (N/A if not services)	E	VG	G	F	P	N/A
F.	Phase-in	E	VG	G	F	P	N/A
G.	Meeting **SDB** Goals	E	VG	G	F	P	N/A
H.	Planning, Estimating and Scheduling	E	VG	G	F	P	N/A
I.	Work Control	E	VG	G	F	P	N/A
J.	Responsiveness to Changing Requirements	E	VG	G	F	P	N/A
K.	Management of Diverse Tasks	E	VG	G	F	P	N/A
L.	Early Identification of Problems and Timely Resolution	E	VG	G	F	P	N/A
M.	Labor Relations	E	VG	G	F	P	N/A
N.	Worked Without Extensive Guidance	E	VG	G	F	P	N/A

V. FINANCIAL MANAGEMENT PERFORMANCE

A. How would you rate the Contractor in the following areas (Circle One):

1.	Complete and Timely Reporting	E	VG	G	F	P	N/A
2.	Cost Control	E	VG	G	F	P	N/A
3.	Procurement System	E	VG	G	F	P	N/A
4.	Property Management System	E	VG	G	F	P	N/A
5.	Accounting System	E	VG	G	F	P	NIA
6.	Adherence to Cost Estimates	E	VG	G	F	P	N/A
7.	Overall Financial Management	E	VG	G	F	P	N/A

B. Has the Contractor experienced overruns or underruns? Yes No

If yes, please elaborate: _____

_____

_____

VI. TECHNICAL PERFORMANCE

A How would you rate the Contractor's technical performance in the following areas:

1. Completeness and Accuracy	E	V	G	G	F	P
2. Timeliness	E	V	G	G	F	P
3. Product Reviews/Product Assurance	E	V	G	G	F	P
4. Documentation	E	V	G	G	F	P
5. Qualifications of Technical Staff	E	V	G	G	F	P
6. Overall Technical Performance	E	V	G	G	F	P

B. How long **did** proposed key personnel remain on contract? _____

_____

_____

C. What is the Contractor's average annual turnover rate? _____

_____

D. Is there an award or incentive fee? If so, please give the fee dollars and percentages earned for the last three reporting periods:

Review Period	Fee Dollars	% of Possible Fee
_____	$_____	_____%
_____	$_____	_____%
_____	$_____	_____%

VII. CONCLUSIONS

Would you recommend this Contractor for another contract? Why? Please add any comments you feel pertinent. _____

_____

_____

_____

_____

_____

ATTACHMENT 3

OFFERORS LIBRARY

TASK I

DESIGN REPLACEMENT SETTLING CHAMBER AND NOZZLE FOR THE 20-INCH MACH 6 TUNNEL

Statement of Work
FY'99 CoF Project _
DESIGN for Upgrades to the 20-Inch Mach 6 Tunnel

Part 1 Scope and Description

This task requires a complete design with analyses for replacing the Settling Chamber and Nozzle in the 20-Inch Mach 6 Wind Tunnel (20M6). The task includes replacing the internal components in the Settling Chamber. The Requirements and Criteria Document (RCD) for the task are in Attachment A.

The task requires a fully defined and documented design with drawings and specifications for the replacement parts. The Contractor shall review and correct the drawings and specifications as required to ensure that the final package is complete and adequate for a Langley Research Center Invitation-For-Bid procurement package.

The Settling Chamber and its internal components shall be replaced with new hardware fabricated from a stainless steel material. The replacements parts shall be fabricated to match the configuration of the existing Settling Chamber and its internal components.

The Nozzle shall be replaced with new hardware fabricated from a material with a very low coefficient of thermal expansion such as Invar. The replacements parts shall be fabricated to match the configuration of the existing Nozzle. The selection of the materials for these components shall be dictated by careful consideration of the thermal expansion of the two materials in areas where the components are attached to each other.

Part 2A Requirements/Deliverables - Phase I

1. Preliminary Equipment Evaluation and Analysis

The Contractor shall review and evaluate the Requirements and Criteria Document furnished in Attachment A and the drawings furnished. The Contractor shall submit a list of additional information required for completing the task. The Contractor shall submit a design cost estimate for the task.

Required Date: December 13, 1996

The Contractor shall field verify the existing drawings for the Settling Chamber and Nozzle. The Contractor shall select the material from which each component will be fabricated. The Contractor shall make appropriate stress analyses for each component. The analysis shall include all mechanical and thermal effects. The Contractor shall generate a device list of all the equipment, including existing and new, that will be used to meet system design criteria and requirements of the new components. The Contractor shall verify that all selected components meet the design requirements as stated in the Requirements and Criteria Document.

Required Date: Preliminary: May 1, 1997

2. Preliminary Construction Schedule and Cost Estimate

The Contractor shall develop a cost estimate for the fabrication and installation of the new components including the demolition of the existing tunnel components. The Contractor shall develop a proposed construction schedule. The construction schedule shall include all major milestones such as start date, tunnel shutdown, installation, testing, design reviews, and checkout. The construction schedule shall minimize tunnel shutdown time. The cost estimates **shall** be detailed and include all markups and fees.

Required Date: Preliminary: May 1, 1997

Part 26 Requirements/Deliverables

1. Construction schedule and cost estimate

The Contractor shall develop a final construction schedule. The construction schedule shall include all major milestones such as start date, tunnel shutdown, installation, testing, design reviews, and checkout. The Contractor shall submit a plan to minimize tunnel downtime and to reduce the **risk** of the installation time expanding beyond the scheduled tunnel shutdown time. The Contractor shall develop a final construction cost estimate. The cost estimate shall be detailed and include all markups and fees.

Required Date: Final: August 1, 1997

2. Final Equipment Evaluation and Analysis

The Contractor shall make an appropriate stress analysis for each component. The analysis shall include all mechanical and thermal effects. Verify that the selected components, existing and new, will meet the design requirements as stated in the requirements and criteria document.

Required Date: Final: August 1, 1997

3. Drawings

The Contractor shall make new drawings for fabricating the new components. The drawings shall include, but are not limited to: mechanical demolition, detail of all components, sub-assemblies and assemblies, and material lists including manufacturer and part numbers. Any other drawings required for a complete design shall be included. The contractor shall also deliver all required redline and as-built drawings.

30% Required Date: May 1, 1997
60% Required Date: June 15, 1997
90% Required Date: July 15, 1998
Final Required Date: August 1, 1998

4. Identify Hardware

The Contractor shall submit a required equipment list of proposed hardware for a complete system. This list shall include all mechanical equipment and any required equipment to interface to the existing system. The government shall approve the vendor selection and any subsequent hardware purchases.

Required Date: July 15, 1997

5. Deliverables

All deliverables shall be sent to ????

Part 3 Design Schedule/Estimate

The required delivery dates are listed in the Requirements Section. The Contractor shall participate in the Preliminary and Final Design Reviews and other informal reviews as required to validate the Contractor's progress.

Preliminary Design Review Package due:	April 15, **1997**
Preliminary Design Review:	**May1 , 1997**
60% Design Review Package due:	June **7,1997**
60% Design Review:	July **1,1997**
Final Design Review Package due:	**July 21,1997**
Final Design Review:	August **1,1997**
Final Drawing package due:	August **15,1997**

The design cost estimate shall be in **two** phases. There shall be a cost estimate for each phase. The phases are:

Phase I	Described in Part 2A
Phase II	Described in Part 2B

Part 4 Government Furnished Items

Upon request, the Government will make available to the Contractor existing drawings and requirements required for the project. Also the Contractor will be supplied with a Requirements and Criteria Document. Additional required information shall be determined from field investigation by the Contractor. The Government will provide a copy of the Facility Baseline Drawings and Facility Reference Drawings as they pertain to this task.

National Aeronautics and Space Administration

Langley Research Center

Modifications to 20-Inch Mach 6 Tunnel

Criteria and Requirements Document

for

FY '98 CoF & FY '99 CoF

NOVEMBER 1996

Task 1
Attachment

Introduction

Purpose

The Criteria and Requirements Document (CRD) delineates the functional requirements and design criteria for the required facility modifications.

Scope

This CRD compiles the requirements and the criteria for the facility modifications to the 20-Inch Mach 6 Tunnel (20"M6) for the:

FY '98 CoF
- Settling Chamber
- Controls.

FY '99 CoF
- Nozzle.

Responsibilities

The Technical Project Engineer (TPE) shall develop the CRD and shall insure that all requirements are consistent with the project objectives. The TPE shall generate and maintain this document. The TPE shall be responsible for the design and the construction of the elements of this project. The Research Project Engineer (RPE) shall assist in generating this document and concur with the CRD.

Approval of this document and all changes will be by the TPE with the concurrence of the RPE.

Document Organization

The requirements for each element are organized in the following sequence:

Research Requirements

Design Requirements

Interfaces

Reference Documents and Drawings.

Design Criteria

The design for each elements shall be in accordance with the requirements of the latest codes and standards listed below:

NASA Facilities Engineering Handbook NHB 7320.1B

NASA LaRC Wind Tunnel Model Systems Criteria LHB 1710.15

NASA Safety Regulations **Covering** Pressurized Systems **LHB** 1710.40

American Society of Mechanical Engineers (ASME)

American Gear Manufacturers Association **(A G M)**

American Institute for Steel Construction (AISC)

American National Standards Institute (ANSI)

American Society for Testing and Materials (ASTM)

American Welding Society (AWS)

Pipe Fabrication institute

institute of Electrical and Electronic Engineers (IEEE)

National Electrical Manufacturers Association (NEMA)

National Fire Protection Association (NFPA)

National Electrical Code (NEC)

SETTLING CHAMBER

Research requirements:

Provide a new Settling Chamber Assembly with internals. The new Settling Chamber Assembly shall be similar in size and configuration to 20" M6 Tunnel Settling Chamber Assembly located in Room 108 of Building 1247D. The Settling Chamber Assembly supports shall be similar to the supports on the existing Settling Chamber Assembly. Add a rigimesh support section and three rigimesh filter elements.

Design requirements:

Design conditions:

Flow media	air
Pressure range	0 to ***600*** psia
Temperature	600 °F

The Settling Chamber Assembly and its internals **shall be** fabricated using a stainless steel with high corrosion resistance properties.

The pressure containing components for the Settling Chamber Assembly shall be ASME Code stamped.

Interfaces:

The Settling Chamber shall interface with existing nozzle and the existing filter elements.

Interfaces are defined by existing facility drawings.

References:

Shop Drawings for the 20"M6
Existing Facility Drawings
18" Mach 8 Quiet Tunnel Drawings

NOZZLE

Research requirements:

Provide a new Nozzle similar in size and configuration to 20"M6 Nozzle located in Room 108 of Building 1247. The new Nozzle shall be fabricated from a material with a low coefficient of thermal expansion, such as Invar.

Design requirements:

Design conditions:

Flow media	air
Pressure range	0 to 600 psia
Temperature	600 °F

Interfaces:

The Nozzle interfaces with the following:

Test Section
Settling Chamber

Interfaces are defined on listed references below.

References:

Existing drawings for the 20"M6.
Existing and new Settling Chamber Drawings

TASK 2

DESIGN EXHAUST LINE, MODIFICATIONS TO SECOND MINIMUM AND DIFFUSER SECTION, MODIFIED COMPONENTS IN THE TUNNEL CIRCUIT, AND PITCH/YAW ARC SECTOR FOR THE EXISTING INJECTION/PROJECTION SYSTEM FOR THE 20-INCH SUPERSONIC WIND TUNNEL

TASK DESCRIPTION

This task requires the Contractor to furnish a design for (1) a five foot diameter exhaust line from the 20 Inch Supersonic Wind Tunnel (20"SWT) to the 100 foot sphere, (2) modifying an existing second minimum and diffuser section, and installing the modified components in the tunnel circuit and (3) a pitch and yaw arc sector for the existing injection/projection system. Attachment **A** lists the requirements for the systems.

This task requires:

a. A review of:
   1. The original Contractor designs, drawings and specifications for the FY'94 project.
   2. The original FY'94 CoF requirements.
   3. The LaRC changes to the designs and final bid package.
   4. The changes required during fabrication and installation of the FY'94 CoF project.

b. A review and evaluation of the requirements in Attachment **A.**

c. A cost estimate for the task.

d. The identification of additional information required to complete the design.

e. The identification of modifications to the requirements in Attachment A to improve the final design.

f. A complete design with up-to-date part numbers and items which meets the FSED modified requirements.

g. Complete drawings required to fabricate and install the items required in Attachment A.

h. Complete specifications required to fabricate and install the items required in Attachment **A.**

i. A cost estimate for (1) the commercial parts and materials, (2) fabrication and (3) installation of each system.

j. he following submittals:
   1. Comments and suggestions from a. above.
   2. Detailed cost estimate for the design.
   3. List of additional information required for the design.
   4. List of possible modification suggestions for the requirements.
   5. Calculations packages:
      * 30% complete
      * 60% complete
      * 100% complete
   6. Drawings
      * 30% complete
      * 60% complete
      * 100%- reviewed by the Contractor and ready for the bid package
   7. Complete specifications - reviewed by the Contractor and ready for the bid package
   8. Detailed construction cost estimate.

k. Reviews by LaRC:
   * informal:
   At 10% completion of task - Conceptual Design Review
   * formal:
   At 30% completion of task - Preliminary Design Review

At 60% completion of task
At 90% completion of task - Critical Design Review

Reviews to include:
i. Schedule
ii. Technical approach
iii. Cost estimate

NOTE: 1. The requirements for each review are specified in LMI 7000.2.
2. The submittals shall meet the requirements of the "Facility Systems Engineering Division Submittal Guidelines for Final Design".

LaRC personnel responsible for the final designs, the bid package and the FY'94 CoF project construction will be available to meet with The Contractor **to** discuss the changes to the original designs. These people will also be available for limited consultation during the design of the FY'99 CoF.

The drawings, both original Contractor and final LaRC, are available on electronic files via
"BOB/PROJECTS
p:\20swt*.*
p:\20swt\outdated*.*
p:\20swt\outdated\svt*.*.

Specifications and drawings for the final FY'94 CoF bid package are available in FSED's Contract Files located in Building 1209. Drawing 548676 has the bid package drawing list.

The FY'94 CoF requirements will be supplied upon request.

Special requirements exist:

For the Exhaust Line: An existing five foot gate valve is to be installed in the line. This valve is in the 60" Mach 18 Helium Tunnel located in Building 1247H.

20 INCH SUPERSONIC WIND TUNNEL

FY '99 CoF

BACKGROUND INFORMATION

During the FY '94 CoF for the 20 Inch Supersonic Wind Tunnel (20"SWT), the Contractor designed (1) a model injection and projection system with pitch/yaw mechanism and (2) the modifications to an existing second minimum. The Contractor also began a design for a five foot diameter exhaust line from the 20"SWT to the 100 foot diameter vacuum sphere. Due to limited design funds, Langley Research Center (LaRC) completed the designs for the model system and the second minimum. Due to limited construction funds, the second minimum and the connection to the sphere were removed from the final construction contract for the FY'94 CoF. In addition, the FY'94 CoF contract was descoped by removing the motor driven pitch and yaw system. The original pitch/yaw mechanism was replaced with a manually adjustable pitch mechanism which has no capability for varying yaw. LaRC made changes to the original design of the injection/projection system to accommodate the altered design for the pitch/yaw mechanism. The scope of the FY'99 CoF project consists of items that were removed from the FY'94 CoF project.

Requirements
for
FY'99 20-Inch SWT CoF Project

1.0 SCOPE

This document summarizes the requirements for adding a pitch/yaw mechanism to the existing injection/projection system, for a second minimum and for an exhaust line in the 20-Inch Supersonic Wind Tunnel.

1.1 Model Support

1.1.1 Mechanical Description

The pitch/yaw mechanism for *the* model support **shall** vary the pitch and yaw of the model.

1.1.2 Controls Description

The control system for the pitchlyaw mechanism shall (1) be integrated with the existing model support controls and (2) monitor and display the position of the model during tests. The new system shall consist of two independent closed loop control subsystems as listed below:

- Control and monitor pitch motion (electrical)
- Control and monitor yaw motion (electrical)

The pitch/yaw control system shall be integrated with the existing control system which has two control stations; one located in the control room and a handheld portable control station located at the test section. An existing Programmable Logic Controller (PLC) monitors all system functions and assures that operations are done in their proper sequence. The new controls shall be integrated into the existing PLC.

1.2 Second Minimum

1.2.1 Mechanical Description

The second minimum and diffuser from the 6x28 Tunnel shall be installed in the 20" SWT. The existing hydraulics, which positions the movable walls in the second minimum, shall be modified for use in the 20' SWT. The second minimum shall be mechanically interlocked to prevent over-pressurization of the tunnel.

The second minimum pressure vessel has been recertified. The hydraulics shall be inspected, reassembled, checked out and modified to meet requirements.

1.2.2 Controls Description

The second minimum control system shall operate the hydraulic equipment which positions the movable walls. The system shall: (1) provide symmetrical movement of the two walls; (2) permit the two walls to be moved independently of each other with control room console pushbuttons; (3) two control room displays of position (always active); and **(4)** move the two walls to the fully open position in the following circumstances to prevent overpressurization of tunnel components.

- E-stop from the High pressure control room PLC (any current manual or automatic E-stop condition shall be effective to initiate the second minimum opening).

- Emergency open switch on the control room console being actuated (this switches only function).

The system shall be a closed loop system. The control panel shall be located in the control room. The interlock for protection from over-pressurization shall be part of the Kirk Key interlock chain for the valve 3296A/cam bank/air permissive between the cam bank and the air permissive switch.

1.3 Exhaust Line

1.3.1 Mechanical Description

A new exhaust line shall be installed between the existing 5 ft. diameter 2 0 SWT exhaust line and the 6 ft. diameter exhaust line which enter the 100 ft. sphere. The new exhaust line shall include an isolation valve and expansion joint. The line shall minimize bends and shall be attached to both the 6 ft diameter and 5 ft. diameter lines at about a 45 degree angle.

1.3.2 Controls Description

The controls for the new exhaust line shall open and close the new isolation valve. New push buttons, indicators, key switches, relays, and I/O modules shall connect the valve controls to an existing PLC which shall operate the new valve. Interlocks shall prevent tunnel operation when the 100 ft. sphere is being used by other facilities.

1.4 System Ready and Interlocks for Air Permissive/Vacuum Permissive

Changes from the existing Air Permissive and Vacuum Permissive interlock protection system will be the addition of Second Minimum mechanical interlock added to Nozzle/3296A Interlock system.

2.0 REQUIREMENTS

2.1 Environment

Type 1- Control Room environment	- 20 to 100 deg F - 14.5 to 15 psia - 40 to 70% RH - 93 db
Type 2 - Test Area environment	- 20 to 130 deg F - 14.5 to 15 psia - 5 to 95% RH - 115 db
Type 3- Test Section, Model Injection Plenum and Nozzle Exit environment	- 10 to 200 deg F - .01 *to* 65 psia - 5 to 95% RH - estimated 115 db

Note: The maximum temperature in the plenum will be 175 deg. F

2.2 Pitch/Yaw Mechanism for the Model Support

2.2.1 General Requirements

2.2.1.1 Mechanical Requirements

2.2.1.1.1 Performance requirements

- The pitch/yaw mechanism shall position the model on the test section window centerline.

- The maximum acceleration load on the model support will not exceed 6g's.

- The pitch/yaw mechanism shall be interlocked as required to ensure that the model will not interfere with the test section during injection/projection.

- The model aerodynamic design loads will be:

	Running Loads	Unstart Loads
Normal force	1100 lb	3500 lb
Side force	1000 lb	2000 lb
Axial force	1800 lb	2000 lb
Pitch	800 in-lb	2550 in-lb

Note: The above loads are applied to the model when it is positioned at the test section window centerline. The loads are measured parallel and perpendicular to the strain gauge balance centerline.

- The side design load, applied to the model support arc sector at its geometric center during unstart conditions will be 2424 lb and 1615 lb for running loads.

- The positioning capability for both injection and projection are:

Position accuracy:	+/- 0.10 inches
Position stability:	+/- 0.05 inches

- Maximum model and sting weight is expected to be 30 lb.

2.2.1.1.2 Interlocks/safety features

- The test section windows and doors will be closed before the injection/projection system will operate in the fast mode. These windows and doors will be interlocked electrically.

- When in Control room mode, an open window/door halts motion and disables controls.

2.2.1.1.3 Failure events

- If electrical or hydraulic power is lost, the insertion system will fail "as is."

- If the model is not in motion an E-stop will leave the model in place.

- If the model is in motion, an E-stop will not interrupt the motion profile.

- For all E-Stop cases (except for heat transfer injection profiles outside of the current envelope), the model will return to zero pitch and yaw angles once in the fixed position.

2.2.2 **Pitch Requirements**

2.2.2.1 Mechanical Requirements

2.2.2.1.1 Performance Requirements

- Pitch (alpha) range is -10 degrees to +35 degrees.
- Rate of pitch will be variable from 0.5 degrees/sec to 30 degrees/sec.
- Positioning controls: +/- 0.05 degrees with model test load
- The pitch system will operate within two speed ranges. *The* fast speed range will be from 0.5 to 30 degrees/second The slow speed range will be from zero to 10 degree/second.

2.2.2.1.2 Interlocks/Safety Features (Effective only in Control Room Mode)

- Window limit switches (closed to operate)
- Door limit switches (closed to operate)
- Sliding Door limit switches (open to operate)

2.2.2.1.3 Failure events

- If electrical power is lost, the pitch remains "as is."
- When an emergency stop is activated, the model will return to zero degrees pitch.

2.2.2.2 Controls Requirements

2.2.2.2.1 The requirements for the model pitch control system are:

- Pitch Angle Display Accuracy - +/- 0.05 deg
- Pitch Angle Feedback Accuracy - +/- .02 deg

2.2.2.2.2 Required Pitch angle controls

Control Room: All OPERATIONS IN FAST SPEED RANGE
- Station Control Key
- auto/jog mode selection switch
- jog +
- jog -
- pitch speed controls
- auto execute
- position displace
- "zero-zero" switch (returns pitch and yaw to zero at maximum rate if pressed)

Test Section: All OPERATIONS IN SLOW SPEED RANGE
- Station Control Key
- auto/jog mode selection switch

- jog +
- jog -
- pitch speed controls
- auto execute
- position display
- Stop button

NOTE: the above controls can be on a handheld PLC interface with the exception of the Stop button and Station Control Key.

2.2.2.2.3 Pitch angle interlocks

- Station Control Key
- + limit switch
- - limit switch

2.2.3 Yaw Requirements

2.2.3.1 Mechanical Requirements

2.2.3.1I Performance requirement

-Yaw range is **-10** degrees to **+10** degrees

- Yaw angle control accuracy will be -+/- 0.05 deg.

- The yaw system will operate within **two** speed ranges. The fast speed range will be from 0.5 to **15** degrees/second The slow speed range will be from zero to 1.0 degree/second.

2.2.3.1.2 Interlocks/Safety Features

- Window limit switches (closed to operate - Control Room Mode ONLY)
- Door limit switches (closed to operate)
- Yaw at zero degrees for model injection and projection to operate

2.2.3.1.3 Failure events

- If electrical or hydraulic power is lost, the yaw shall remain "as **is.**"

- When an emergency stop is activated, the model will return to zero degrees of yaw.

2.2.3.2 Controls Reauirements

2.2.3.2.1 The requirements for the model yaw control system are:

Yaw angle control accuracy	+/- 0.05 deg
Yaw angle display accuracy	.05 deg
Yaw angle feedback accuracy	.02 deg

2.2.3.2.2 Required Yaw angle controls

Control Room: All OPERATIONS IN FAST SPEED RANGE

- Station Control Key
- auto/jog mode selection switch
- jog +
- jog -
- yaw speed controls
- auto execute
- position display
- "zero-zero" switch (returns pitch and yaw to zero at maximum rate if pressed)

Test Section: All OPERATIONS IN **SLOW** SPEED RANGE

- Station Control Key
- auto/jog mode selection switch
- **jog** left
- jog right
- yaw speed controls
- auto execute
- position display
- Stop button

NOTE: The above controls can be on a handheld PLC interface with the exception of the stop button and Station Control Key.

2.2.3.2.3 Yaw angle interlocks

- Station Control Key System
- left limit switch
- right limit switch

2.3 **Second** Minimum

2.3.1 Mechanical Requirements

2.3.1.1 Performance requirements

- The second minimum will be movable from fully opened (20 inches) to fully closed.
- The hydraulic power unit will be the existing unit from the 6x28 Inch Transonic Wind Tunnel.
- The existing hydraulic system will be modified to permit the walls to be independently controlled
- The walls shall be capable of being moved symmetrically within +/- .05 inches.
- Accumulator to assure second minimum opening under all modes

2.3.1.2 Interlocks/Safety Features

- The movable walls will be interlocked **so** that the minimum flow area will be sufficient to prevent overpressure of the test section.

- The mechanical interlocking will permit selection of one of four positions which correspond to the minimum permitted flow area of four tunnel flow conditions.

- Positioning the mechanical interlock will be part of the Nozzle/Valve 3296A/Air Permissive Kirk Key Interlock System.

- Three stages of the system will protect the tunnel:

1) The PLC will be programmed to prevent the walls from approaching the minimum position.

2) If a wall approaches the minimum too closely, an E-stop **will** be initiated by a limit switch on the mechanical interlock.

3) If **the** wall continues towards the minimum after the limit switch position. Then a hydraulic cam operated valve will bypass the primary controls and hydraulics and **cause** the second minimum walls to move to the fully open position.

2.3.1.3 Failure events

- If electrical power or hydraulic pressure is lost, the second minimum will open at the maximum rate to fully open.

- On E-Stop, the second minimum will open at the maximum rate to fully open.

2.3.2 Controls Requirements - Each Wall

- Second Minimum Range	- 0 to 10 inches
- Second Minimum Control Accuracy	- +/- 0.05 inches
- Second Minimum Speed	- 0.25 in/sec to maximum rate
- Second Minimum Display Accuracy	- .05 inches
- Second Minimum Feedback Accuracy	- .02 inches

2.3.2.1 Control Room

- auto/jog mode selection switch
- jog open
- jog close
- auto execute
- wall selection (North - Both - South)
- wall speed control
- position displays

2.3.2.2 Test Section - NO CONTROLS

2.3.2.3 Second Minimum Interlocks

- Kirk Key System
- open limit switches
- close limit switches
- Station Control Key - Control Room mode to operate, leaving Control Room mode opens the second minimum fully.

2.4 Exhaust Line - Isolation Valve

2.4.1 Mechanical Requirements

Design Conditions	
Flow medium:	air
Design pressure:	20 micron Hg to 65 psia
Design temperature:	200 deg F max
Design flow rate:	320 lbm/sec

The new exhaust line will:

- Minimize bends with approximately 45 degree entries to the existing 5 ft. and 6 ft. lines.
- Tie-in to the existing 5 ft. dia. 2 0 SWT exhaust line between valves 3691V and 3597V.
- Be supported and designed for flexibility to allow for relative movement between the existing 5 ft. diameter and 6 ft. diameter lines.
- Be designed in accordance with ANSI/ASME B31.3.
- Have a gate valve for isolation with the following features:
  - electrically actuated
  - open and closed limit switches and auxiliary cylinder lock-up with limit switches to indicate
  - engagement and disengagement.
  - vacuum rated

2.4.2 Control Requirements

The valve will fail as is on loss of either electric or pneumatic signal. The valve will have mechanical locking pins and be electrically interlocked through the Control Room PLC located in Room 139 of Building 12470.

2.5 PLC INTERFACE TO DATA ACQUISITION SYSTEM

2.5.1 Electrical specification

- The interface will be an IEEE 488 (HPIB) interface

2.5.2 Data specification

- The following parameters shall be available to the data acquisition system at all times;

- yaw angle
- yaw rate
- pitch angle
- pitch rate
- second minimum wail positions

2.5.3 Control specification

- **Precise positioning of the model system shall be available in** *two* **manners over the IEEE 488.**

  1) **Downloaded** injection/projection/pitch/yaw **sequences single step controlling.**

  2) Direct and immediate execution commands to the injection/ projection/pitch/yaw **system.**

TASK 3

PERFORM CONCEPTUAL DESIGN FOR THE 8-FOOT HIGH TEMPERATURE TUNNEL INCLUDING: NEW ELEVATOR CYLINDER, ELEVATOR SUBSYSTEM, PITCH SUBSYSTEM, AND RADIANT PRE-HEATER SUBSYSTEM

Project: Modifications to the 8-Foot High Temperature Tunnel

Scope/Description:

Engineering Services for design development, construction assessment, cost estimates, and schedule development to support the conceptual design review. This work order (Rev. **2)** covers engineering services prior to and including the conceptual design review which will be held at the approximately the 10% design completion level. The tunnel is currently configured for the requirements of the **CDE** test configuration. This project will restore the tunnel model support/preheat systems to the pre-CDE test configuration performance levels with upgraded controls.

NASA has developed a Work Breakdown Structure, Requirements Document, List of Design Questions and Answers, cost estimates, and a design/construction assessment document, Portions of these documents require additional work to evaluate the design/construction approach. The Contractor shall use these documents as a baseline *to* further develop the design/construction assessment and meet the Conceptual Review objectives listed below.

The primary work packages of this project are listed and prioritized as follows:

1) installation of new elevator cylinder (new cylinder to have same performance as existing)
2) restore full stroke operation of elevator subsystem - includes process, mechanical, and electrical work
3) replace pumps in hydraulic system #1
4) restore operation of pitch subsystem - includes process, mechanical, and electrical work
5) restore operation of radiant preheater subsystem - includes process, mechanical, and electrical work

The task includes work packages 1), 2), 4), and 5). Alternatives to accomplish some work items such as repair work, demolition, installation, and testing will be considered to meet schedule and cost constraints. Work package 3) will be accomplished **by** NASA and is deleted from this work order (Rev. 2).

At the conceptual review, the following objectives are to be accomplished:

- Definition of the design and construction approach.
- Assessment of design and construction factors including areas of risk, safety considerations, schedule considerations, and alternatives considered.
- Design cost estimate and schedule
- Construction cost estimate and schedule

Details **of Design/Construction** Assessment

Requirements for the various work packages are in the Requirements Document. Additional information is furnished in the NASA design/construction assessment document, Work Breakdown Structure, and List of Design Questions and Answers.

Additional information and description of the design and construction approach is included in the document attached with this work order.

Detailed Design and Drafting

The following requirements will apply for the detailed design that begins after the conceptual design review.

The general requirements for the detailed design and drafting are:

a) Development of all required drawings to show the detail necessary for construction. Drawings shall be prepared using AUTOCAD. The completed design package shall include computer diskettes for all AUTOCAD generated drawings.

b) Attend/conduct progress meetings with the TPE and other NASA officials as may be required. Resolution of actions resulting from these meetings.

c) An informal concept review meeting will be held to review the design requirements and design plan. Also, the following items will be discussed: project approach, design coordination, unique design requirements, areas of risk, evaluation of design cost, site conditions, project documentation, and schedule.

d) A design review will be held at the 60% complete level. This will require development of presentation materials, performing the presentations, and the written resolution of all action items resulting from the review. The presentation information shall be provided to the Government no less than 10 working days prior to the review. It will be the Government's responsibility to reproduce and distribute the presentation information prior to the design review. The government will establish the design review date and select the design review panel. The review will be presented to a branch level audience.

e) A design review will be held at the 90% complete level. This will require development of presentation materials, performing the presentations, and the written resolution of all action items resulting from the review. The presentation information shall be provided to the Government no less than 10 working days prior to the review. It will be the Government's responsibility to reproduce and distribute the presentation information prior to the design review. The government will establish the design review date and select the design review panel. The review will be presented to a branch level audience. The 90% complete package shall be submitted as a complete bid-ready set of drawings, specifications and cost estimate. The remaining effort will support the design review and subsequent NASA comments to furnish a 100% final submittal.

f) The 100% design completion level shall have all NASA comments incorporated into the drawings and specifications. Therefore, it will be necessary to provide drawings and specifications for NASA review just prior to the 100% design completion level (at the 90% complete level).

g) Progress submittals consisting of CAD drawings, calculations, specifications, vendor catalog data, and/or construction cost estimates at the 30%, 60% and 90% design completion levels. Each progress submittal shall include a brief written description of current status, problem areas, and anticipated resolution, and schedule projection of upcoming effort.

h) The following end products (100% submittal) shall be provided:

1) Full size (22" x 34") signed paper drawings
2) 5 half size copies of each drawing
3) 2 copies of the Construction Cost Estimate
4) Engineering report containing design requirements, work order with revisions, 1/2 size drawings, system design calculations, vendor catalog data, correspondence, and other information that was used in the development of the final design
5) Construction schedule

6) Updated computer disks, 3 1/2" **MS-DOS** format, containing all drawings and cost estimate.

Proiect Management Reauirements

The Contractor shall provide personnel to perform all Project Management and coordination activities associated with the design phase of this project. These activities shall manage the Contractor's resources to meet the cost, schedule, and technical requirements as described herein.

CRITERIA AND REQUIREMENTS DOCUMENT FOR

MODIFICATIONS TO THE 8-FOOT HIGH TEMPERATURE TUNNEL FOR PRODUCTIVITY ENHANCEMENTS BUILDING 1265

FY 96 Minor CoF

_____
xxxx, Technical Project Engineer

_____
xxxx, Process Systems Branch Head

_____
xxxx, Research Project Engineer

_____
xxxx, Research Project Engineer

_____
xxxx, Facility Safety Head

_____
xxxx, OSEMA

_____
xxxx, <Contractor> Project Manager

NASA

National Aeronautics and Space Administration
Langley Research Center
Hampton, Virginia 23681-0001

CRITERIA AND REQUIREMENTS FOR MODIFICATIONS TO THE 8-FOOT HIGH TEMPERATURE TUNNEL FOR PRODUCTIVITY ENHANCEMENT, BLDG 1265 FY 1996 MINOR CoF

REVISIONS

REV. NO	DATE	DESCRIPTION
-	4-8-96	initial version

CRITERIA AND REQUIREMENTS FOR
MODIFICATIONS TO THE 8-FOOT HIGH TEMPERATURE TUNNEL FOR
PRODUCTIVITY ENHANCEMENT, BLDG 1265
FY 1996 MINOR CoF

1.0 SCOPE

1.1 The purpose of this document is to establish the design criteria and performance requirements for the facility modifications included in this project throughout the duration of the project.

1.2 This document summarizes the criteria and requirements for various modifications to enhance Research productivity at Buildings 1265. This document also serves as a baseline for the project and to formalize changes.

2.0 RESPONSIBILITIES

2.1 The Technical Project Engineer (TPE) is responsible for the development and maintenance of this document throughout the duration of the project.

2.2 The responsibility for design and construction elements lies with the personnel in the Facilities Systems Engineering Division assigned to this project. The assigned personnel have the responsibility to identify potential changes to the criteria and requirements defined herein and forward information (including cost and schedule impacts) for revisions to the TPE.

2.2 Revisions made to the requirements may result in additional costs and time extensions. When a requirement change is requested, engineering (FSED) will provide a cost and schedule impact to Research for review and acceptance. All changes will be agreed to and signed off by the TPE, RPE and Contractor's project manager. The resulting changes in costs and schedule will be included in this document and the NASA Task Document.

3.0 APPLICABLE DESIGN CODES AND STANDARDS

The design shall be in accordance with the latest versions of the following codes and standards:

NASA Facilities Engineering Handbook	NHB 7320.1B
NASA Safety Regulations Covering Pressurized Systems	LHB 1710.40
American Concrete Institute	ACI
American Society Of Mechanical Engineers	ASME
American Institute for Steel Construction	AISC
American National Standards Institute	ANSI
American Society for Testing and Materials	ASTM
American Welding Society	AWS
Institute of Electrical and Electronic Engineers	IEEE
National Electrical Manufacturers Association	NEMA
National Fire Protection Association	NFPA
National Electrical Code	NEC

4.0 PROJECT OBJECTIVES

•Replace the elevator cylinder, restore the elevator, pitch and pre-heater systems to the original capabilities for flight structures and aerothermal loads testing. The work items are prioritized as follows:

1) replace existing elevator cylinder with new cylinder assembly
2) restore full stroke operation of elevator system
3) restore operation of pitch carriage
4) restore operation of radiant preheater

- Apply modern control technology to the elevator, pitch and pre-heater systems to increase productivity and meet the required performance levels.
- Upgrade the hydraulic system to improve performance and enhance productivity.
- Maintain ability to return to CDE test configuration without hardware modifications.

5.0 DESIGN REQUIREMENTS

5.1 ENVIRONMENT

Type 1 - Control Room Environment: 40 to 100 degree **F,** 14.7-psia

Type 2 - Test Pod: 20 to 150 degree F, 0.1 to 14.7 psia (depressurization time of approx. 2 second)

Type 3 - Test Section, Model: 0 to 3650 R, 0.1 to 30 psia

Test media: Air and methane combustion by-products with oxygen enrichment. Oxygen enrichment only available up to p_o = 2000 psia.

Run Time: 60 seconds (30 seconds of stable test conditions)

5.2 ALLOWABLE LOADS IMPOSED BY MODEL

The allowable tunnel loads imposed by model are listed below:

	Tunnel Allowables[1]
Axial (F_x, lbf)	±21,000[2]
Vertical (F_z, lbf)	±55,000[3]
Lateral (F_Y, lbf)	±50,000
Pitch (M_Y, lbf-ft)	±168,333

Notes:

(1) The tunnel allowables are listed as reference information. The allowables represent the capabilities prior to the CDE test program. Since most of the mechanical and hydraulic hardware is existing, the system performance may be limited by the existing hardware. This project is not required to increase load capabilities above the previous capabilities.

(2) From Compudyne Analytical Report "Model Positioning Systems, *8* Foot High Temperature Structures Tunnel", April 20, 1962.

(3) Live plus dead load available for user; includes aerodynamic load plus weights *of* model, pedestal, force measurement, adapter plate, half of all fluid & instrumentation flex heads, and other model support components attached to the facility carriage.

(4) Loads are applied at the top center *of* the elevator carriage.

5.3 ELEVATOR SUBSYSTEM

5.3.1 PERFORMANCE REQUIREMENTS

- The performance of the elevator subsystem shall be:

elevator range:	0 to **84** inches
elevator inject duration:	1.2 seconds to 20 seconds*
elevator retract duration:	**2.0** seconds to **20** seconds*
elevator acceleration/ deceleration:	2 Gs (maximum)
position accuracy:	inject to tunnel centerline within ±1 inch

• Based on original design by Compudyne **Corp. 1962, use *of*** one 250 gpm servovalve, and total moving weight of **24,000 lbs.** Minimum inject time will increase with total weight greater than **24,000** lbs.

The performance levels match those of the subsystem prior to the CDE model configuration and are based on the existing mechanical and hydraulic hardware.

- Failure modes:

If electrical or hydraulic power is lost, the elevator shall failsafe and will stop with deceleration not exceeding 2 Gs (fail "as-is").

If the elevator motions exceed the allowable operating envelope (velocity and position), the elevator shall failsafe and will stop with deceleration not exceeding **2** Gs (fail "as-is").

- Safety features:

The elevator system shall be interlocked with the preheater and flow survey apparatus to avoid collisions.

The pod area shall be secured to prevent personnel access when the elevator hydraulic circuit is pressurized.

5.3.2 ENGINEERING REQUIREMENTS

- The existing elevator subsystem hardware shall be re-conditioned and re-installed to restore full operation .

- The existing elevator cylinder shall be replaced with a new cylinder assembly that mates to the existing piping connection points and carriage connection. .

- The existing cylinder assembly will be removed and stored at the facility for future **use.**

- Restoration of the Variable Pressure (Boost) subsystem is included.

Control Modes:

Slow mode: Provides slow elevator rate to allow checkout of motion profile and movement of instrumentation and equipment.

Simulation (SIM) mode: Provides checkout mode to simulate elevator operation without tunnel flow.

Manual/Auto Modes: Provides selection of motion profile with various rates, accelerations, and decelerations.

5.4 PITCH CARRIAGE SUBSYSTEM

5.4.1 PERFORMANCE REQUIREMENTS

- The performance of the pitch system shall be:

pitch range:	+20 degrees
pitch rate:	0 to 20 degrees in one second (outside of cushion area)*
position accuracy:	±0.1 degree

* Based on original design by Compudyne Corp. 1962, use of one 250 gpm servovalve and hydraulic cushions in existing actuators. The cushions affect motion in approximately 2.8 degrees at each end of range and will result in reduced velocities in cushion region.

The performance levels match those of the subsystem prior to the CDE model configuration and are based on existing mechanical and hydraulic hardware.

- Failure mode: If electrical or hydraulic power is lost, the pitch system shall be failsafed in its last position (fail "as is").

- Safety features:

The pitch system shall be interlocked with the preheater and flow survey apparatus to avoid collisions.

The pod area shall be secured to prevent personnel access when the pitch hydraulic circuit is pressurized.

5.4.2 ENGINEERING REQUIREMENTS

- The existing pitch system hardware shall be re-conditioned and re-installed as appropriate.

- Control Modes:

Slow mode: Provides slow pitch rate to allow checkout of motion profile and movement of instrumentation and equipment.

Simulation (SIM) mode: Provides checkout mode to simulate pitch operation without tunnel flow.

Manual/Auto Modes: Provides selection of motion profile with various rates, accelerations, decelerations, set points, and dwell times.

5.5 RADIANT PRE-HEATERS SUBSYSTEM

5.5.1 PERFORMANCE REQUIREMENTS

- The performance of the radiant preheater subsystem shall be:

project/retract range:	fully extend to cover model for heating and retract to prevent interference with elevator
retract duration:	approx. 1 second'
project duration:	approx. 2 seconds'
max. model surface temp.:	2000°F
total heating power input:	800 amps at 480 VAC
accuracy/stability:	at least six heating zones to provide ±65°F over flat model surface

* Based on requirements specified in NASA Memo from 8' High Temperature Structures Tunnel Branch, Ed Bruce to E. M. Moggio, dated Oct. 27, 1966.

These performance levels match those of the subsystem prior to the CDE model configuration and are based on use of the existing mechanical and hydraulic hardware.

- Failure mode: If electrical or hydraulic power is lost, the preheater system shall be failsafed in its last position (fail 'as is").

- Safety features: The pitch system shall be interlocked with the preheater and flow survey apparatus to avoid collisions.

5.5.2 ENGINEERING REQUIREMENTS

- The existing radiant preheater subsystem hardware shall be re-conditioned and re-installed as appropriate.

- Work associated with the quartz lamps and lamp holders is not included in the CoF project.

- Control Modes:

Slow mode: Provides slow rate to allow checkout of motion profile and movement of instrumentation and equipment.

Simulation (SIM) mode: Provides checkout mode to simulate preheater operation without tunnel flow.

Manual/Auto Modes: Provides selection of motion profile with various rates, accelerations, and decelerations.

TASK 4

PERFORM CONCEPTUAL DESIGN TO INVESTIGATE ALTERNATE ENERGY SOURCES AND HEATER TYPES TO REPLACE THE TWO EXISTING HEATERS IN THE 20-INCH MACH-6 CF4 TUNNEL WITH A SINGLE, MORE RELIABLE, EFFICIENT, AND ENVIRONMENTALLY COMPATIBLE HEATER, WITH NO SACRIFICE IN PERFORMANCE

Statement of Work
CF4 Replacement Heater Study

General Description:

This task requires a conceptual design study to investigate alternate energy sources and heater types to replace the two existing storage heaters in the 20-Inch Mach 6 CF4 Tunnel (B1275) with a single, more reliable, efficient, and environmentally compatible heater, with no sacrifice in performance. The new heater will be capable of a wider range of reservoir temperatures than previously possible with the existing salt (or previous lead) bath heaters, will not be of the storage type, and will have the capability of heating heavy gases having molecular weights between 44 and 150 (CF4 molecular weight is 88).

The study of a replacement heater needs to consider the technical problems of CF4 decomposition, minimum preheat time requirements, selection of an optimum energy source, investigation of material compatibility problems, accuracy of temperature controls, and cost.

The preliminary heater requirements for this project are shown in the attached CoF Initiation Form. A more comprehensive Criteria and Requirements Document for this project is currently being prepared and will be available by September 6, 1996.

Detailed Work Statement:

The project will be broken into two phases:

Phase A: Search and Compile Data on Potential Commercial Heaters

Critical Work Elements:

(1) Review the Criteria and Requirements Document for the replacement heater and previous heater studies provided.

(2) Develop an approach for completing a focused market survey, which optimizes useful information received.

(3) Hold an initial meeting (kickoff) with NASA to review plan, before starting market survey.

(4) Perform the new focused market survey to locate potential commercial heaters candidates, which could possibly meet the project requirements.

(5) Compile performance and cost data on each heater candidate.

(6) Narrow number of potential heater candidates to four or five. Conduct detailed discussions with the top four or five potential suppliers of most promising heater candidates to verify applicability. If standard products will not meet the requirements, investigate if supplier can modify heaters to meet requirements or improve performance to come closer to meeting requirements.

(7) Write Phase A Report, documenting the results of the market survey. Discuss the approach used, and provide summary information and details of the information received. Highlight the most promising candidates, and provide detailed information on heater performance, size, and cost. Recommend evaluation criteria to be used in Phase B trade-off study.

(8) Deliver Phase A Report. Hold review meeting with NASA to orally review Phase A results.

Phase B: Trade-off Study

Critical Work Elements:

(1) Evaluate the advantages and disadvantages *of* each high potential heater. Use the evaluation criteria proposed in Phase A, after it is reviewed and approved by NASA

(2) Formulate recommendations on selecting the optimum heater or combination of heaters which would best meet this application.

(3) Complete a budgetary cost estimate for the recommended installed heater system.

(4) Write a Phase B Report, documenting the results of the trade-off study. Discuss the approach used, provide top level summary information, as well as all details on the proposed heaters, for future reference.

(5) Deliver Phase B Report. Hold review meeting with NASA to orally review Phase B results.

(6) After Phase B meeting, update Phase A and Phase B reports, to include any comments provided by NASA.

Schedule Requirements:

This effort is needed in 3 months. It is anticipated that Phase A would take 2 months and Phase B 1 month.

REQUIREMEN AND CRITERIA DOCUMENT

1.0 INTRODUCTION/PROJECT OBJECTIVES

The CF4 tunnel is located in Building 1275 at **NASA** LaRC. It is a blow down facility used to simulate the high normal shock density ratios of a "real gas" on the aerodynamic characteristics of blunt *to* moderately blunt bodies. This facility is the only heavy gas hypersonic wind tunnel in the nation.

A brief description of a tunnel run is as follows:

CF4 gas flows from a set of high pressure (5000 psig) manifolded bottles through piping to a storage heater. The heater currently allows varying the gas temperature from 600 to 1000 degrees F. The gas then flows to a settling chamber, through a nozzle, test section (where models are mounted), heat exchanger and finally to the vacuum spheres.

This objective of this project is to replace the existing heating system, with an improved heating system, with much greater performance capabilities. This Criteria and Requirements Document further defines the facility needs and provides guidelines for designing, procuring, and installing **a** new heater system.

2.0 BACKGROUND INFORMATION ON HEATER

Summarv:

The CF4 heater system was designed 26 years ago and has been heavily used throughout it's history. Because of the combination of the unique conditions at the facility and it's heavy usage, maintenance has been a continual problem. Also, improved temperature accuracy and higher productivity requirements in modern wind tunnels dictate the need for improved overall heater performance. Because of problems with tube bundle corrosion, environmental concerns with the use of lead, and needed performance improvements in the heater, replacement of the existing heater system is a priority. **A** single, more reliable, and environmentally compatible heater, with rapid response and providing near continuous heat output is required. The following discussion describes the problems with the existing heaters in more detail:

Corrosion Problem:

The original CF4 heater system consisted of 316 stainless steel tube coils, immersed in a molten lead bath **(2** units). The low Prandtl number molten lead provided excellent heat transfer properties and the coiled tubes provided a large surface area. Additionally, the coiled tubes were well suited for internal forced convection heat transfer. However, internal corrosion resulted in clogging of the tube passages and eventual tube failure. The 316 stainless tube bundle provided service for approximately seven years before failure. The initial failure was thought to be caused by cleaning the inner tube surface with nitric acid during a maintenance period.

After the tube bundle failed a second time, the decision was made to replace the 316 stainless steel tube bundle with 347 series stainless steel. The 347 stainless tube bundle lasted only two years before failing again. The failure was again from inner corrosion with the CF4 gas. CF4 gas is inert at low temperatures. However, at elevated temperatures with moisture it forms fluorine gas and hydrogen fluoride. A moisture problem was recognized in the system at the time of the first failure. Following the third failure, Inconel 600 was chosen to replace the stainless tube bundle materials, because of the good resistance to fluorine and hydrogen fluoride. The 300 series stainless showed poor resistance to high temperature fluorine and hydrogen fluoride corrosion. The 347 stainless showed the worst resistance to this type of corrosion.

Environmental Problem With Lead:

The second problem with the existing heaters is the known environmental problems with lead. If there is a leak or rupture in the tube bundles, or during the routine handling of the heaters for maintenance, exposure to lead and lead vapors is a concern. Because of environmental problems with lead, the lead heat storage material in one unit was changed to tin. However, a known incompatibility existed between the inconel and tin. Therefore, the inconel heater surface was oxidized in a furnace for protection against the molten tin. Other types of surface protection were not deemed feasible at the time.

The inconel tube bundle failed after only 4 months of service. It is believed that the oxide layer was damaged during the post heating hydrostatic tests. The cause of failure was from external corrosion with molten tin rather than internal corrosion. As a result, the tin was replaced with a molten salt, which was shown to be more compatible with the inconel. Due to the previous problems with corrosion, a testing program was initiated to examine the corrosive effects of high temperature (1200 degrees F) moist CF4 with Inconel. Two tests have been completed at the time of this document. The tests show low to no corrosion in a six month period. Testing is still in progress. Currently one heater bath contains lead (not used) and the second bath contains salt.

Performance Problems:

In addition to the corrosion and environmental problems, associated with the existing heater, the facility needs better overall heater performance capabilities. Improvements in data quality and overall facility productivity has resulted in the need for more stringent heater performance requirements. The decay in temperature over time, which is characteristic of storage type heaters, is a significant problem and can be tolerated now with the existing heater only because of the relatively short run times. With the desire to significantly increase run time, the temperature decay of the existing heater, or any storage type heater, would be unacceptable. Improvements are also required to minimize heater preheat time, improve overall temperature control accuracy, decrease time for flow stabilization after tunnel start-up, and improve the heater recovery after completion of a tunnel run.

3.0 REQUIREMENTS FOR NEW CF4 REPLACEMENT HEATER

General Requirements:

The following requirements were developed to define an improved replacement heater system for the 20-Inch Mach 6 CF4 Hypersonic Wind Tunnel:

The heater system shall be capable of heating and maintaining a pre-set constant CF4 gas temperature during a run. The range of pre-set gas temperatures shall be variable from 500 to 1000 degrees Fahrenheit, with CF4 gas entering the heater at 70 degrees Fahrenheit. A temperature control tolerance of no greater than 1% shall be allowed during operation.

The heater gas pressure shall remain constant during a tunnel run. The required pre-set pressure range shall be variable between 100 and 3000 psig. The CF4 gas flow through the heater system shall range from 0.7 to 18 lbm/sec, depending upon the desired pressure and temperature conditions. The pressure drop through the heater shall be no greater than 200 psi at inlet conditions of 70 degrees Fahrenheit, 1250 psig, at 18 lbm/sec and an outlet temperature of 1000 degrees Fahrenheit.

The heater shall have a quick response capability. A maximum of 1 hour shall be allowed at the start of the work day to preheat the system, with no CF4 gas flowing through the tunnel. CF4 gas can be introduced into the heater, to be preconditioned during the heater preheat cycle. At the start of a tunnel run, the main control valve is opened and CF4 gas flow through the tunnel is initialized. A maximum of 5 seconds shall be allowed to stabilize the flow conditions. After the tunnel is started, no additional time shall be allowed for additional heating of the CF4 gas or tube bundle. The tunnel will be operated for a

time period of 10 to 180 seconds for each run. A maximum of 30 minutes shall be allowed between tunnel runs for reheating the heater system and preparing for the next run. For the next run, the temperature and pressure set points can be changed to any condition within the ranges, specified above.

The heater shall be designed to the ASME Boiler and Pressure Vessel Code, and have a design pressure of no less than 3000 psig at the heater outlet. All heater materials in contact with CF4 gas shall be Inconel 625 and shall not exceed 1350 degrees Fahrenheit due to decomposition of the CF4 gas at elevated temperatures.

The heater shall be designed and constructed for high reliability and long life (50,000 cycles). Heater maintenance shall be minimized and performance of overall preventative maintenance items shall occur once a year, during a planned facility shutdown period.

The replacement heater system shall be capable of being completely integrated into the existing facility, with minimal changes to the existing operations. The heater shall have electronic semi-automatic controls, mounted in a free standing panel, to be located in the existing control room. The length of pipe between the outlet of the replacement heater and the tunnel shall be minimized.

Specific Technical Criteria:

Operating Pressure:	Variable from 100 to 3000 psig
Operating Temperature:	Variable from 500 to 1000 Deg F
Maximum Surface Temperature: In Contact With CF4 Gas	1350 Deg F max
Stabilization Time:	5 seconds max
Run Time Capability:	From 10 to 180 seconds
Temperature Control Tolerance:	1% max
Mass Flow Rate:	Variable from 0.7 to 18 lbs/sec
Maximum Pressure Drop:	200 psig max @ 1250 psig inlet, 18 lbs/sec, & 1000 degrees F
Maximum Preheat Time:	1 hour max
Maximum Reheat/Cooling Time:	30 minutes max
Design Life:	**25** years at 2000 runs per year
Heater Reliability:	High
Maintenance Requirements:	Limit to Annual Shutdown
Control System:	Electronic, Semi-Automatic

4.0 DESIGN CODES AND STANDARDS

The design of all project elements shall be in accordance to the latest codes, standards and requirements of the following:

NASA Facilities Engineering Handbook, NHB 7320.1B

NASA Safety Regulations Covering Pressurized Systems, LHB 1710.40

American Society of Mechanical Engineers (ASME)

American Society of Civil Engineers (ASCE)

American Concrete Institute (ACI)

American Institute of Steel Construction (AISC)

American National Standards institute **(ANSI)**

American Society for Testing **and** Materials **(ASTM)**

American Welding Society (AWS)

Pipe Fabrication Institute (PFI)

Institute of Electrical and Electronic Engineers (IEEE)

National Electrical Manufacturers Association (NEMA)

National Fire Protection Institute (NFPA)

National Electric Code (NEC)

TASK 5

PERFORM IMPLEMENTATION, INSTALLATION, CHECKOUT, AND DOCUMENTATION OF AUTOMATION SYSTEM COMMUNICATIONS UPGRADE FOR THE NATIONAL TRANSONIC FACILITY

Statement of Work for Construction
1994 NTF Productivity Enhancements Project
Controls Integration Work Package

Part 1 Scope and Description

Construction activities shall be performed in support of the following Construction of Facilities project:

1994 NTF Productivity Enhancements Project (1236)

The **construction** (*i.e.* implementation, installation, checkout, and documentation) of the following automation system **productivity improvements** shall be performed:

- Automation System Communications Upgrade

Part 2 Requirements

2.1 General

2.1.1 The Contractor shall furnish all labor, materials, equipment, services, and operations necessary to perform **construction.**

2.1.2 The Contractor shall perform **construction** to accomplish the **design** in accordance with the requirements contained herein and the following appendices:

- Appendix A - *Implementation Requirements for the NTF Automation System Communications Upgrade*

The **design** is defined as the system drawings, Detailed Software Design Document, Preliminary Operating Manual, and related documentation which have been developed to satisfy the specific project requirements as presented in *Requirements Specification for Design* of *the Automation System Productivity Improvements for the National Transonic Facilify.*

2.1.3 The Contractor shall integrate reliability, productivity, maintainability, safety, and other such efforts into the total engineering effort to meet cost, schedule, and technical performance objectives.

2.1.4 Procedures and Standards

- NASA Facilities Engineering Handbook, NHB 7230.1B
- Langley Facilities System Safety Analysis and Configuration Management Handbook, LHB-1740.4.
- Human Engineering Design Criteria, Military Specifications MIL-STD-1472
- NASA Software Documentation Standard, NASA-STD-2100-91

2.1.5 Applicable Codes

- Institute of Electrical and Electronic Engineers (IEEE)
- National Electrical Manufacturer's Association (NEMA)
- National Fire Protection Association (NEPA)
- National Electrical Code (NEC)
- Instrumentation Society of America (ISA)

2.1.6 Safety. The Contractor shall perform on-site work in accordance with Langley Safety Requirements and the approved NASI-20001 Safety Plan.

2.1.7 Quality Assurance. The Contractor shall provide products and perform work in accordance with the ***NTF Productivity*** Enhancements Project *Safety/Facility* Assurance Plan.

2.2 Submittals

2.2.1 The Contractor **shall** supply a monthly progress schedule, in addition to regular monthly reporting requirements under contract NAS1-20001.

2.2.2 The Contractor shall supply a **test report** documenting the results of each test required herein within 10 calendar days of the applicable test.

2.3 Documents

2.3.1 The Contractor shall supply a Software Maintenance Manual which includes the following information, at a minimum:

1. purpose / description of each source file;
2. purpose / description of each task or program unit;
3. description of requirements for execution of a task or program unit, including (but not limited to) system environment variables, input files, output files, priority, semaphores, events, etc.;
4. hierarchical relationship of subroutines in a task or program unit;
5. description of interfaces between tasks or program units;
6. identity and usage of each file required to generate each task or program unit.

2.3.2 The Contractor shall provide an Operation Manual which describes the as-built operation of the **productivity improvements** identified herein.

2.3.3 The Contractor shall develop a **test procedure** which is necessary and sufficient to verify functionality and validate requirements compliance of the **productivity improvements** identified herein. The Controls Integration work package schedule allows for incremental delivery of the **test procedure,** although applicable elements must be supplied at least 10 calendar days prior to a particular test or part thereof.

2.4 Testing

2.4.1. The Contractor shall conduct a **bench test** based on the test procedure identified herein prior to installation of the **productivity improvements.** Elements of the test procedure which cannot be readily accomplished in a bench test environment shall be identified by the Contractor.

2.4.2 The Contractor shall conduct a **site test** based on the test procedure identified herein following installation of the **productivity improvements.**

2.5 Site Work

2.5.1 The Contractor shall provide written notification of any planned utility power outages to the Facility Coordinator at least 24 hours in advance.

2.5.2 The contractor shall maintain an up-to-date set of drawings on site at all times. These redlined drawings shall show any deviations or detailing required.

Part 3 Schedule

3.1 The **construction** work described herein shall be accomplished such that subsequent milestones of the NASA-developed Controls Integration work package schedule are satisfied.

3.2 The Contractor shall participate in engineering reviews of the **construction** work. The reviews will be convened at Langley Research Center and scheduled such that subsequent milestones of the NASA-developed Controls integration **work** package schedule are accomplished on time. The Contractor should expect one-review corresponding to each **productivity enhancement** identified herein.

Part 4 Government Furnished Items

Upon request, the Government will make available to the Contractor, existing drawings, sketches, plans, layouts, rough drafts or special requirements, justification, and costs that may be related to this project. This information shall be used as guide material only, as it is primarily schematic in nature and may not represent actual field conditions. All critical information shall be determined from field investigation.

The Government will furnish, upon request, a copy of the following documents:

- Facility baseline documents
- Facility reference documents
- Applicable NTF Productivity Enhancements Project documents
- Applicable NTF software and documentation
- Applicable 16-Foot Transonic Tunnel software and documentation
- NASA-STD-2100-91

[Part 5 Deliverables

Deliverables **shall** be sent *to* the office **of** the Contracting Officer's Technical Representative, accompanied by the Technical Submittal Form approved for use under contract NAS1-20001.

- Engineering Review presentation materials (8 copies per review)

- Redlined markups of existing drawings (Working original plus 5 copies)

- As-built version of project design drawings/sketches on paper media, not to exceed standard D-size format (Original plus 5 copies) and on electronic media, using AutoCAD® Release 11 or 12 format on 3.5 inch MS-DOS® format disks (I copy)

- Items procured by the Contractor specifically for this project, including (but not limited to): hardware; commercial software products; vendor-supplied operation, maintenance, and technical documentation

- Contractor-developed application, test, diagnostic, or utility program software products, consisting of: source code (including header files, configuration files and all other similar files), build procedures,

and executable programs supplied on 3.5 inch MS-DOS® format disks or other NASA-approved media.

- Software Maintenance Manual in hardcopy form (original plus 5 copies) and on electronic media using Microsoft Word / Excel / PowerPoint® format on 3.5 inch MS-DOS® format disks (1 copy)
- Operation Manual in hardcopy form (original plus 5 copies) and on electronic media using Microsoft Word / Excel / PowerPoint® format on 3.5 inch MS-DOS® format disks (1 copy)
- Test procedure(s)
- Testreports
- Monthly contract submittals and progress schedule

implementation Requirements
for the NTF
Automation System Communications Upgrade

1.0 INTRODUCTION

1.1 Identification of Document

This is Appendix A of the Statement of Work *for Construction,* 1994 ***NTF*** Productivity Enhancements Project, Controls Integration Work Package.

1.2 Scope of Document

This document applies to the microcomputer control systems, Process Computer System, and Research Computer System of the NTF, as referenced herein. This document indirectly applies to the NTF programmable logic controllers (PLCs).

1.3 Purpose and Objectives of Document

The purpose of this document **is** to present requirements regarding implementation of the Automation System Communications Upgrade. These requirements are unique to the specific hardware platforms, operating systems, and existing software applications of the NTF and/or the 16-Foot Transonic Tunnel. The intent of these requirements is to ensure compatibility with existing functionality, foster reuse of existing software, and reduce implementation risk.

2.0 HARDWARE REQUIREMENTS

2.1 Procurement

2.1.1 The Contractor shall procure SCRAMNet® shared memory VMEbus boards, one each for microcomputer control system A, B, and C (MicroA, MicroB, MicroC); one each for the Process Computer System (PCS) and the Research Computer System (RCS); and one for the Multibus II development system accountable by Facility Systems Engineering Division (FSED).

2.1.2 The Contractor shall procure VMEbus to Multibus II adapters, one each for MicroA, MicroB, and MicroC; and one for the Multibus II development system accountable by Facility Systems Engineering Division (FSED).

2.1.3 The Contractor shall procure all necessary cabling, connectors, fasteners, and any auxiliary equipment to support data transfers among MicroA, MicroB, MicroC, PCS, and RCS.

2.1.4 The Contractor shall purchase SCRAMNetB compatible equipment which supports powerup, powerdown and/or failure by any node while transparently maintaining data transfers among all other active nodes.

2.2 Acceptance

2.2.1 The Contractor shall verify functional performance of **all** procured equipment prior to installation at the NTF.

2.2.2 The Contractor shall provide written proof of acceptance to NASA.

2.3 Installation

2.3.1 The Contractor shall install all SCRAMNetB equipment to be housed by MicroA, MicroB, and MicroC. LaRC's Experimental Testing Technology Division (ETTD) will bear the responsibility for installing SCRAMNetB equipment in the RCS and PCS and performing any supporting operating system changes therein.

2.3.2 The Contractor shall install all cabling, connectors, and fasteners among MicroA, MicroB, MicroC, RCS, and PCS.

3.0 SOFTWARE REQUIREMENTS

3.1 Communications Protocol

3.1.1 The communications protocol shall support the capability for any node to send data *to* any other node and for any node to receive data from any other node. **This** represents **a** change **from** the existing protocol which consists of a master-slave relationship between the PCS and each of the microcomputer control systems, with the exception that a microcomputer may request reinitialization of a link.

3.1.2 The Contractor shall provide the following logical communication paths:

- From RCS to MicroA, MicroB, and MicroC (broadcast mode)
- From PCS to MicroA, MicroB, and MicroC, individually
- Individually from MicroA, MicroB, and MicroC to PCS
- Individually from MicroA, MicroB, and MicroC to RCS
- From RCS to PCS
- From PCS to RCS

3.1.3 The Contractor shall make provisions for the following logical communication paths:

- From MicroA to Micro6 and MicroC, individually
- From MicroB to MicroA and MicroC, individually
- From MicroC to MicroA and MicroB, individually
- From PCS to PLCA, PLCB, and PLCC, individually
- Individually from PLCA, PLCB, and PLCC to PCS

3.2 Communications Data Transfers

3.2.1 The Contractor shall derive data packet formats from communications software **as** described in the *16-Foot* ***Open*** *Architecture* ***PMC Software*** *Reference Manual.*

3.2.2 The Contractor shall provide software to support data transfers as follows:

- RCS process updates to MicroA, MicroB, and MicroC (broadcast)
- PCS setpoints and control commands to MicroA, MicroB, and MicroC
- PCS auxiliary commands to MicroA, MicroB, and MicroC
- MicroA, MicroB, and MicroC status updates to PCS
- MicroA, MicroB, and MicroC auxiliary updates to PCS

3.2.3 The Contractor shall make provisions to support data transfers as follows:

- MicroA unspecified data updates to MicroB and MicroC
- MicroB unspecified data updates to MicroA and MicroC
- MicroC unspecified data updates to MicroA and MicroB
- PCS status requests to PLCA, PLCB, and PLCC
- PLCA, PLCB, and PLCC ***status*** updates to **PCS**

3.3 Microcomputer Control Systems

3.3.1 The Contractor shall provide SCRAMNetB compatible software to replace applicable MicroA, MicroB, and MicroC software which drives serial communications with the PCS.

3.3.2 The Contractor shall add software to MicroA, MicroB, and MicroC and eliminate the existing protocol translation software in order to provide the communications functions described in the *16-**Foot Open Architecture PMC Software Reference Manual.***

4.0 IMPLEMENTATION CONSTRAINTS

4.1 The existing serial communications equipment and supporting software shall remain in place until the SCRAMNet® implementation has been successfully demonstrated and accepted.

4.2. The capability of the MICSEQ task to **drive** the serial links to the **PLCs** shall be preserved until after the PLC upgrade is completed.

4.3 The existing software **task** structure of MicroA, MicroB, and MicroC **shall** be retained.

Implementation Requirements for the NTF On-Setpoint Status Indicators

1.0 INTRODUCTION

1.1 Identification of Document

This is Appendix B of the Statement of Work for Construction, *7994* NTF Productivity Enhancements Project, Controls Integration Work Package.

1.2 Scope of Document

This document applies to the microcomputer control systems, Process Computer System, and Research Computer System of the **NTF,** as referenced herein.

1.3 Purpose and Objectives of Document

The purpose of this document is to present requirements regarding implementation of the On-Setpoint Status Indicators. These requirements are unique to the specific hardware platforms, operating systems, and existing software applications of the NTF. The intent of these requirements is to ensure compatibility with existing functionality, foster reuse of existing software, and reduce implementation risk.

2.0 HARDWARE REQUIREMENTS

Implementation shall not require additional hardware or modifications to existing hardware.

3.0 SOFTWARE REQUIREMENTS

3.1 Process Computer System

3.1.1 On-setpoint detection software shall detect and set on-setpoint status of the following **research processes:** Mach number, Pressure, Temperature, Alpha, and Beta.

3.1.2 On-setpoint detection software shall use separate tolerance band entry and exit values for each **research process** to prevent cycling of a given status indicator.

3.1.3 On-setpoint conditions shall be determined using setpoint and process values which originate as shown in the following table:

Setpoint / Process	Source
Mach	MicroA
Pressure	MicroA
Temperature	MicroA
Alpha	PCS
Beta	PCS

3.1.4 Default on-setpoint tolerances shall be read from an ASCII configuration file in conjunction with system initialization.

3.1.5 On-setpoint tolerance values shall be adjustable via the facility operator interface during tunnel runs.

3.1.6 The setpoint value, process value, and on-setpoint status of each **research process** shall be shown in an X-window display on any designated facility X-terminal device.

3.2 Microcomputer Control Systems

3.2.1 On-setpoint detection software in MicroA shall detect and set on-setpoint status of the following processes:

1. Mach number
2. Pressure
3. Temperature

3.2.2 On-setpoint detection software **in** MicroC shall detect and set on-setpoint status of the following processes:

1. Alpha
2. Beta
3. Fan RPM
4. Pitch position
5. Roll position

4.0 IMPLEMENTATION CONSTRAINTS

4.1 The existing software task structure of the PCS shall be retained.

4.2 The existing software task structure of MicroA, MicroB, and MicroC shall be retained.

Implementation Requirements
for NTF
Automated Test Sequencing

1.0 INTRODUCTION

1.1 Identification of Document

This is Appendix C of the *Statement of Work for Construction, 1994 NTF Productivity Enhancements Project, Controls Integration Work Package.*

1.2 Scope of Document

This document applies to the microcomputer control systems, Process Computer System, and Research Computer System of the NTF, as referenced herein.

1.3 Purpose and Objectives of Document

The purpose of this document is to present requirements regarding implementation of Automated Test Sequencing (ATS). These requirements are unique to the specific hardware platforms, operating systems, and existing software applications of the NTF. The intent of these requirements is to ensure compatibility with existing functionality, foster reuse of existing software, and reduce implementation risk.

2.0 HARDWARE REQUIREMENTS

Implementation shall not require additional hardware or modifications to existing hardware.

3.0 SOFTWARE REQUIREMENTS

3.1 General

3.1.1 ATS software shall execute on the Process Computer System.

3.1.2 ATS software shall read, on demand, a *batch* file and store the contents in the batch data structure. *Batch* refers to a set of Mach, Pressure, and Temperature setpoints.

3.1.3 ATS software shall read, on demand, a *polar* file and store the contents in the polar data structure. *Polar* refers to a set of 15 Alpha and Beta setpoint pairs.

3.1.4 If a batch is accompanied by a polar file name, ATS software shall read the polar file and store the contents in the polar data structure.

3.1.5 Upon receipt of a *next_point* event, ATS software shall advance to the next *testpoint* by dispatching setpoints of the current batch and next setpoint pair of the current polar to the appropriate microcomputer control systems. *Testpoint* refers to the combined set of Mach, Pressure, Temperature, Alpha, and Beta setpoints from a given batch and polar.

3.1.6 If the end of the current polar has been reached, ATS software shall advance to the next batch and first setpoint pair of the next polar, unless the last batch has been processed, in which case, ATS software shall wait for an operator command.

3.1.7 ATS software shall support intervention as follows:

1. Allow operator to enter setpoints not in a batch or polar file.
2. Allow operator to terminate a polar file; go to the next polar file.
3. Exceptional condition (e.g. model protection safety condition) causes termination of polar.

3.1.8 Whenever the current batch is terminated, the current polar shall also be terminated.

3.2 Operator Interface

3.2.1 The ATS display for Mach, Pressure, Temperature, and Reynolds number shall be similar *to* the existing Alpha, Beta, Pitch, and Roll display.

3.2.2 The ATS display shall be shown in an X-window on any designated facility X-terminal device.

3.2.3 The ATS operator interface shall support the following operator commands:

1. Initiate batch / polar;
2. Terminate batch / polar;
3. Page forward;
4. Page back;
5. Print batch / polar file;
6. Exit

3.2.4 A printout of batch and polar files shall show tolerances associated with each batch *or* polar setpoint.

4.0 IMPLEMENTATION CONSTRAINTS

4.1 The existing software task structure of the PCS shall be retained.

4.2 The existing Alpha, Beta, Pitch, and Roll test setup display shall be retained.

4.3 The existing software task structure of MicroA, MicroB, and MicroC shall be retained.

Implementation Requirements
for NTF
Alpha / Beta Controls

1.0 INTRODUCTION

1.1 Identification of Document

This is Appendix D of the, *Statement of Work for Construction, 7994 NTF Productivity Enhancements Project, Controls Integration Work Package.*

1.2 Scope of Document

This document applies to the microcomputer control systems, Process Computer System, and Research Computer System of the **NTF,** as referenced herein.

1.3 Purpose and Objectives of Document

The purpose of this document is to present requirements regarding implementation of Alpha/Beta Controls. These requirements are unique to the specific hardware platforms, operating systems, and existing software applications of the NTF. The intent of these requirements is to ensure compatibility with existing functionality, foster reuse of existing software, and reduce implementation risk.

2.0 HARDWARE REQUIREMENTS

Implementation shall not require additional hardware or modifications to existing hardware.

3.0 SOFTWARE REQUIREMENTS

3.1 Microcomputer Control System

3.1.1 Closed loop control of Alpha/Beta shall be performed by microcomputer control system C (MicroC) in Computer operation mode.

3.1.2 MicroC shall accept Alpha/Beta setpoints from the Process Computer System (PCS) when the Local-Computer mode panel switch is placed in Computer mode.

3.1.3 MicroC shall accept from the Research Computer System **(RCS)** data required for Alpha/Beta control, consisting of parameters needed. to compute Alpha/Beta (e.g. deflection angles, knuckle angles); forces, moments, force and moment limits to monitor Alpha/Beta; and on-board AOA, (if applicable, on-board roll).

3.1.4 MicroC shall accept from the RCS and interpret, a *sensor_mode_flag* which indicates the source *of* the computed Alpha/Beta values: sting bending or on-board AOA.

3.1.5 In Computer operation mode, the Alpha and Beta values computed by the RCS shall be the primary feedbacks; however, MicroC shall independently compute Alpha and Beta.

3.1.6 MicroC shall stop moving the pitch mechanism if the absolute difference between the Alpha or Beta values computed by MicroC and RCS, respectively, is greater than 1 degree.

3.1.7 Upon entry into or during Computer operation mode, if MicroC cannot perform Alpha/Beta control, it shall maintain the current pitch and roll positions and shall send an appropriate condition code to the PCS.

3.1.8 MicroC shall monitor forces and moments during a setpoint transition and inhibit further travel in the current direction(s) if any force or moment limit would be exceeded.

3.1.9 Upon receipt of a *pitch* ***home*** command, MicroC shall position the model to the start of sweep orientation.

3.2 Research Computer System

3.2.1 The RCS shall generate and send parameters required for Alpha/Beta control to MicroC ten times per second (see requirement 3.1.1).

3.2.2 The RCS shall generate **a** *sensor_mode_flag* which indicates the source of the computed Alpha/Beta values: sting bending or on-board AOA.

3.2.3 The *sensor_mode_flag* (and other flags required for Alpha/Beta control) shall be sent upon request or upon a change **of** state.

3.2.4 When a parameter value required ***for*** Alpha/Beta control **is** invalid, the RCS shall provide an indication of such to MicroC.

3.3 Process Computer System

3.3.1 The PCS shall send Alpha/Beta setpoints to MicroC.

3.3.2 The PCS shall display appropriate messages upon receipt of condition codes from MicroC.

4.0 IMPLEMENTATION CONSTRAINTS

4.1 The existing software task structure of the PCS and RCS shall be retained.

4.2 The existing software task structure of MicroC shall be retained.

TASK 6

DESIGN, FURNISH, AND INSTALL MACH NUMBER MEASUREMENT SYSTEM FOR THE NATIONAL TRANSONIC FACILITY

Statement of Work - Design, Furnish, and Install Mach Number Measurement System 1994 NTF Productivity Enhancements Project Controls Integration Work Package

Part I Scope and Description

Activities identified herein will be performed in support of the following Construction of Facilities project:

1994 NTF Productivity Enhancements Project (1236)

Services will be provided to design, furnish, install, test, and document a Mach Number Measurement System (MNMS). The design will incorporate a PSI 8400 series flow reference system **(FRS)** supplied by NASA. The FRS will be installed immediately upstream of the test section, along the far-side tunnel wall. The tunnel shell will be penetrated to support routing of pressure tubing from the FRS to two new probes, one each for total and static pressure. The FRS will acquire total and static pressure via the new probes and total temperature from an existing sensor. The FRS will transmit these parameters via a new IEEE-488 interface to microcomputer control system A, which controls Mach number, Pressure, and Temperature. The system will be tested and evaluated for short-term performance. Supporting documentation will be provided.

Work includes design of the probe mounts, pressure tube routing, electrical connections, and cable routing; procurement of probes, tubing, mounting materials, electrical supplies, and IEEE-488 equipment; installation of the FRS, probes, tubing, mounts, electrical connections, IEEE-488 equipment, and Mach number computation software; testing of hardware and software; documentation of tests, evaluation, operation, and maintenance.

Part 2 Requirements

2.1 General

2.1.1 The Contractor shall furnish all labor, materials, equipment, services, and operations necessary to design, furnish, install, test, evaluate, and document the MNMS.

2.1.2 The Contractor shall integrate reliability, productivity, maintainability, safety, and other such efforts into the total engineering effort to meet cost, schedule, and technical performance objectives.

2.1.3 Procedures and Standards. The Contractor shall perform work in accordance with the following procedures and standards, as a minimum:

- NASA Facilities Engineering Handbook, NHB 7230.1B
- Langley Facilities System Safety Analysis and Configuration Management Handbook, LHB 1740.4.
- Wind-Tunnel Model Systems Criteria, LHB 1710.15
- Human Engineering Design Criteria, MIL-STD-1472
- NASA Software Documentation Standard, NASA-STD-2100-91

2.1.4 Applicable Codes. The Contractor shall perform work in accordance with the following codes:

- Institute of Electrical and Electronic Engineers (IEEE)
- National Electrical Manufacturer's Association (NEMA)
- National Fire Protection Association (NEPA)
- National Electrical Code (NEC)
- Instrumentation Society of America (ISA)
- American Society of Mechanical Engineers (ASME) Pressure Vessel Code, section 8.

2.1.5 Safety. The Contractor shall perform on-site work in accordance with Langley Safety Requirements and the approved NAS1-20001 Safety Plan.

2.1.6 Quality Assurance. The Contractor shall provide products and perform work in accordance with the ***NTF Productivity Enhancements Project Safety/Facility Assurance Plan.***

2.2 Design

2.2.1 The Contractor shall perform design of the following:

1. FRS and enclosure layout, arrangement, and installation;
2. FRS tunnel interface equipment layout, connections, and installation including probes, tubing, mounts, and related materials;
3. FRS electrical interface layout, arrangement, and installation:
4. IEEE-488 interface layout, arrangement, and installation;
5. Microcomputer control system A board layout, connections, and installation.

2.2.2 The Contractor shall perform a stress analysis of MNMS elements inside the tunnel, including (but not limited to) probes, tubing, and mounts.

2.2.3 The Contractor shall generate new drawings necessary to represent the design, including (but not limited to) system layout, equipment location and arrangement, wiring, cable routing and connections, and parts lists.

2.2.4 The Contractor shall redline facility baseline drawings affected by installation.

2.2.5 Tunnel shell penetrations shall not exceed 1/4-inch diameter and shall not void the pressure vessel certification.

2.2.6 Materials and equipment which will be installed inside the tunnel must be certified for performance or operation in a cryogenic environment.

2.2.7 Materials and equipment which will be installed inside the tunnel shall comply with applicable requirements stated in LHB 1710.15, *Wind-Tunnel Model Systems* ***Criteria.***

2.3 Procurement

Subsequent to design approval by NASA:

2.3.1 The Contractor shall procure all materials necessary to interface the FRS to the tunnel shell and interior.

2.3.2 The Contractor shall procure all materials necessary to enclose the FRS and supply power from facility electrical systems.

2.3.3 The Contractor shall procure a Multibus II compatible IEEE-488 board (or VME board and Multibus II adapter), cables, extenders, and necessary materials to interface microcomputer control system A with the FRS.

2.4 Installation

2.4.1 The Contractor shall install the FRS and all supporting equipment and materials required to interface with the tunnel shell and interior.

2.4.2 The Contractor shall install all materials necessary to supply power to the FRS from facility electrical systems.

2.4.3 The Contractor shall install all IEEE-488 equipment and cabling necessary to interface microcomputer control system A with the FRS.

2.4.4 Penetration of the tunnel shell and installation of probes, pressure tubing, and mounting equipment shall be performed in accordance with applicable procedures and standards.

2.5 Site Work

2.5.1 The Contractor shall provide written notification of any planned utility power outages to the Facility Coordinator at least 24 hours in advance.

2.5.2 The contractor shall maintain an up-to-date set of drawings on site at all times. These redlined drawings shall show any deviations or detailing required.

2.6 Testing

2.6.1 The Contractor shall develop a test procedure which is necessary and sufficient to verify functionality and validate the design of the MNMS.

2.6.2 Based on the test procedure, the Contractor shall conduct a bench test of the MNMS prior to installation. Elements of the test procedure which cannot be readily accomplished in a bench test environment shall be identified by the Contractor.

2.6.3 Based on the test procedure, the Contractor shall conduct a site test of the MNMS following installation.

2.7 Manuals

2.7.1 The Contractor shall supply a supplement to the Software Maintenance Manual which describes the IEEE-488 interface and Mach number computation software. This manual shall include the following information, at a minimum:

1. purpose / description of each source file;
2. purpose / description of each task or program unit;
3. description of requirements for execution of a task or program unit, including (but not limited to) system environment variables, input files, output files, priority, semaphores, events, etc.;
4. hierarchical relationship of subroutines in a task or program unit;
5. description of interfaces between tasks or program units;
6. identity and usage of each file required to generate each task or program unit.

2.7.2 The Contractor shall provide an Operation Manual which describes the as-built operation of the MNMS.

2.8 Evaluation

2.8.1 The Contractor shall develop an **evaluation plan** to assess short-term performance of the MNMS compared to the existing Ruska-based system, based on criteria including data quality, reliability, and timing.

2.8.2 The Contractor shall evaluate short-term operational performance of the MNMS in accordance with the **evaluation plan.**

2.8.3 The Contractor shall provide an **evaluation report** which describes the short-term operational performance of the MNMS.

Part 3 Schedule

3.1 The work described herein shall be accomplished such that subsequent milestones of the NASA-developed Controls Integration work package schedule are satisfied.

3.2 The Contractor shall participate in an informal 50% design review to be convened at Langley Research Center.

3.3 The Contractor shall submit project documentation for review and/or approval as indicated in Table 1:

Submittal	Due
Progress schedule	Weekly
Drawings	50%: 15 calendar days before design review Installation: 30 calendar days before start As-built: At completion of site work
Stress analysis report	15 calendar davs before desian review
Presentation materials	15 calendar days before design review
Test procedure	Draft: 15 calendar days before applicable test Final: Before applicable test
Test report(s)	Within 10 calendar davs of applicable test.
Evaluation plan	Prior to start of site work
Evaluation report	10 calendar days before task completion
Software Maintenance Manual	Draft: 15 calendar days before task completion Final: At task completion
Operation Manual	Draft: 15 calendar days before task completion Final: At task completion

Table 1 - Submittal Schedule

Part 4 Government Furnished items

Upon request, NASA make available to the Contractor, existing drawings, sketches, plans, layouts, rough drafts or special requirements, justification, and costs that may be related to this project. This information shall be used as guide material only, as it is primarily schematic in nature and may not represent actual field conditions. Critical information shall be determined from field investigation.

NASA will furnish, upon request, a copy of the following documents:

- Facility baseline documents
- Facility reference documents
- Applicable NTF Productivity Enhancements Project documents
- LHB 1710.15
- NASA-STD-2100-91

NASA will furnish the following items:

- PSI 8400 series flow reference system
- Flow angularity probe
- IEEE-488 interface software
- Mach number computation software

Part 5 Deliverables

Deliverables shall be sent to the office of the Contracting Officer's Technical Representative, accompanied by the Technical Submittal Form approved for use under contract NAS1-20001.

- Engineering Review presentation materials (10 copies)

- Redlined markups of existing drawings (Working original plus 5 copies)

- As-built version of project design drawings/sketches on paper media, not to exceed standard D-size format (Original plus 5 copies) and on electronic media, using AutoCAD® Release 11 or 12 format on 3.5 inch MS-DOS@format disks (1 copy).

- Items procured by the Contractor specifically for this project which do not become a permanent part of the facility, including (but not limited to): hardware; commercial software products; vendor-supplied operation, maintenance, and technical documentation.

- Contractor-developed application, test, diagnostic, or utility program software products (if any), consisting of: source code (including header files, configuration files, and all other similar files), build procedures, and executable programs supplied on 3.5 inch MS-DOS@format disks or other NASA-approved media.

- Software Maintenance Manual in hardcopy form (original plus 5 copies) and on electronic media using Microsoft Word / Excel / PowerPoint® format on 3.5 inch MS-DOS@format disks (1 copy)

- Operation Manual in hardcopy form (original plus 5 copies) and on electronic media using Microsoft Word / Excel / PowerPoint® format on 3.5 inch MS-DOS® format disks (1 copy)

- Plans, procedures, and reports

- Schedules

TASK 7

REPLACE PROGRAMMABLE LOGIC CONTROLLER SYSTEM FOR THE NATIONAL TRANSONIC FACILITY

Statement of Work for Fabrication of the Replacement Programmable Logic Controller System NTF Productivity Enhancements Project (FY94) Controls Interlocks Integration Work Package

Part 1 Scope and Description

A Replacement PLC System shall be fabricated in support of the following Construction of Facilities project:

1994 NTF Productivity Enhancements Project (1236)

The Replacement PLC System shall include four (4) Allen-Bradley PLC-5 Programmable Logic Controllers (PLCs) and the exact number of Allen-Bradley Flex-I/O discrete input modules and digital output modules as previously identified by the ASE-Fluidyne Preliminary Engineering Assessment. The Replacement PLC System shall include two (2) 19" wide racks to house the Replacement PLC system and two (2) Hoffman enclosures to house the remote I/O modules located in the control room for the NTF (room 220 of building 1236.) The Replacement PLC System shall include two (2) programming-monitoring-control (PMC) stations.

Part 2 Requirements

The Contractor shall fabricate the Replacement PLC System in accordance with the requirements determined during the ASE-Fluidyne Preliminary Engineering Assessment.

The Contractor shall fabricate the Replacement PLC System in accordance with the following requirements:

2.1 The fabrication shall be complete prior to March 1, 1996

2.2 The factory test shall verify proper operation of the fabricated system.

2.3 The fabricated system shall be delivered to NASA Langley Research Center in Hampton, Virginia prior to April 1, 1996.

2.4 The Contractor shall not procure any Replacement PLC System components before completion of the NASA CoDR, scheduled for August 15, 1995 and subsequent written notification to proceed with the procurement.

2.5 The Contractor shall assemble three (3) of the four (4) PLC-5 racks and one (1) of the PMC stations in the two (2) 19 inch cabinets.

2.6 The Contractor shall assemble all field-box I/O modules on the field-box panels, as identified by the Preliminary Engineering Assessment.

2.7 The Contractor shall assemble all control-room I/O in the Hoffman enclosures, as identified by the Preliminary Engineering Assessment.

2.8 The Contractor shall factory test the Replacement PLC System with temporary Local Area Network (LAN) cables cut to the same dimensions as the permanent LAN cables installed in the NTF.

2.9 The Contractor shall ship directly to NASA Langley Research Center the off-line development PLC-5 system, one (1) PMC station and all software packages upon receipt.

2.10 The factory test shall verify communications between all three PLC-5s with all assembled I/O modules.
2.11 The factory test shall also verify communication between the off-line development system and the remaining I/O modules.
2.12 The Contractor shall ship the assembled Replacement PLC System to NASA Langley Research Center upon successful completion of the factory test as witnessed by a Government representative,

The Contractor shall furnish all labor, materials, equipment, services, and operations necessary to fabricate, factory test, and ship the Replacement PLC System for the NTF.

The Contractor shall integrate reliability, productivity, maintainability, safety, and other such efforts into the total engineering effort to meet the technical performance objectives as identified in the Preliminary Engineering Assessment.

Part **3** Schedule

The work described herein shall be delivered in completed, final **form** within **240** days of the acceptance of the task but no later than April 1, 1996. See attached task schedule.

The Government reserves the right to have a representative continually review the work as the task progresses. The Contractor shall cooperate fully and make sufficient information available to evaluate progress toward completion of the task.

The Contractor shall plan to conduct telephone conferences with Government representatives at least every ten (10) working days during the duration of the task to discuss progress. The Contractor shall provide to the Government, prior to the telephone conferences, a written agenda and a list of the major points to be covered during the telephone conference.

Part 4 Government Furnished Items

Upon request, the Government will make available to the Contractor, existing drawings, sketches, plans, layouts, rough drafts or special requirements, justification, and costs that may be related to this project. This information shall be used as guide material only, as it is primarily schematic in nature and may not represent actual field conditions. All critical information shall be determined from field investigation.

The Government will furnish, upon request, a copy of the following documents:
- Facility baseline documents
- Facility reference documents

Part **5** Deliverables

The Contractor shall deliver the following items:
5.1 Detailed Factory Test Plan for the selected Replacement PLC System in hardcopy form and on electronic media (submitted to the Government at least 30 days prior to the scheduled Factory Test)
5.2 Detailed Factory Test Report stating the results, within 10 working days of the successful completion, of the Factory Test
5.3 Detailed Cost breakouts of all Replacement PLC system components in hardcopy form and on electronic media within **2** working days of placing the order for any and **all** components
5.4 Design drawings/sketches on paper media, not to exceed standard D-size format and on electronic media
5.5 Assembled Replacement PLC System (as described in 2.5, 2.6, and 2.7) after successful completion of the Factory Test on or before April 1, 1996
5.6 Two **(2)** Programming-Monitoring-Control Stations as described in Section **2**

5.7 Programming Software Packages as described in Section 2
5.8 Training, by Allen-Bradley instructors, scheduled for two (2) one-week training sessions to be held at NASA Langley Research Center, the first session on or before October 14, 1995 and the second on or before March 15, 1997

Deliverables shall be sent to the office of the Contracting Officer's Technical Representative, accompanied by the Technical Submittal Form approved for use under contract NAS1-20001. All electronic media submittals shall be in Microsoft Word / Excel / PowerPoint / Project® format or AutoCAD® Release 11 (or later) format on 3.5 inch MS-DOS® high density format disks (1 copy). All hardcopy submittals shall be the original, plus 5 copies.

TASK 8

PERFORM CONTROL SYSTEM DESIGN FOR THE 14 X 22 SUBSONIC WIND TUNNEL

Statement of Work
for the Design of the
14 x 22 Subsonic Wind Tunnel Control System (FY'98)
Modification 3
Revision Summary

Part 1 Scope and Description
- Added full software scope
- Added PLC system

Part 2.3 Construction Schedule and Cost Estimate - changed final date

Part 2.5 Drawings
- Added 60% date; changed other dates
- Added PLC dates

Part 2.7 Identify candidate hardware - Changed date; added PLC hardware

Part 2.8 Develop preliminary test plan - Changed date

Part 2.9 Develop display screen based on DesignDay - NEW

Part 2.10 Software implementation plan - NEW

Part 2.11 Software specification - NEW

Part 2.12 PLC Specification - NEW

Part 3 Design schedule/Estimate
- Added 60% review
- Added 90% drawing package due date; changed other dates
- Added Phase 4

Statement of **Work**
for the Design of the
14 x 22 Subsonic Wind Tunnel Control System (FY'98)

Part 1 Scope **and** Description

A final design for the upgrade of the 14 x 22 SWT control systems shall be done in support **of** the following Construction **of** Facilities project:

1998 Upgrade Project for the 14 X **22** Foot Subsonic Tunnel

The design shall fully define and document a control system specification. The control system shall operate the tunnel drive, the model propulsion air, the **MG** sets, the boundary layer, the new cart #7 model attitude, and existing cart #2 model attitude. The modifications to the control system consist of the replacement of the obsolete computer equipment with a new **VXI** based system. **All** existing computer hardware and software, control panels, display terminals and associated equipment shall be replaced. Antiquated hardware interlock logic will be replaced by a PLC system and associated logic programming. **All** other components of the control system shall remain. These other components consist of all equipment external to the control room. They include motors, gear drives, sensors, feedback devices, and wiring/cabling. The Contractor will be responsible for all software development and installation, and will participate in the checkout of the softwarelhardware during the testing phase.

For a more complete description of the project see the Requirements and Criteria Document.

Part 2 RequirementslDeliverables

1. Develop Control Block Diagrams
The Contractor shall develop a control block diagram(s) for the tunnel drive, the MG sets, the boundary layer, the new cart #7 model attitude controls, the existing cart #2 model attitude controls, and model propulsion air. There is a description of each system in the Requirements and Criteria Document. Contractor developed control block diagram(s) shall indicate all system components and signals transmitted between components. These diagram(s) shall also show all interfaces to external components such as manual controls, interlocks, and limit switches. The Contractor shall use at least one drawing per system. **All** drawings shall be on D sized sheets.

Required date: April 30, 1996

2. Develop a Control Scheme
The Contractor shall develop a control scheme that will identify all control loops. This control scheme shall **also** include all loop interactions, signal levels/types, engineering units (range), and timing. The Contractor shall confirm the existence of a device list. If there is not a list, the Contractor shall develop one for all devices used in the above mentioned control systems.

Required date: April 30, 1996

3, Construction schedule and cost estimate
The Contractor shall develop a proposed construction schedule. This construction schedule shall include all major milestones such as start date, tunnel shutdown, installation, testing, and checkout. The cost estimate shall be detailed and include all markups and fees. Attached is **a** preliminary statement of work for construction to be used as a guideline for costing and scheduling.

Preliminary required date: March 15, 1996
Final required date: February 7, 1997

4. Design requirements verification
The Contractor shall verify that the existing external components are capable of meeting all design requirements as stated in the requirements and criteria document. Any external components that do not meet the design requirements shall be identified and their existing capabilities defined.

Required date: August 1, 1996

5. Drawings
The Contractor shall deliver a complete set of drawings required for construction. This includes, but is not limited to, control room layout, control console arrangement, wiring diagrams, system schematics, control console/panels wiring/cabling, and field wiring interface. The Contractor shall also deliver all required redlined drawings.

30% Required date: October **22, 1996**
60% Required date: January 15, 1997
90% Required date: February 20, **1997**
Final Required date: April 1, 1997

For PLC-related drawings:

30% Required date: February 7, 1997
60% Required date: April **4,** 1997
90% Required date: May 16, 1997
Final Required date: June 20, 1997

6. Preliminary operations manual
The Contractor shall develop a preliminary operations manual. This operations manual shall include instructions for starting, operating and shutting down all systems. This includes the tunnel drive, the MG sets, the boundary layer, new cart #7 model attitude controls, existing #2 model attitude controls, and model propulsion air. It shall also include troubleshooting, calibration, and any required maintenance schedule.

Required date: March 15, 1997

7. Identify candidate hardware
The Contractor shall identify and submit a list of proposed hardware for a complete control system including the VXI crate and boards, and PLC system including chassis, boards, and remote I/O. Also any external connectors, terminal boards, cabling, test or development equipment shall be included. NASA shall approve all hardware selections.

Required date: February 7, 1997

8. Develop preliminary test plan
The Contractor shall develop a preliminary test plan. This plan should include, but is not limited to, the following items:
- Approach to verification and validation of control systems
- Facility support required
- Special testing needs

Required date: February 7, 1997

9. Develop display screens based on Automated Controls Design Day - October 9, 1996
The Contractor shall integrate preliminary display screens with the standard layout developed at the Design Day.

Required preliminary date: February 7,1997
Required final date: May 2,1997

10. Develop a software implementation plan

The Contractor shall develop a software implementation plan. The following shall also be included: number or programmers, types and number of development systems, owner of development systems, software packages to be used, software/hardware integration approach, and a preliminary detailed software development schedule.

Required date: February 7, 1997

11. Software Specification

The Contractor shall develop a software specification which conforms to the style and contents of the ***NASA Software Documentation Standard, Software Engineering Program,*** NASA-STD-2100-91. **This** specification shall include, as a minimum, the following items:

- Architectural diagrams / descriptions
- Module descriptions
- Data flow diagrams
- Pseudo code or equivalent (as applicable)

Required preliminary date: February 7, 1997
Required final date: May 2, 1997

12. PLC Specification

The Contractor shall develop a PLC specification with respect to the following systems: tunnel drive, the MG sets, the boundary layer, the new cart #7 model attitude controls, the existing cart #2 model attitude controls, and model propulsion air. This specification shall conform to the style and contents of the ***NASA Software Documentation Standard,*** *Software Engineering* ***Program,*** NASA-STD-2100-91 and shall include, as a minimum, the following items:

- Architectural diagrams / descriptions
- Logic diagrams
- Input / output signal list

Preliminary required date: February 7, 1997
Final required date: May 2, 1997

Deliverables

All deliverables shall be sent to the office of the Contracting Officer's Technical Representative, accompanied by the Technical Submittal Form approved for use under contract NASI-20001. **All** electronic media submittals shall be in the Microsoft Word/Excel/PowerPoint/Project format or AutoCAD Release 11 (or later) format on 3.5 inch MS-DOS high density format disks. All hardcopy submittals shall be the original, plus 2 copies

Part 3 Design Schedule/Estimate

The required delivery dates are listed in the requirement's section. The Contractor shall participate in the preliminary and final design reviews. There may be other informal reviews as required to validate Contractor's progress.

Preliminary design review package due: May 24, 1996
Preliminary design review: May 31, 1996
60% design review package due: October 16, 1997
60% design review: October 23, 1996
Final design review package due: February 7, 1997 (30% PLC-related)
Final design review: February 14, 1997
PLC-related Final design review package due: May 23, 1997
PLC-related Final design review: May 30, 1997

The design cost estimate shall be in four phases. There shall be a cost estimate for each phase. The phases are:

Phase 1	Consists of items 1, 2, 3 of Part 2 - Requirements/Deliverables
Phase 2	Consists of items 4 and 5(30%) of Part 2 - Requirements/Deliverables
Phase 3	Consists of items 5(90% and final), 6, 7, and 8 of Part 2 - Requirements/Deliverables
Phase 4	Consists of items 9, 10, 11, and 12 of Part 2 - Requirements/Deliverables

Part 4 Government Furnished Items

Upon request, the Government will make available to the Contractor, existing drawings, sketches, plans, layouts, rough drafts, or special requirements, justification, and cost that may be related to the project. This material shall be used as a guide information only as it is schematic in nature and may not represent actual field conditions. **All** critical information shall be determined from field investigation.

The Government will furnish, upon request, a copy of the following documents:
- Facility baseline drawings
- Facility reference documents

Statement of Work
for the Construction of the
14 x 22 Subsonic Wind Tunnel Control System (FY'98)

Part 1 Scope and Description

A replacement of the control systems shall be done in support of the following Construction of Facilities project:

1998 Upgrade Project for the 14 X 22 - Foot Subsonic Tunnel

The modifications to the control system consist of the replacement of the obsolete computer equipment with a new **VXI** based system and antiquated hardware interlock logic with a **PLC** system. **All** existing computer hardware and software. control panels, display terminals and associated equipment will be replaced. All other components *of* the control system will remain. These other components consist of all equipment external to the control room. This includes motors, gear drives, sensors, feedback devices, and wiring. The Contractor will be responsible for system component procurement, existing equipment removal, and new equipment installation and testing; VXI-based system software including application development, installation, software/hardware integration, testing, and documentation; PLC system ladder logic software development, installation, hardware/software integration, testing, and documentation.

For a more complete description of the project see the requirements and criteria document.

Part 2(A) **RequirementslDeliverables**

1. Procure hardware
The Contractor shall procure all the **VXI** based system and PLC hardware. The Contractor shall also procure all associated hardware such as cabling/wiring, connectors, terminal blocks, signal conditioners, and other miscellaneous parts necessary to make a complete operating system. Also all hardware required to interface *to* existing components such as sensors, motors, and switches shall be procured. All procurements shall be approved by the NASA prior ordering.

Required date: TBD

2. Install Hardware
The Contractor shall install all the **VXI** based system and PLC system hardware. The Contractor shall also install all associated hardware such as cabling/wiring, connectors, terminal blocks, signal conditioners, and other miscellaneous parts necessary to make a complete operating system. Also all hardware required to interface to existing components such as sensors, motors, and switches shall be installed.

Required date: TBD

3. Perform wiring/cabling checks (point to point)
The Contractor shall verify that all new and existing components and all wiring and cabling are installed as per the drawings and the documentation. All checks shall be documented.

Required date: TBD

4. Develop final test plan
The Contractor shall deliver a complete set of test plans to NASA for approval. The test plans shall include point to point, equipment tests, and software/hardware integration test procedures.

Required date: TBD

5. Develop final operations manual

The Contractor shall develop the final operations manual. The operations manual shall include instructions for starting, operating and shutting down all of the control systems. Any safety hazards shall be noted. It shall also include troubleshooting, calibration, and any required maintenance schedule.

Required date: TBD

6. Develop and Configure Control System software

The Contractor shall be responsible for developing all control system software applications including, **but not limited to,** the following:

- operator commands / displays
- manual control
- automatic test sequencing
- on-setpoint status detection
- DAS communications
- controf algorithms
- input / output signal processing
- fault detection and handling

The Contractor shall also be responsible for configuring and calibrating all inputloutput channels. All application software shall be documented, including instructions for reconfiguring the operator displays and modifying the input/output channels (i.e. software maintenance manual).

Required date: TBD

7. Develop and Configure PLC System software

The Contractor shall be responsible for developing all PLC system software including, **but not limited to,** the following:

- safety interlock logic
- discrete input / output signal processing
- analog signal monitoring (as applicable)
- fault detection and handling
- status communications with the control system
- command communications with the control system (as applicable)

The Contractor shall also be responsible for providing a software maintenance manual.

Required date: TBD

8. Conduct site test

The Contractor shall be responsible for ensuring a complete operational system. This shall be done by performing a complete set of tests as described in the Contractor generated, NASA approved test plans. All tests shall be witnessed by NASA and documented by the Contractor. NASA will approve or disapprove all tests. All testing shall be repeated until approved by NASA.

Required date: TBD

9. As-Built Drawings

The Contractor shall deliver a complete, as-built set of all new drawings required for construction. The Contractor shall also deliver all required redlined drawings, marked as-built.

Part 2(B) RequirementsIDeliverables – Post-construction activities

The Contractor shall expect to participate in the following activities as required. These activities shall not be included in the construction cost estimate or in the construction schedule.

1. Support the integrated system testing
2. Support the system shakedown

Part 3 Construction Schedule

There may be other informal reviews as required to validate Contractor's progress.

Tunnel Shutdown: TBD
Installation: TBD
Checkout/Testing: TBD
Site Test: TBD

Part 4 Government Furnished Items

Upon request, the Government will make available to the Contractor, existing drawings, sketches, plans, layouts, rough drafts, or special requirements, justification, and cost that may be related to the project. This material shall be used as a guide information only as it is schematic in nature and may not represent actual field conditions. All critical information shall be determined from field investigation.

The Government will furnish, upon request, a copy of the following documents:

- Facility baseline drawings
- Facility reference documents

ATTACHMENT 4

LIST OF COMPANIES THAT RESPONDED TO THE "SOURCES SOUGHT SYNOPSIS"

AND

DRAFT SOLICITATION

RESPONSES TO SYSTEMS ENGINEERING FOR RESEARCH FACILITIES INTEGRATED SYSTEMS (SERFIS) SOURCES SOUGHT SYNOPSIS

Advex Corporation
121 Floyd Thompson Drive
Hampton, VA 23666-1307
Tel.: (757) 865-0920

Aero Systems Engineering, Inc. (Large Bus.)
358 E. Fillmore Avenue
St. Paul, MN 55327
Tel.: (612) 227-7515

American GNC Corporation
9131 Mason Avenue
Chatsworth, CA 91311
Tel.: (818) 407-0092

Calspan SRL (Large Bus.)
P.O. Box 400
Buffalo, NY 14225
Tel.: (716) 631-6778

Daniel, Mann, Johnson & Mendehall (DMJM) (Large Bus.)
1525 Wilson Boulevard, Suite 1100
Arlington, VA 22209
Tel.: (703) 807-2568

Diversatech, Inc.
110 Boggs Lane, Suite 325
Cincinnati, OH 455246
Tel.: (513) 772-4447

Dynamic Eng., Inc.
703 Middle Ground Boulevard
Newport News, VA 23606
Tel.: (757) 873-1344

Dyn Corp Information & Eng. Tech., Inc.
303 Butler Farm Road, Suite 105
Hampton, VA 23666
Tel.: (757) 865-0223

General Physics Corporation (Large Bus.)
Engineering and Applied Science
6700 Alexander Bell Drive, Suite 400
Columbia, MD 21046
Tel.: (410) 290-2300

Integral Technologies, Inc. (Women-owned/Disadv. SB)
1521 North 37th Street, Suite 299
Orange, TX 77630
Tel.: (409) 886-8442

Keay, Inc. (Small Disadv. Bus.)
150 East Mall Plaza
Carnegie, PA 15106
Tel.: (412) 279-0066

Mainthia Technologies, Inc. (MTI) (8a)
17535 Rosbough Drive, Suite 200
Corporate Center of Middleburg Hts.
Cleveland, OH 44130
Tel.: (216) 816-0202

ManTech Systems Engineering Corporation (Large Bus.)
7501 Forbes Blvd., Suite 207
Seabrook, MD 20706
Tel.: (301) 805-6415

NRE, Inc. (8a) (SDB)
P.O. Box 7036
Oak Ridge, TN 37831
Tel.: (423) 671-3401

NYMA, Inc. (Large Bus.)
7501 Greenway Center Drive, Suite 1200
Greenbelt, MD 20770
Tel.: 9757) 864-5801 (Hampton, VA Office)

Rosenblatt & Son, Inc. (Large Bus.)
813 Diligence Drive, Suite 100
Newport News, VA 23606-4229
Tel.: (757) 873-0611

Sierra Lobo, Inc. (Small Disadv. Bus.)
20525 Homestead Park Drive
Strongsville, OH 44135
Tel.: (440) 891-9128

Sverdrup Technology, Inc. (Large Bus.)
600 William Northern Blvd.
P.O. Box 884
Tullahoma, TN 37388
Tel.: (931) 393-6674

TIW Fabrication & Machining, Inc. (Large Bus.
1255 Old Coor Road, SW
Albuquerque, NM 87121
Tel.: (505) 242-5251

VIGYAN, Inc. (Large Disadv. Bus.)
30 Research Drive
Hampton, VA 23666
Tel.: (757)865-1400

Wyle Laboratories (Large Bus.)
128 Maryland Street
El Segundo, CA 90245
Tel.: (310)563-6720

XL Associates, Inc. (Small Disadv. Bus.)
11300 Rockville Pike, Suite 709
Rockville, MD 20852
Tel.: (301)770-0090

ATTACHMENT 5

SUMMARY **OF** SIGNIFICANT
COMMENTS/QUESTIONS RECEIVED
FROM INDUSTRY
INCLUDING
GOVERNMENT RESPONSES

The following is a list of significant comments/questions received from industry. It is noted that duplicate comments/questions were received and some have been incorporated into a single commentlquestion:

I - Questions regarding the Small Business Subcontracting Goal:

- Section L.10 (Small Business Subcontracting Goal) is both ambitious and will be difficult to achieve. The SDB threshold of 10% is aggressive given the $2.5M size standard threshold and the nature of this procurement

- The contract minimum would set a goal of $10,000 for subcontracts. Contracts this small spaced over 5 years could make delivery by a small contractor difficult. If the Government chooses to fund in excess of the minimum and because the funding by the Government could be variable and at times non-existent, small subcontractors may not be capable of providing the resources for the potential of $380,000 over less than 5 years. These circumstances beyond the control of the NASA could place at risk subcontractor's schedules and cost. Therefore, funding limitations and a variable annual goal amount (by percentage) will make it difficult for small businesses to effectively partner with a prime contractor. Would the Government consider a goal of five percent for SDB participation?

- We believe it is self evident that the prime contractor should perform the architect and engineering services aspect of this procurement. Thus, it would be very difficult for an SDB with less than $2.5M in three year average revenues to demonstrate financial capability on a contract of this magnitude.. We believe the capitalization required to perform this work eclipses a $2.5M SDB size standard. We thus, request that the threshold of 10% include both small and small disadvantaged businesses rather than just SDBs.

- Under Solicitation Provision Section L.15, QEC-4, titled "Approach to Meeting 10% Small Disadvantaged Business (SDB) Participation Goal" the solicitation requests discussion of amount of work in terms of total dollars that will be performed by SDBs. Would this not better be discussed in Volume II, Business Proposal?

- In QEC-4, "Approach to Meeting the 10% Small Disadvantaged Business (SDB) Participation Goal" would typically reside in the business section of our proposal, as part of our Subcontracting Plan contains price information. Would the Government consider moving this requirement to the business section of the proposal? If an SDB's is the prime contractor for this effort, would that team receive a score of "Exceeds Requirements" without having to answer the question?

  Response. NASA is required by statute (Public Laws 101-144, 101-507 and 102-389) to establish annually a goal to make available to small disadvantaged business concerns, Historically Black Colleges and Universities, minority institutions and women-owned small business concerns, at least 8 percent of NASA's procurement dollars under prime contracts or subcontracts awarded in support of authorized programs. NFS 1852.219-76 requires that the contractor assist us in achieving this goal by using its best efforts to award subcontracts to such entities to the fullest extent consistent with efficient contract performance. To achieve this goal the source evaluation team considered these requirements in making the decision to include achievement of an established goal an evaluation factor. We believe this provides motivation for offerors to aggressively pursue subcontracting opportunities with these entities. Questions and comments concerning the draft solicitation's 10% SDB goal were reviewed by the Small Business Specialist at LaRC. Based upon the review the SDB goal has been changed to 8%.

  The Small and Small Disadvantaged Business Subcontracting Plan will be considered part of the contract offer, and should not be included with the response to Volume I, QEC-4 - Offerors Approach to Meeting the 8% Small Disadvantaged Business (SDB) Participation Goal. The response to Volume I, QEC-4 shall be addressed as part of Volume I - Technical Proposal.

An SDB who proposes as a prime must respond to the QEC and will be evaluated according to Section M Clause entitled Method of Evaluation.

2. Questions regarding the SIC Code:

- The Small business size standard for SIC Code 8711 is $2.5M under classification code C-Architect and Engineering Services. Is there another potential *SIC* Code with a corresponding size standard for the team members/subcontractors work other than engineering services?

- The small Business Size Limitation of 2.5 Million and 500 employees is inconsistent with the quoted SIC 8711 (which is $20M annually).

- In reviewing this SIC and associated solicitation provisions, we note that this is a Walsh-Healey acquisition rather than a Service Contract Act acquisition. Therefore, we believe a more appropriate categorization of the size standard under this SIC would be "Military and Aerospace Equipment and Military Weapons" with a size standard of $20.0M since the Government does intend to acquire hardware rather than just services. We believe that this categorization is appropriate and would be beneficial to NASA as it would allow more firms *to* qualify as small businesses thus facilitating NASA meeting its set aside goals. We are thus requesting that NASA modify its size standard from $2.5M to $20.0M for this procurement.

- May a firm who does not qualify as a small business under this SIC, due to their revenues exceeding the size standard, be treated and qualify as an SDB because of their principle ownership makeup? Example a firm with $50M in average revenues during the past 3 years exceeds the size standard but, is woman owned. Would that firm qualify as an SDB?

  Response: The 500 employees referred to in K.9, paragraph (a)(3) of subject solicitation refers to a concern which proposes to furnish a product which it did not itself manufacture. If you refer to Federal Acquisition Regulation (FAR) Subpart 19.102(g), there are three different size standards for the SIC 8711. They are as follows: Engineering Services - $2.5M; Military and Aerospace Equipment and Military Weapons - $20.0M; and Contracts and Subcontracts for Engineering Services Awarded Under the National Energy Policy Act of 1992 - $20.0M. This procurement was reviewed by cognizant technical, contracting, and small business personnel, and it was determined that the size standard of $2.5M is the most appropriate for this procurement. As a result of a market survey advertised on the Internet and the Commerce Business Daily, it was determined that this procurement would be competed under the full and open competitive procedures.

  To help clarify subcontracting with small, small disadvantaged and women-owned business concerns, your attention is directed to FAR Subpart 19.701, which is quoted below:

  "Small business subcontractor" means any concern that –

  In connection with subcontracts of $10,000 or less if, including its affiliates, its number of employees does not exceed 500 persons; and

  In connection with subcontracts exceeding $10,000, if its number of employees or average annual receipts, including its affiliates, does not exceed the size standard under (FAR) section 19.102 for the product or service it is providing on the subcontract."

3. Question: Is the ISO 9001 certification (Third Party Registered) requirement only for prime contractors, or does it apply to team members/major subcontractors as well?

Response: ISO 9001 certification is a requirement for the prime contractor only. Pursuant to H Clause in the solicitation entitled Quality Management System (ISO-9000) Requirements, the Contractor must be certified no later than 12 months after award of the contract.

4. Question: Where can the Offerors Library be found and what additional information is available other than what is provided in the solicitation?

Response: The Offerors Library is contained in the solicitation as Attachment 3. It incorporates eight tasks which are representative of the type of work which will be required under the contract(s). In Section L of the Solicitation there are sources for publications referenced in the solicitation..

5, Question: Are the sample tasks in the Offerors Library an accurate representation of the work breakdown structure required for this contract?

Response: The Offerors Library shows actual statements of work that have been issued through the existing contracts affected by this solicitation. The library shows only a representative sample of the type of the work within the scope of this solicitation. The library serves as a guide to determining the type, quantity, and quality of information that might appear in delivery orders. The Statement of Work, in section C provides an accurate work breakdown structure.

6. Question: Offerors Library: Please provide Attachment A for Task 1 and Task 2. This attachment lists the requirements for the system and, therefore, is required to properly assess man-hour specialties needed for the delivery order.

Response: The solicitation now includes Attachment A for Task 1 and 2.

7. Question: Offerors Library: Additional information and descriptions are required for the design and construction requirements for Task 3 to assess man-hour specialties needed for the delivery order.

Response: The solicitation now includes the requirements corresponding to Task 3.

8. Question: How will the Government determine whether a particular delivery order is FFP or CPFF?

Response : Delivery orders will be awarded on a firm fixed price basis when the Government has reasonably definite functional or detailed specifications and when the Contracting Officer can establish fair and reasonable prices at the outset. Cost plus fixed fee delivery orders will be used only when uncertainties involved in contract performance do not permit costs to be estimated with sufficient accuracy to use fixed price delivery orders. Contractor tasks such as special studies and reports, requirements definition and analysis, preliminary engineering reports and designs may be CPFF and Contractor tasks such as development, installation, system integration and activation, and maintenance would typically be FFP.

9. Question: Has the Government considered any cost or fee incentives to the contractor for timely completion of work?

Response: The Government will consider incentives on an individual delivery order basis.

10. Question: Are there any penalties to the contractor for late deliveries or delays?

Response: Individual delivery orders may include a deduction schedule for late deliveries.

Section I clause entitled Liquidated Damages - Supplies, Services, or Research and Development will be utilized on an individual delivery order basis.

11. Question: For evaluation purposes, please identify the Government's expected weights between engineering, fabrication, installation, etc.

Response: The actual percentages among the types of contractor tasks (design, development, fabrication, installation, etc.) will vary depending on the nature, size, and duration of a particular delivery order. This can be seen by examining the type of work presented in the Offerors Library and sample DO. For evaluation purposes, the Offerors determination of weights and their supporting rationale for these efforts will be used in the evaluation of their understanding of the work. Refer to L.15.D.1.c.(1)(b) regarding development of skill mix by extrapolation from the eight representative tasks in the Offerors Library and the sample DO.

12. Question: Solicitation Provision M.4 titled "Relative Importance of Qualitative Merit (QEC's), Cost/Price and REPP" states that qualitative merit (QEC's) relevant experience and past performance will be essentially of equal importance. Since there are several QEC's, will certain individual QEC's be weighted more heavily than others? If so, please identify the relative weights of the QEC's or the order of priority

Response: Factor 1 entitled Qualitative Merit includes the following QECs: Understanding the Requirements and Approach, Adequacy of Resources, Management and Operations, Approach to Meeting the 8% Small Disadvantaged Business Participation Goal and ISO 9000 Compliance Plan. Strengths and weaknesses will be developed for each QEC and an adjective rating will be assigned to each QEC (See Provision M-2). The QECs are not weighted or scored.

13. Question: In order to develop the required matrix (Reference Section L Provision entitled Proposal Preparation and Submission – Special Instructions Subparagraph C.1.b. entitled Adequacy of Resources) of all technical specialties and skill levels, please define the relative weights between 1) Mechanical Equipment and Systems 2) Fluid Systems and Components, and 3) Facility Automation Systems.

Response: Based on historical data, the weights for Mechanical Equipment and Systems, Fluid Systems and Components, and Facility Automation Systems will be approximately equal.

14. Question: The sample Delivery Order assumptions included that material and fabrication costs are treated as ODC costs. Are we to assume that the hours referred in the QEC b. (the Government understands this to be Subpart B to QEC 1) and the cost proposal are only engineering hours, or are the fabrication hours included as well?

Response: Cost information requested for the sample delivery order is applicable only to QEC-1 (Understanding the Requirements and Approach) in order that an Offeror's technical approach can be properly evaluated. Cost information requested for the Business Proposal should include the costs for all skills required to accomplish delivery orders throughout an entire contract and is not applicable to nor inclusive of QEC cost information.

15. Question: To better assist the Government in assessing the offerors capabilities, we suggest that the Government request the inclusion of resumes of Key Personnel, limiting each resume to *two* pages and excluding them from the page count as an attachment to Volume I - Technical Proposal.

Response: Since the requirements of this procurement are set forth in performance based specification, NASA is concerned about the work to be performed and not on individual qualifications of key personnel. NASA will evaluate the relevant experience and past performance of the company as a whole.

16. Question: Does the Government have a suggested breakdown between labor categories of the direct labor hours/estimated material costs or can the sample task be assumed to be consistent with the overall effort?

    Response: Refer to L.15, D.1.c. For proposal purposes only, 55,000 direct labor hours and $2,500,000 of materials will be required annually. NASA chooses not to identify a breakdown among labor categories because this might impose limitations on the technical approach of individual Offerors. The skill mix shall be extrapolated from the eight representative tasks set forth in the Offerors Library and the sample DO.

17. Question: Will or can the labor categories be expanded to include, (but not be limited to), welder, fitter, machinist, nondestructive testing personnel?

    Response: No. The labor categories were chosen to provide a common basis upon which to conduct the price/cost analysis. Provision L.15 entitled Proposal Preparation and Submission --Special instructions, Subpart D.l.c.(3) allows the Offeror to use the labor categories it determines are needed but to relate them to any of the four categories in **(b)** for evaluation consistency.

18. Question: Would the cost data required to be submitted using Lotus 123 be acceptable using Excel?

    Response: Yes, as Lotus 1-2-3 will translate Excel.

19. Question: Business Proposal, Section C(3) requires that contractor discuss how personnel skills and labor rates are appropriate for equipment used. Will all Offerors be required to address all phases of contractor efforts to include design, engineering, fabrication and installation?

    Response: Provision L.15 entitled Proposal Preparation and Submission --Special Instructions, Subpart D.l.c.(3) does not require any specific comparisons. In sentences 3 and 4, (1) and (2) are examples, not requirements. Discuss your company's comparison to industry and the effects on your proposal. Discuss in the depth you determine necessary why your proposed costs may not be in line with other Offerors.

20. Question: Under Solicitation Provision L.15.D.1c.(1).c titled "Price and Cost Detail instructions"), NASA specifies four basic labor categories for prospective contractors to price. We believe it would be beneficial to provide a lower level breakdown of the skills and associated man-hours anticipated under this procurement in order to conduct a fair and reasonable cost evaluation for prospective offerors. Otherwise, we believe that the various offerors will propose subjective varying skill mixes based upon their guess of work content and skill requirements because the detailed scope of individual delivery orders is not known at this time. Will NASA consider providing a further breakdown to facilitate a fair and reasonable cost evaluation?

    Response: See 16 and 17 above.

21. Question: What is the anticipated number of contracts resulting from this solicitation?

    Response: The Government anticipates the award of two or three contracts.

22. Question: Is there a guaranteed minimum dollar amount for each contract awardee?

    Response: Each awardee will have a guaranteed minimum of $25,000 for the 5-year period of performance. (Reference Clause B.2 entitled Indefinite Delivery Contract.) It is noted that this is a change from the draft solicitation.

23. Question: What is a typical period of performance of a DO?

    Response: There is no typical period of performance for delivery orders.

24. Question: Section C, Part I, Para. 2.0, states that all drawings shall be generated using AutoCAD. Later PROEngineer is referenced. Is contractor restricted to using these programs? There are various programs that accomplish the same thing (such as using ANSYS for finite element analysis versus NASRAN).

    Response: The solicitation has been amended such that computer-generated drawings must be provided in AutoCAD release 14 or later format. The software applications used to perform specialized analyses and designs must be translatable to the respective formats of the applications indicated in the solicitation.

25. Question: What type of DOs will be performed on-site?

    Response: It is expected that on-site activities will be required for delivery orders that involve site investigation, progress or design reviews, some fabrication, installation, integration, testing, activation, maintenance, and troubleshooting/repair issues.

26. Question: Is the contractor required to have local facilities (near LaRC)?

    Response: No.

27. Question: This solicitation looks like an excellent opportunity for a small disadvantaged business. We are an 8(a) company and are capable of performing this type of contract, along with our subcontractors. Is there any way for this solicitation to be considered under the 8(a) program?

    Response: Seventeen responses were received from the sources sought synopsis which was published October 30, 1997. These responses were evaluated and based upon the results, it was determined to be in the Government's best interest to solicit proposals on a full and open competitive basis.

28. Question: Sample Delivery Order: Some of the technical requirements appear inconsistent with reality. You may wish to be more explicit with the sample task in the solicitation (or maybe this is the point in determining the contractors understanding of the requirement). In any case a 2 foot long model sting weighing 5000 pounds (made of steel, it would be roughly 2 feet wide), and dynamic floor loading of 50 pounds per square foot to support an 85,000 pound rolling cart don't appear to be realistic parameters for a reasonably priced task product.

    Currently, the highest cost and technical risk is a poor task specification. Major missing parameters are cart power source, mobility features, acceptable aerodynamic properties of the model support system with the tunnel, pressure sealing of the cart with the tunnel, and instrumentation requirements and data transmission features, amongst others.

    Response: The sample delivery order in the solicitation has been amended.

29. Question: Sample Delivery Order: Under Solicitation Provision Section L.15,C, 1, a, 1, C, b & c, the solicitation requests direct labor hours and costs by skill, and a summary of cost estimate which includes indirect costs, other costs, and a 6% fixed fee as a part of the Sample Delivery Order. How should this information be covered in Volume I, or should it be included in Volume II, the Business Proposal?

Response: Refer to Item 14. Provision L.15 entitled Proposal Preparation and Submission - Special Instructions. subparagraph B.1.(c) has been changed to reflect the appropriate instructions.

30. Question: Does the Government intend for offerors to exclude all cost information from the Technical Proposal? Section L.15.C.1.C.1 of the draft RFP requires cost information to be included in the Technical Proposal as part of the response to the sample delivery order. Specifically, it requests a projection of direct labor hours and costs by skill and a summary cost estimate which includes indirect costs, other costs, and a 6% fixed fee. Also, Section L.15.C.1.C.2 of the draft RFP requests cost information as part of the Technical Proposal as it states: **Describe** your approach to cost estimating. What percentage of the time are your estimates within budget?

Response: Refer to Item 14. The request to describe the approach to cost estimates does not require any cost information.

31. Question: Under Solicitation Provision C.1, Part 1, Section 2.0 titled "Standards and Constraints," what version of AutoCAD is *the* government requiring, or will any 3-D CAD software for the drawings be acceptable?

Response: Since NASA expects to upgrade to AutoCAD release 14 in early **1998,** the solicitation has been amended such that computer-generated drawings must be provided in AutoCAD release 14 or later format.

32. Question: Under Draft Solicitation Provision **L.13,** Note, last sentence, there is mention of award fee determination. There is no other discussion found of award fee in the solicitation. will there be award fee determinations?

Response: The solicitation has been corrected to delete all mention of award fee determinations.

33. Question: The Government has specified in Provision L.15.B.1 a type size no smaller than 12 characters per inch (12 cpi) type. Because the draft RFP is not presented in **12** cpi nor in a consistent type face, we request further specification. Typefaces used on typewriters are generally measured in terms of characters per inch, while computer (electronic) type faces are measured in terms of point sizes (e.g., 12 point) and have proportional spacing. Since most proposals are prepared using computers, would the Government consider specifying the type size in terms of point size rather than characters per inch? To ensure that the proposal text size limitations are not circumvented through use of proportional type faces, the Government could also specify the standard type face to be used (e.g., Times or Times New Roman).

Response: NASA agrees with the comment and is in the process of formally changing the provision. The provisions currently states '...using not smaller than 12 characters per inch (or equivalent) type." For proposal preparation purposes, the Offeror should base an equivalent type size for electronic generated documents as being no smaller than 12 points.

34. Question: In the evaluation of relevant experience and past performance, which area is expected to have a higher or lower weight between engineering, development, installation, system integration and activation, and maintenance?

Response: Relevant experience and past performance will be evaluated collectively based upon the Offerors experience and ability to provide systems engineering of mechanical, fluid, and automation systems for research facilities. Activities such as design, development, installation, system integration and activation, and maintenance collectively represent systems engineering.