TO: NASA Headquarters  
Attn: NX-2/Director, Facilities Engineering and Computer Management Division  
FROM: 112/Director, Systems Engineering and Operations  
SUBJECT: Rehabilitation of Tow Tank No. 1 in Building 720  

The Naval Underwater Systems Center (NUSC) has requested the use of Tow Tank No. 1 in Building 720 for the purpose of testing underwater vehicle hydrodynamics. In order to reactivate this tow tank for these tests, refurbishment and certain modifications are requested.

Attached are the project documents, Forms 1509 and 1510, for the rehabilitation of this facility. Also attached are copies of all correspondence between LaRC and NUSC regarding this project.

The Navy has agreed to furnish all funds for this project and leave the facility operational for LaRC's use when their testing program is completed. LaRC's Structures and Dynamics Division, Impact Dynamics Branch, will then use the facility for spray ingestion testing.

Therefore, it is advantageous to NASA and LaRC that this project be implemented as soon as possible.

"Original signed by"

Robert L. Swain

5 Enclosures

cc:
NASA - RF/A. Henderson  
NASA - RF-2/J. F. Weir  
NASA - NXF-2/P. Messina  
112/R. L. Swain  
112/H. K. Clark  
112/J. R. Dinkins  
497/J. L. McCarty  
497/S. M. Stubbs  

446/Minman:as 11-23-82 (3467)  

446/CRS  

436/J. E. Knemeyer  
436/C. E. Kirby  
448/J. A. Zitzelberger  
448/C. E. Horne  
448/J. A. Poslik  
446/C. R. Schilling  
446/J. M. Inman  
446/FPDO Files

436/JEK  

446/JEK  

11/24/82
This project provides for the refurbishment of Test Tank 1 in Building 720 for use by the Naval Underwater Systems Center in testing underwater vehicle hydrodynamics. The work to be accomplished includes the installation of a filtration system, refurbishment of the electrical system, site and tank cleaning and minor building repairs.

The filtration system will be designed to filter the tank volume once every seven days. The intake and return will be at opposing ends of the tank. A pump of approximately 50-HP will circulate water at 500-GPM through two sets of filters. A depth filter will remove particles to 10 microns followed by cartridge filters capable of 3 microns. The pump and filters will be palletized. Piping will be done on site.

Impact on Existing Facility Capability: a. None ; b. □ Increase □ X ; c. Environmental impact

The primary objective of the Naval Underwater Systems Center's (NUSC), Improved Performance Undersea Vehicle (IPUV), program is the development of the heated laminar flow drag reduction technique. Past studies have indicated that future experimental testing must be performed: (1) in a fresh and salt water environment; (2) in a controlled particle environment; and (3) at high Reynolds numbers.
Rehabilitation of Tow Tank No. 1 in Building 720

SCOPE/DESCRIPTION: (Continued)

Refurbishment of the electrical system will include cleaning all motors and generators, drying out the windings, refurbishment and adjustment as necessary to brushes, trolleys, limit switches, and safety devices. The control system will also be refurbishment and reinstalled.

Site and tank cleaning will include a thorough house cleaning of the entire building and tank area. The tank will be cleaned with a water blast.

Facility repair work will include a new outboard strainer for the tank water supply line. Asbestos batt at the south end of the building will be removed. Miscellaneous building leaks will be repaired. The wave-making plate will be cleaned and painted.

LaRC's Environmental Impact Statement, dated August 1971, is adequate to cover this project. Review and coordination in accordance with OMB Circular A-95 are not required. The provisions of the Randolph-Sheppard Act of 1974 are not applicable to this project.

BASIS OF NEED: (Continued)

Due to these unique constraints and the necessity to acquire a large data base, the Salt Water Towing Tank located at NASA/Langley is needed to perform the required testing. This tank is the only facility in this country which has the capability of providing NUSC's IPUV program with the above needed requirements. Before testing can begin at NASA/Langley; however, refurbishment of the test tank is required.
### Facility Project Cost Estimate

**DATE** 11/22/82

**SUBMISSION/REVISION** A

**PROJECT NO.** 83CNAZ

**PROJECT TITLE** Rehabilitation of Tow Tank No. 1 in Building 720

**BASIS OF COST ESTIMATE**

NUSC Estimate - October 1982

---

### I. SUMMARY OF COST ESTIMATE

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>AMOUNT (a.)</th>
<th>PERCENT (b.)</th>
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<tbody>
<tr>
<td>1. ENGINEERING ESTIMATE</td>
<td>$110,500</td>
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<tr>
<td>2. COST ADJUSTMENT (Enter percentage of item 1a to right in col. 2b)</td>
<td>5,500</td>
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<tr>
<td>3. SUBTOTAL (1 + 2)</td>
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<td>4. CONTINGENCIES (Enter percentage of item 3 to right in col. 4b)</td>
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<td>5. SUPERVISION, INSPECTION AND ENGINEERING SERVICES (Enter percentage of items 3a and 4a to right in col. 5b)</td>
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<tr>
<td>6. OTHER BURDEN COSTS</td>
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<tr>
<td>7. TOTAL BUDGET ESTIMATE (3 + 4 + 5 + 6)</td>
<td>$140,000</td>
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</tbody>
</table>

Based on 8 percent cost rise per year to mid-point of construction (March 1983)

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### II. PLANNING AND DESIGN

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>STATUS</th>
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<tbody>
<tr>
<td>1. PRELIMINARY ENGINEERING REPORT</td>
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<tr>
<td>2. SPECIAL STUDIES (Specify)</td>
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<tr>
<td>3. FINAL DESIGN</td>
<td>X In-House NUSC</td>
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<tr>
<td>4. SUPERVISION AND ADMINISTRATION OF DESIGN SERVICES</td>
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TOTAL PLANNING AND DESIGN COST

---

### III. RELATED COST DATA (Not included in this Approved Facility Cost Estimate but required to make the facility initially operable)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>AMOUNT</th>
<th>ITEM</th>
<th>AMOUNT</th>
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<td>4. TO BE PURCHASED</td>
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<td>8. ACTIVATION</td>
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<td>5. TRANSFER TO EXCESS</td>
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<td>9. OTHER REAL ESTATE</td>
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<td>6. EXISTING</td>
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<td>10. OTHER (Specify)</td>
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<tr>
<td>7. FUTURE FUNDING</td>
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**NOTE:** NASA FORM 1510 MAY BE PREVIOUS EDITIONS ARE OBSOLETE.
### IV. FACILITY PROJECT COST ESTIMATE

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>UNIT OF MEASURE</th>
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<td>($)</td>
<td>($)</td>
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<tr>
<td>Filtration System</td>
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<td>Depth Filter</td>
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<td>Cartridge Filters</td>
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<td>Facility Repair</td>
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<td>3. BUILDING/STRUCTURE WITHIN 5 FOOT LINE (Summary)</td>
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<td>4. OTHER COLLATERAL EQUIPMENT NOT INCLUDED IN 3. ABOVE (Summary)</td>
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<td>5. SPECIAL FEATURES (Summary)</td>
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<td>In-House Estimate by NUSC - October 1982</td>
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</table>

| TOTALS | 110,000 | 140,000 |

V. RELATED ITEMS/ACTIONS (Explain as appropriate. Use extra sheets, as necessary, for this block and above)
ORDER FOR WORK AND SERVICES—NAVCOMPT FORM 2275 (2-81)  S/N 0104-LF-702-7250

1. THIS ORDER MUST BE ACCEPTED ON A REIMBURSABLE BASIS ONLY AND IS SUBJECT TO THE
   CONDITIONS LISTED ON THE REVERSE SIDE.

2. DOCUMENT NUMBER
   N6660483WR10037

3. REFERENCE NUMBER
   N0002483WR10210

4. FUNDS EXPIRE ON
   30 Sep 1984

5. WORK COMPLETION DATE
   30 Sep 1983

6. DATE PREPARED
   05 Nov 1983

7. AMENDMENT NO.
   NEW

8. FROM:
   Commanding Officer
   Naval Underwater Systems Center
   Newport, RI 02840

9. FOR DETAILS CONTACT:
   D. Brown
   Code 3634 - AV 948-2495

10. TO:
    NASA, Langley Research Center
    Problems & Resource Division
    Mail Stop #104, Hampton, VA 23665
    Attn: Joseph Poslak

11. MAIL BILLINGS TO:

12. ACCOUNTING DATA TO BE CITED ON RESULTING BILLINGS

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<th>D. OBJ.</th>
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<th>F. SA.</th>
<th>G. AAA</th>
<th>H. TT</th>
<th>I. PAA</th>
<th>J. COST CODE</th>
<th>K. AMOUNT</th>
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</table>

L. 03634
M. 53120

TOTAL THIS DOCUMENT $30,000.00
CUMULATIVE TOTAL $30,000.00

13. THIS ORDER IS ISSUED AS A [ ] PROJECT ORDER [ ] ECONOMY ACT ORDER AND IS TO BE ACCOMPLISHED ON A [ ] FIXED PRICE
   [ ] COST REIMBURSEMENT BASIS. WHEN THE FIRST BLOCK IS CHECKED, THIS ORDER IS PLACED IN ACCORDANCE WITH THE PROVISIONS
   OF 41 U.S.C. CODE 23 AND DOD DIRECTIVE 7220.1. THE FOLLOWING SUPPLEMENTARY ITEMS ON REVERSE ALSO APPLY AND ARE AN
   INTEGRAL PART OF THIS ORDER:

14. DESCRIPTION OF WORK TO BE PERFORMED AND OTHER INSTRUCTIONS

Funds issued for refurbishment of Langley Tow Facility.

Source Appn: RDT&E
Element: 62633N
Subproject: SF33321001

NOTE: (1) REQUEST ACKNOWLEDGMENT OF ACCEPTANCE IN ACCORDANCE WITH NAVCOMPT MANUAL, PARAGRAPH 035411-1.
   (2) REQUEST ADVANCE COPIES OF ALL 1080 BILLINGS BE FORWARDED TO GENERAL
   ACCOUNTING DIVISION, CODE 074.
   (3) AMOUNTS AUTHORIZED BY THIS DOCUMENT ARE SUBJECT TO SECTION 3679 R.S.
   (4) REQUEST (2) ACCEPTANCE COPIES BE FORWARDED TO CODE 0731.

FOR ACTION OF

FOR INFO OF

FOR SIGNATURE OF

DUE DATE 11/20  ASSIGNED BY

NASA-LANGLEY  NOV 15 1982

I CERTIFY THAT THE FUNDS CITED ARE
PROPERLY CHARGEABLE FOR THE
WORK OR SERVICES REQUESTED

AUTHORIZING OFFICIAL (NAME, TITLE AND SIGNATURE)

WILLIAM MONIZ, BUDGET OFFICER

11/5/82

ACCEPTING OFFICIAL (NAME, TITLE AND SIGNATURE)

16. THIS ORDER IS ACCEPTED AND THE
   WORK OR SERVICES WILL BE PROVIDED
   IN ACCORDANCE HEREWITH.
Naval Underwater Systems Center  
Attn: Mr. Thomas A. Davis  
Headquarters  
Newport, RI  02840

Subject: Refurbishment of Facility 720 (Tank 1) at Langley Research Center  
for LDV-2 Tow Tank Experiments

October 26, 1982

This is to confirm the level of support to be provided by Langley Research Center (LaRC) to refurbish our Facility 720 (Tank 1) for use by the Naval Underwater Systems Center (NUSC) for the purpose of performing LDV-2 Tow Tank experiments.

It is understood from your letter dated September 8, 1982 (36301:TAD:kic), that NUSC will prepare all necessary drawings and specifications in LaRC format for the solicitation of bids to accomplish the following work:

(a) Procurement and installation of a water circulation and filtration system.

(b) Procurement of services and supplies for the reactivation of the power supply and controls to the carriage.

(c) Procurement of services and supplies for cleaning and refurbishment of the tank.

To ensure compliance with Center standards and policy, it is agreed that LaRC will provide engineering support to review the drawings and specifications, coordinate the procurement package, and review the project as it progresses through the construction and start-up phases.

NUSC will provide all engineering and other technical personnel necessary to monitor and direct the contractual efforts during the construction and start-up phases. When the facility becomes operational NUSC will provide all operating and maintenance personnel to support its testing activities.

It is further understood that NUSC will provide the funding required for the subject modifications, for support services provided by LaRC, and for operating expenses.
Before this project can proceed, a complete project-description, justification, and cost estimate should be sent to this office. This office will prepare the necessary budget documents and present the project to NASA Headquarters for approval.

Charles R. Schilling  
Head, Facilities Program Development Office

cc:
101/General Files
112/R. L. Swain
114/E. F. Stahl
497/S. M. Stubbs
123/R. T. Layman
446/FPDO
446/J. M. Inman

JMI\textsuperscript{446}/JMInman:as 10-25-82 (3467)
Mr. Colin McMath  
Real Property Accountability Officer  
National Aeronautics and Space Administration  
Langley Research Center  
Hampton, VA 23665

Dear Mr. McMath:

At our meeting on 17 July 1982, we discussed the possibility of some limited NASA engineering support to assist in a contractual effort to procure supplies and services to refurbish the Facility 720 (Tank 1). We are planning a contractual effort to accomplish the following tasks:

a. Procurement and installation of a water filtering system.
b. Procurement of services and supplies for removing debris from the tank area and pressure cleaning the tank walls.

c. Electrical support.

The Naval Underwater Systems Center (NUSC) is preparing the specifications and drawings we feel are required to solicit bids on these tasks. It is requested that NASA provide the required engineering personnel to support the advertisement, award and monitoring of these contracts. It is understood that NUSC will provide the required funding for the contracts and the engineering support services. The specification package will be prepared in NASA format and a NUSC engineer will be assigned to assist in supporting and monitoring the contractual efforts.

Sincerely,

Thomas A. Davis  
IPUV Program Manager

TAD/k1c

[Handwritten note: Plus electrical]
Commanding Officer  
Naval Underwater Systems Center  
Headquarters  
Newport, Rhode Island 02840

Dear Sir:

In response to your letter dated August 20, 1981 (36361:TAD:kle, 3900, SCR 13633-61), Langley Research Center agrees with your proposal to use our Facility 720 (Tank 1) for the LDV-2 Low Tank Experiments. We understand that your command will provide all financial support and personnel to refurbish and operate the facility, except for some minor expenses such as stock and labor costs to us for general support, which you will reimburse.

In addition, because this is an NNSA facility, we will designate engineering and safety/NNSA personnel to coordinate with your operating personnel during the refurbishment period, to help assure that our normal facility standards are met.

Please appoint an Initial point of contact for your project and supply the name to our Facilities Management and Directives Branch, Mail Stop 123, telephone (304) 827-3511. The Facilities Management and Directives Branch will provide general administrative support for your initial efforts.

Sincerely,

Donald P. Hearst  
Director

cc:  
101/Official Files  
106/Director  
103A/Deputy Director  
111/Director for Ngt. Ops.  
429/SSQRO.  
436/RFED  
123/NSD  
123/Colon R. McMath, Jr.

123/RTLayman:bsl 9-9-81 (3511)  
123/CRM  
123/mth  

Approved:  
John F. Stokes  
Director for Management Operations  

Concur:  
Richard H. Peterson  
Deputy Director
From: Commanding Officer, Naval Underwater Systems Center
To: Director, Langley Research Center, National Aeronautics and Space Administration, Langley Station, Hampton, Virginia 23665

Subj: Request to Use the Langley Tow Tank for Special LDV-2 Tow Tank Experiments

1. The Improved Performance Undersea Vehicle (IPUV) Program at this Center has been investigating, for several years, emerging technologies which offer improved performance to small underwater vehicles. The primary thrust is the development of laminar flow drag reduction techniques. IPUV is an exploratory development program and the technology is expected to be used in the development of an advanced submarine launched torpedo.

2. Hydrodynamic tests in the ocean environment are an absolute necessity in the development of laminar flow vehicles. Up to this point in time, at-sea test ranges have provided the only means of obtaining environmental data. Towing tank facilities are available at the David Taylor Model Basin and have been used by the IPUV program to investigate many parameters associated with laminar flow. A major conclusion from both at-sea tests and David Taylor tests is that the ocean environment, because of its concentrations of living and dead particles of nearly neutral buoyancy, interacts with the laminar boundary layer and causes premature transition to turbulent flow. The David Taylor Model Basin with fresh water is unsuitable for experiments with this phenomena. The Langley towing tank facility with its bay water tank offers the only laboratory environment capable of investigating the unique properties of sea water on a laminar boundary layer.

3. It is requested that the Naval Underwater Systems Center (NUSC), through its IPUV program, be granted use of the large NASA Langley towing tank to perform these unique environmental tests. It is assumed that the operations of the towing tank would be very similar to the operation when last used by the David Taylor Model Basin. The NUSC IPUV program will provide all financial support and personnel to refurbish and operate the facility. Both Government and contractor personnel will be used. The Navy will provide funds to NASA for overhead operating expenses, including utilities, liaison and shop service costs. The Navy will require, in addition to the tank itself,
Subj: Request to Use the Langley Tow Tank for Special LDV-2 Tow Tank Experiments

approximately 2000 square feet of preparation/office space in the towing tank building. It would be desirable to have a secure area for these spaces. This Center plans to perform tow tank refurbishment and feasibility tests during an initial three month period. Following a successful feasibility phase, a hydrodynamic test program of approximately one year is anticipated. Preliminary consultations have been held with Mr. Colin McMahon of your facilities staff.

4. The refurbishment of the towing tank facility is expected to include the following tasks:

   a. Transport all equipment presently at DTNSRDC, Carderock to Langley. Inspect and set-up the equipment in its original locations. Repair and rewire all cables interfacing the equipment to the carriage systems.

   b. Clean up and organize the Langley facility hardware and documentation to an acceptable level needed for testing. Inventory all equipment and supplies to determine status, need for refurbishment or replacement, and locate/inventory any spare parts.

   c. Verify the operability of the water outlet/inlet pumping and valving systems. Refurbish, as necessary, any hardware to make the system operational.

   d. Review and checkout all carriage safety devices. Functionally verify that all systems are operating reliably.

   e. Checkout and test the carriage primary DC power systems, overhead rails and rail sliding contacts. Inspect and clean power rails and contacts.

   f. Perform system level testing of the Carriage Drive Controller as reinstalled and interfaced with the drive motors.

   g. Install a water filtering system and the associated plumbing.

   h. Install a tank liner by butting a plastic liner to the tank walls.

   i. Inspect tank roof and modify, if required, to insure that loose particles do not fall into tank.
Subj: Request to Use the Langley Tow Tank for Special LDV-2 Tow Tank Experiments

j. Perform system level checkout and testing of all carriage hardware to verify operation prior to testing. Operate the carriage over the speed range and loads needed for LDV-2 tow tank experiments. Record data to demonstrate the carriage performance.

5. The testing procedure after refurbishment will include operating the carriage with various LDV-2 vehicle hydrodynamic configurations in either filtered or unfiltered bay water. Configuration changes will be made at the preparation area at the tow tank. The test sequence will include several weeks of testing followed by a configuration change period during which no carriage tests will be performed. The sequence will be repeated a number of times over the total test period (approximately one year). Upon completion, the equipment loaned for the test series by DTNSRDC will be returned to that Center and the improvements to the tank and filter system will be left intact at NASA.

J. R. SHORT
By Direction