NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER A-1 (Revision L) **DATE** 6/30/97

1. **TASK TITLE:** Contract Management

2. **DESCRIPTION:** This is a sustaining work order to cover CALSPAN management of the contract.

3. **REQUIREMENTS:**

1. Provide overall contract and technical management for all required work.
2. Insure preparation and timely submittal of all reports, documents or other data.

4. **GUIDELINES:** Required written reports and periodic oral reports to facility management personnel.

5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97,

LEVEL OF EFFORT 12 man-months

Receipt Acknowledged:

George Boyles 6-30-97
COTR

C. Catalanotto 6-30-97
CALSPAN

NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER B-1 (Revision M) **DATE** 6/30/97

1. **TASK TITLE:** Plant Systems Coordination and Support

2. **DESCRIPTION:** This is a sustaining work order which includes coordination and support tasks for NTF Plant Systems.

3. **REQUIREMENTS:**

1. Operate and/or perform routine maintenance on NTF auxiliary equipment and systems per NTF procedures.
2. Perform daily, monthly, yearly, etc. maintenance as required.
3. Inspect/repair internal tunnel components as assigned.
4. Provide qualified escort and surveillance of personnel working in hazardous areas not trained in safety hazards.
5. Develop/modify operations and maintenance procedures.
6. Provide replacement parts procurement/restocking, tool crib monitoring/restocking for Plant and Plant Electrical/facility lock-up.
7. Develop and maintain a system for internal work control, scheduling, and spare parts inventory management.
8. Maintain a viable safety program.
9. Provide in-shop fabrication as required.
10. Perform housekeeping tasks to insure a safe, hazard free work place.
11. Perform training to certify/recertify technicians and maintain continuity resulting from equipment/system changes.
12. Provide qualified personnel to monitor the cryo chamber during cooldown/warmup.
13. Provide mechanical support for the tunnel model video system.
14. Perform daily operational checks of the projection equipment.

4. **GUIDELINES:**

5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97,

LEVEL OF EFFORT 51 man-months

Thomas E. Deans 6/30/97
Technical Monitor
(T. Deans)

George Boyles 6-30-97
COTR

Receipt Acknowledged:

C. Catalanotto 6-30-97
CALSPAN

NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER C-1 (Revision L) **DATE** 6/30/97

1. **TASK TITLE:** Oxygen Monitoring System Operation and Maintenance

2. **DESCRIPTION:** Maintain, calibrate and configure oxygen monitoring equipment in the Building 1236 complex, Building 1241, Building 1235 and Building 1242.

3. **REQUIREMENTS:**

1. Perform periodic inspections as detailed by applicable MIPs.
2. Perform routine maintenance as prescribed by applicable PMPs.
3. Initiate repairs as necessary to maintain system operation.
4. Order spare parts and maintain an inventory sufficient to insure continuous system operation.
5. Configure the system as directed by TTRs.
6. Inform facility personnel of any deficiency in system status.
7. Maintain a trained and responsive emergency team.

4. **GUIDELINES:**

1. Perform inspection and maintenance in a timely manner.
2. Minimize system downtime due to equipment failure.

5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97,

LEVEL OF EFFORT 3 man-months

Thomas E. Deans 6/30/97
Technical Monitor
(T. Deans)

George Boyle Jr 6-30-97
COTR

Receipt Acknowledged:

C. Catalanotto 6-30-97
CALSPAN

NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER D-3 (Revision M) **DATE** 6/30/97

1. **TASK TITLE:** NTF Multivendor System Software Maintenance and System Administration.
2. **DESCRIPTION:** Provide system administration, software support and technical management pertaining to computer software for all computers used for support of tunnel operation, acquiring of research data, and data reduction.
3. **REQUIREMENTS:**
   1. Provide system administration services including maintaining of system configuration, user accounts, security, network, vendor software and file structure.
   2. Provide backup and recovery procedures in order to protect the integrity of the system.
   3. Implementation of software required by TTR.
   4. Provide software modifications and corrections as required by TTR.
   5. Provide system level support for problem resolution as required by TTR/PFR.
   6. Provide for installation of all software using NTF configuration control procedures.
   7. Provide coordination with RFB computer system administrator to provide methods for enhancing test data distribution to research engineers.
   8. Provide technical support to RFB computer system administrator.
   9. Provide Operating System support, including installation problem resolution and documentation.
   10. Act as the technical point of contact between CALSPAN and NTF's Data System Technical Monitor.
   11. Provide overall coordination of new software development, software maintenance, and system administration for the NTF computer complex.
   12. Provide supervision of testing and review of all software deliverables. This shall include software and the appropriate documentation.
   13. Provide for training of personnel in safe operations and professional advancement at the NTF facility.
4. **GUIDELINES:**
   1. Activities under this work order are to be coordinated with the NASA NTF Data System Technical Monitor.
   2. Item 11 will be accomplished using procedures to be established by NASA.
5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97, **LEVEL OF EFFORT** 5 man-months

(G. Boyles) George Boyles 6-30-97
Technical Monitor

George Boyles 6-30-97
COTR

Receipt Acknowledged:

C. Catalanotto 6-30-97
CALSPAN

(WO.11)

NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER D-4 (Revision M) **DATE** 6/30/97

1. **TASK TITLE:** NTF MULTIVENDOR COMPUTER SOFTWARE LIBRARY MAINTENANCE AND OPERATION

2. **DESCRIPTION:** Operate and maintain the NTF software library. Items 4 and 5 of D-4 (Revision B) have been moved to work order D-3 (Revision C).

3. **REQUIREMENTS:**
   1. Operate and maintain the NTF software library, source code, object code, and executable code, in accordance with approved NASA policies and procedures.
   2. Maintain associated control room software documentation, including source listings, operational procedures, logs, and vendor manuals.
   3. Provide backups and recovery services for all designated computer systems.
   4. Maintain NTF test research and process test data library on file server.

4. **GUIDELINES:**
   1. Individual updates to the NTF software library under item 1 is to be completed as soon as test schedule allows after delivery of software.
   2. Listings will be filed within one week after program testing is complete and programs are accepted as part of the operational systems.
   3. Backups will be done in accordance with a checklist which describes which files are to be backed up and the schedule for the backups.

5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97,
   LEVEL OF EFFORT 1 man-month

(G. Boyles) George Boyles 6-30-97
Technical Monitor

George Boyles 6-30-97
COTR

JUN 30 1997
Receipt Acknowledged:

C. Catalanotto 6-30-97
CALSPAN

NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER D-6 (Revision M) **DATE** 6/30/97

1. **TASK TITLE:** NTF ADP SYSTEMS ENGINEERING SUPPORT

2. **DESCRIPTION** Operate and maintain the NTF Acquisition System including Data Quality Assurance.

3. **REQUIREMENTS:**

1. Provide continuous control room support, for MPA and tunnel operations, as the primary coordinator of Calspan's resources to insure a successful and productive operation.
2. Monitor and provide on-line troubleshooting of any Data Acquisition System or ADP related irregularity (computer system fault, tunnel parameter control microprocessor fault, or interfaces with Instrumentation) that would impair the facilities data quality, system response, security or communications.
3. Configure and verify the process, research, and MPA Data Acquisition system for each test per AIP-29. This includes data verification.
4. Provide configuration control of all required computer systems, both hardware and software, to insure conformity to established NASA policies and procedures.
5. Provide research and process data setup and reduction (on-line and off-line) activies (e.g. Process Plots, Research Plots, data transmittal files, tabular listings, TPC polar generation, displays, etc.)
6. Provide a test occupancy summary (Process Summary, Consumables, Productivity) at the close of each test program.
7. Technical supervision for ADP systems engineering support.
8. Provide additional off-line software as required by test program.

4. **GUIDELINES:**

1. AIP-29 will be used to configure and verify research data system for test program. TTR system will be used to establish requirements for data reduction and graphics.
2. Data will be prepared for transmittal within one week after end of test program.

5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97,

LEVEL OF EFFORT 28 man-months

JUN 30 1997

(G. Boyles) George Boyles 6-30-97
Technical Monitor

Receipt Acknowledged:

George Boyles 6-30-97
COTR

C. Catalanotto 6-30-97
CALSPAN

NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER D-12 (Revision L) **DATE** 6-30-97

1. **TASK TITLE:** NTF Data System Enhancements

2. **DESCRIPTION:** Provide support for enhancing the NTF Data System.

3. **REQUIREMENTS:**
   1. Provide support for enhancements of research and process plotting including displays required for tunnel operation.
   2. Develop and implement Test Occupancy Summary Report which includes PDS, consumable and productivity data.
   3. Develop procedures and provide training for the on-line and off-line computer systems.
   4. Provide documentation as required by NASA.
   5. Evaluate software packages in order to determine their suitability for inclusion in the system.
   6. Design and implement Temperature Controls for Side Wall Heaters.
   7. Specify and implement additional play back capability in order to make use of initial state data now being supplied in raw data files.
   8. Upgrade the TTR System to use Visual FoxPro.
   9. Convert PCS play back processes to run on SUN.
   10. Design and implement a Sequence of Event Monitoring System.
   11. Restructure and enhance Data Reduction for the Solaris Operating System.

4. **GUIDELINES:**
   1. Activities under this work order are to be coordinated with the NASA NTF Data System Technical Monitor.
   2. All items will be accomplished using procedures to be established by NASA.

5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97

LEVEL OF EFFORT 6 man-months

(G. Boyles) George Boyles 6-30-97
Technical Monitor

George Boyles 6-30-97
COTR

Receipt Acknowledged:

C. Catalanotto 6-30-97
CALSPAN

NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER E-02 (Revision M) **DATE** 6/30/97

1. **TASK TITLE:** Instrumentation System Maintenance and Support

2. **DESCRIPTION:** This is a sustaining work order which includes support tasks for maintenance of the NTF instrumentation systems.

3. **REQUIREMENTS:**
   - o Process instrumentation through the LaRC recall system.
   - o Support instrumentation inventory maintenance.
   - o Maintain supplies for instrumentation tasks.
   - o Generate/maintain instrumentation files/manuals.
   - o Attend approved on-site training programs.
   - o Generate and maintain NTF instrumentation drawings.
   - o Maintain instrumentation systems in good operating condition.

4. **GUIDELINES:**

5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97,
   LEVEL OF EFFORT 4.0 man-months

(T. Popernack) 6/30/97
Technical Monitor

George Bafes 6-30-97
COTR

JUN 30 1997
Receipt Acknowledged:

C. Catalanotto 6-30-97
CALSPAN

NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER E-05 (Revision L) **DATE** 6-30-97

1. **TASK TITLE:** Instrumentation Support for Test Operations

2. **DESCRIPTION:** This work order provides for support of tasks required for NTF tests and systems upgrade. Each test will be defined by TTR.

3. **REQUIREMENTS:** Provide instrumentation support to:

- Configure and maintain the patchboard and data acquisition system.
- Satisfy special wiring and instrumentation requirements specified by TTR.
- Generate and maintain test instrumentation documentation per AIP-29.
- Support model buildup, installation and disassembly.
- Provide daily and weekly instrumentation checks.
- Design, fabricate, install and test new systems as required.
- Configure and maintain existing systems for test instrumentation.
- Technical supervision for instrumentation support.
- Support control microsoftware upgrades and maintenance
- Maintain software for the temperature monitor p.c.
- Support and maintain all system and software modifications for the NTF Card Key security system.
- Configure and maintain CCTV system, including support for upgrades and enhancements.
- Configure and maintain the model and wall ESP System.

4. **GUIDELINES:**

5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97,

LEVEL OF EFFORT 32.0 man-months

(T. Popernack) 6/30/97
Technical Monitor

George Bayles 6-30-97
COTR

Receipt Acknowledged:

C. Catalanotto 6-30-97
CALSPAN

(WO.6)

NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER F-1 (Revision L) **DATE** 6/30/97

1. **TASK TITLE:** Structural Analysis and Review of NTF Models

2. **DESCRIPTION:** This work order will cover activities of the CALSPAN structural analyst.

3. **REQUIREMENTS:**
1. Perform and document structural analyses (loads, stress, fatigue, fracture mechanics, deformation, vibration, flutter, divergence, thermal) of models, stings and tunnel support hardware for the NTF.
2. Review independent analyses of models that are to be tested at the NTF to assure conformance with accepted procedures.
3. Participate in design reviews and other technical meetings.
4 Ensure that model integrity reports are complete and that library files are up-to-date for all respective balances and model support equipment prior to model testing.
5. Setup and document the BDDU and CPA calibration for each test.

4. **GUIDELINES:**
1. Required analysis for identified hardware per TTR schedule.
2. Schedule revisions will be provided with test schedule changes. Oral status reports on schedules will be given weekly to the technical monitor.

5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97,
LEVEL OF EFFORT 6 man-months

JUN 30 '97

(T. Popernack) Thomas Popernack 6/30/97
Technical Monitor

George Boyles 6-30-97
COTR

Receipt Acknowledged:
C. Catalanotto 6-30-97
CALSPAN

NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER G-1 (Revision K) **DATE** 6/30/97

1. **TASK TITLE:** Data Management and Technical Library Support

2. **DESCRIPTION:** This is a sustaining work order which includes coordination and support tasks for maintaining and tracking data and supporting and NTF technical library operation.

3. **REQUIREMENTS:**

1. Maintain Facility Operating Procedures and records.
   - provide technical assistance
   - process changes as dictated by modifications
   - assist Facility Safety Head with Configuration Management of Configuration Controlled documents
   - interface with other organizations both NASA and contractors
   - provide word processing support for all procedures and supporting documents for NTF operations
2. Maintain and control Task/Test Project Management System at the direction of the Facility Safety Head in accordance with AIP-1.
   - maintain TTR/PFR file system and computer database for all open and closed files
   - support closeout activities including pretest closeout meeting, drawings, procedures, signatures, and Change Notification Sheets (CNSs).
3. Assist the Facility Safety Head in maintaining Working Masters.
   - Field verify and redline schematics, Pressure Systems Configuration Management documents and procedures
4. Maintain NTF Technical library including coding, logging, distribution, filing, research documentation, updating and organizing.

4. **GUIDELINES:**

5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97,
   LEVEL OF EFFORT 8 man-months

JUN 30 1997

(T. Popernack) Thomas Popernack 6/30/97
Technical Monitor

George Bayles 6-30-97
COTR

Receipt Acknowledged:

C. Catalanotto 6-30-97
CALSPAN

NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER G-2 (Revision K) **DATE** 6/30/97

1. **TASK TITLE:** Drafting and Design Support

2. **DESCRIPTION:** This is a sustaining work order which includes coordination and support tasks for drafting and design in support of NTF operations.

3. **REQUIREMENTS:**

1. Produce new drawings as required including system schematics, design support for NTF systems, models and other hardware as needed.
2. Distribution of drawing updates.
3. Provide component design and structural analysis review and interface with NASA engineering as necessary.
4. Support presentation activities including viewgraphs, charts, graphics, halftones and research as required.
5. Maintain the NTF drawing database including drawing files according to system code, microfilms, facility baseline list, supporting facility documents and AutoCad files (includes appropriate training).
6. Maintain equipment including micrographics, overhead viewgraph, (3 each) AutoCad computer work stations, printer and plotter including upgrades of all equipment as requested.

4. **GUIDELINES:**

5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97,

LEVEL OF EFFORT 34 man-months

JUN 30 1997

(T. Popernack) Thomas Popernack 6/30/97
Technical Monitor

George Boyle 6-30-97
COTR

Receipt Acknowledged:

C. Catalanotto
CALSPAN

(WO.35)

NATIONAL TRANSONIC FACILITY
WORK ORDER

WORK ORDER NUMBER H-1 (Revision J) **DATE** 6/30/97

1. **TASK TITLE:** Instrumentation Engineer

2. **DESCRIPTION:** This is a work order for the activities for the Instrumentation Engineer.

3. **REQUIREMENTS:**

1. Provide technical support to Instrumentation Monitor.
2. Communicate special instrumentation requirements with the ETTD staff.
3. Design and check-out ESP heated containers for models.
4. Design and verify upgrades to instrumentation wiring.
5. Monitor, log, and provide an engineering assessment of ground current changes.
6. Provide recommendations for possible upgrades to instrumentation systems.
7. Trouble-shoot instrumentation failures.
8. Design and checkout heaters and controls system for the CCTV System.

4. **GUIDELINES:**

5. **ESTIMATED:** **START DATE** 6-22-97, **COMPLETION DATE** 12-21-97,

LEVEL OF EFFORT 2 man-months

JUN 30 1997

(T. Popernack) 6/30/97
Technical Monitor

Receipt Acknowledged:

George Boyle 6-30-97
COTR

C. Catalanotto 6-30-97
CALSPAN