

**NBSIR 73-290**

# **Development of a Dynamic Pressure Calibration Technique A Progress Report**

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October 15, 1973

Progress Report Covering period 6-15-73 to 9-15-73

Prepared for  
NASA Langley Research Center  
Hampton, Virginia 23365



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CALIBRATION TECHNIQUE A PROGRESS  
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**U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary**  
**NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director**



# Development of a Dynamic Pressure Calibration Technique

Progress Report for the Period from June 15, 1973 to September 15, 1973

to the

NASA Langley Research Center  
NASA Order L-88319  
NBS Project 4253456

Prepared by

P. S. Lederer  
Project Leader

## 1. Introduction

The objective of this task is the conduct of a research and development study to develop a dynamic pressure calibration technique having a flat frequency response to 2000 Hz or greater and amplitude capability over this frequency range of at least 10 psi peak to peak. This calibration technique is to be capable of directly relating test transducer characteristics to fundamental units of measurement.

## 2. Approach

The proposed technique will be based on a hydraulic sinusoidal calibrator previously developed by the NBS Instrumentation Applications Section and described in NBS Technical Note 720 "A Simple Hydraulic Sinusoidal Pressure Calibrator" April 1972.

## 3. Progress to Date

The electrodynamic vibration excitor used in the original development is not currently available. It became necessary to procure a new, small vibration excitor system (from NBS funds, at no cost to NASA) in order to carry out the work. This system was delivered in August 1973, however the trunnion base for the shaker is not expected until October.

In the meantime, a universal test fixture was designed, which will enable the testing of a variety of tube arrangements and transducers with a minimum of set-up time. Transducers of the flush diaphragm type with sensing end diameters up to 7/8" (2.22 cm) can be accommodated. In addition to ordinary smooth wall tubes, a variety of tubes with internal flutes (which increase the wetted inside surface area of the tube) have been procured from a commercial source. The components for this test fixture are under construction at this time.



In order to assess the performance of the system with a variety of liquids, a quantity of a manometer fluid (density 2.95) and of a fluorine-based inert fluid (density 1.88) was procured for use in the modified hydraulic calibrator. To measure the acceleration applied to the liquid-filled tubes, a piezoelectric accelerometer was purchased. It will be mounted in the base of the test fixture.

#### 4. Plans for Next Reporting Period

A variety of tests will be performed on the new pressure calibration system, involving the use of liquids of different densities and tubes with a variety of cross sectional configurations. Preliminary tests will be conducted with a piezoelectric pressure transducer with integral solid state amplifier. This transducer, purchased for another project, is available for this task. It has adequate sensitivity and a very high natural frequency.

Subsequent tests will be performed on the pressure transducers which are to be furnished by the NASA Langley Research Center as indicated in the work agreement.





U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. NBSIR 73-290	2. Gov't Accession No.	3. Recipient's Accession No.
4. TITLE AND SUBTITLE  Development of a Dynamic Pressure Calibration Technique -- A Progress Report		5. Publication Date 9-15-73	6. Performing Organization Code
		7. AUTHOR(S) Paul S. Lederer	
9. PERFORMING ORGANIZATION NAME AND ADDRESS  NATIONAL BUREAU OF STANDARDS DEPARTMENT OF COMMERCE WASHINGTON, D.C. 20234		10. Project/Task/Work Unit No. 4253456	11. Contract/Grant No. NASA Order L-88319
		12. Sponsoring Organization Name and Address  NASA Langley Research Center Hampton, Virginia 23365	
15. SUPPLEMENTARY NOTES			
16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)  Plans are described for experimental investigation of a hydraulic sinusoidal pressure calibrator as a basis for development of dynamic pressure calibration techniques for frequencies up to 2000 Hz.			
17. KEY WORDS (Alphabetical order, separated by semicolons)  Dynamic calibration; pressure; transducer.			
18. AVAILABILITY STATEMENT  <input checked="" type="checkbox"/> UNLIMITED.		19. SECURITY CLASS (THIS REPORT)  UNCLASSIFIED	21. NO. OF PAGES  5
<input type="checkbox"/> FOR OFFICIAL DISTRIBUTION. DO NOT RELEASE TO NTIS.		20. SECURITY CLASS (THIS PAGE)  UNCLASSIFIED	22. Price





