TECHNOLOGY UTILIZATION BIBLIOGRAPHY

Technology Utilization Division

Bibliography on ELECTROMECHANICAL TRANSDUCERS

WITH INDEXES

GPO PRICE $ 1.00
CFSTI PRICE(S) $ 1.00

Hard copy (HC)
Microfiche (MF)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Bibliography on
ELECTROMECHANICAL
TRANSUDCERS
WITH INDEXES

Material for this Bibliography was selected by
Applied Space Technology = Regional Advancement (ASTRA)
Midwest Research Institute
Kansas City, Missouri

This document is available from the Clearinghouse for
Federal Scientific and Technical Information (CFSTI),
Springfield, Virginia, 22151, for $1.00.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, D.C. February 1966
NOTE

This document was prepared under the sponsorship of the National Aeronautics and Space Administration. Neither the United States Government nor any person acting on behalf of the United States Government assumes any liability resulting from the use of the information contained in this document, or warrants that such use will be free from privately owned rights.
FOREWORD

The Administrator of the National Aeronautics and Space Administration has established a technology utilization program for "the rapid dissemination of information... on technological developments... which appear to be useful for general industrial application." From a variety of sources, including NASA Research Centers and NASA contractors, space-related technology is collected and screened; and that which has potential industrial use is made generally available. Information from the nation's space program is thus made available to American industry, including the latest developments in materials, management systems, processes, products, techniques and analytical and design procedures.

This publication is a part of a series of bibliographic publications intended to serve both scientific and technical personnel and the libraries and librarians who support them.

THE DIRECTOR, Technology Utilization Division
National Aeronautics and Space Administration
INTRODUCTION

This bibliography is designed to assess and identify the current literature on the applications and uses of electromechanical transducers.

The purpose of this series of publications is to provide industry with summarizing information on innovations contained in NASA and other space technology literature.

The bibliographies are intended to indicate the wealth of new information and new technology available from the collections of the National Aeronautics and Space Administration. It is the purpose of the Technology Utilization Bibliographies to select and list available information of special interest to the industrial user.

The format for this series has therefore been designed to permit a variety of forms of utilization. The bound volume provides for circulation among personnel who would be most likely to benefit from the material. At the same time, it serves as a permanent record for library filing and reference.
AVAILABILITY OF DOCUMENTS

N-accession numbers, e.g., N63-12345, identify technical reports which have been announced by NASA in *Scientific and Technical Aerospace Reports (STAR)*, or its predecessor *Technical Publications Announcements (TPA)*. They can normally be purchased from the following sales agency:

Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151
(formerly: Office of Technical Services, U.S. Department of Commerce)

Qualified requesters, e.g., NASA contractors, may also address inquiries about technical reports to: NASA Scientific and Technical Information Facility, P. O. Box 33, College Park, Maryland, 20740.

A-accession numbers, e.g., A63-12345, identify published journal articles and books which have been announced in *International Aerospace Abstracts (IAA)*, a journal published by the American Institute of Aeronautics and Astronautics. Articles are available for examination in those libraries that maintain sets of scientific and technical journals, and, in some instances, reprints may be obtained from the journal offices. Inquiries concerning books should be addressed to the publisher.

Abbreviations that frequently appear in the citations describing the references are listed below:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFSTI</td>
<td>Clearinghouse for Federal Scientific and Technical Information</td>
</tr>
<tr>
<td>OTS</td>
<td>Office of Technical Services</td>
</tr>
<tr>
<td>ph</td>
<td>Photostat. Full size copies of the document are available in photostatic form</td>
</tr>
<tr>
<td>mi</td>
<td>Microfiche. Copies of the document are available in microfilm form</td>
</tr>
<tr>
<td>MF</td>
<td>Microfiche. See mi</td>
</tr>
<tr>
<td>HC</td>
<td>Hardcopy. See ph</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Entry Type</th>
<th>Series</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962 TPA Entries</td>
<td>N62</td>
<td>1</td>
</tr>
<tr>
<td>1963 STAR Entries</td>
<td>A63</td>
<td>5</td>
</tr>
<tr>
<td>1964 STAR Entries</td>
<td>N63</td>
<td>8</td>
</tr>
<tr>
<td>1963 IAA Entries</td>
<td>A64</td>
<td>13</td>
</tr>
<tr>
<td>1964 IAA Entries</td>
<td>N64</td>
<td>16</td>
</tr>
<tr>
<td>Subject Index</td>
<td></td>
<td>I-1</td>
</tr>
<tr>
<td>Personal Author Index</td>
<td></td>
<td>I-13</td>
</tr>
</tbody>
</table>
Bibliography on
ELECTROMECHANICAL TRANSDUCERS
with indexes
FEBRUARY 1966

1962
TPA ENTRIES

N62-10071 Guggenheim Labs. for the Aerospace Propulsion Sciences, Princeton U., N. J.
TRANSIENT PRESSURE MEASURING METHODS; EFFECTS OF TUBING CONNECTION ON TRANSDUCER RESPONSE
Previously, the study of liquid propellant combustion instability has required the use of flush-mounted transducers to measure transient pressure fluctuations, particularly important in rocket-chamber combustion.

The feasibility of using tubing of various lengths to link the transducer to the chamber was studied as well as how the collected data would be influenced by the use of tubing.

The validity of using several inches or more of tubing between transducer and chamber is shown to depend upon the frequency range required, which is related to the size of the chamber and the mode of instability being measured.

N62-10591 New York U., Coll. of Engineering, N. Y.
MEASUREMENT OF TORSIONAL RIGIDITY OF STIFFENED PLATES.
ôTS: ph $3.60, mi $1.28
A torsion testing machine was developed to measure torsional rigidity of stiffened plates and the data obtained with it is compared to the predictions of theory. The agreement of theory and experiment for two structures tested, flat and ribbed plates, revealed the reliability of the apparatus. Data measurements should apply with reasonable accuracy to thin shells as well as plates.

Basically, the torsion testing machine consists of a twist measuring system, and a loading machine. The twist measuring system measures the twist in plates by a differential normal motion over fixed lever arms using capacitor sensors connected electrically in pairs so that the signal is proportional to the rotation of the calibration bar. The loading machine uses a twisted trunnion that lies in a ball bearing. Friction is kept to a minimum by periodic cleaning and measurements reveal that starting friction torque can be kept below 0.002 in/lb.

Experimental errors may be generated in the model, the twist measuring system, the loading system, and possibly in interaction of the model with the loading system. Since torsional rigidity is proportional to the fourth power of the cross section dimension, slight errors in scaling from prototype to model would be reflected in inaccurate values of \( J_t = G(\Delta \theta)/\Delta X \). Loading system errors were found to be chargeable to the radius arm and dead weight. In 10 measurements, radius arm variations were found to be 0.002 in. in an average arm length of 2.0175 in., and each load weight variation was found to be \( 2 \times 10^{-5} \) lb per dead weight of 0.16 lb. Errors due to interaction of the model with the loading system were traced to frictional resistance that could generate warping restrain in the model. (J.R.C.)

STUDY PROGRAM FOR THE DEVELOPMENT OF A BLOOD PRESSURE MEASURING AND MONITORING SYSTEM FOR REMOTE USE ON MAN IN FLIGHT.
Final Report.

The purpose was to study the problem of measuring arterial blood pressure. The measurement was to be made without discomfort to the subject and with no interference of his normal movements. Ideally this would be a continuous measurement, displaying the pressure waveform with absolute calibration. A survey was made of the various blood pressure measuring methods described in the literature, as well as commercially available apparatus for continuous automatic measurement. The choice of employing ear's opacity pulse techniques in the development of a blood pressure transducer was influenced by the results of this survey. Pulse waves of blood passing through the capillary bed of the ear pinna cause slight variations in the ear's opacity to infrared. Several transducers were designed and built deploying a photo conductor and an infrared source to measure these variations. Much work went into the refinement of this technique to provide the best signal available under all conditions. Tests were conducted to determine the existence of any quantitative relationship between this blood flow indicator and actual blood pressure. If any such relationship does exist, it is indeed evasive and therefore the transducer output was treated as purely qualitative information. A system for obtaining pressure measurements is described and a laboratory model built and tested. An improvement on this system and a second system for obtaining dynamic blood pressure measurements is described and proposed for further study. (Author Abstract)

N62-11007 Therm Inc., Ithaca, N. Y.
A FEASIBILITY STUDY ON THE MEASUREMENT OF THE TIME-DEPENDENT SHROUD PRESSURE OF A DUCTED PROPELLER.

Results of a limited study on the measurement of the instantaneous incremental shroud pressure on a ducted propeller by means of a piezoelectric transducer are given. The instrumentation is described and
photographs of the observed pressure pattern presented. The feasibility of such measurements, the reproducibility and quality of the signal, and the magnitude and decay of the higher harmonics over a range of advance ratios are examined. Recommendations for future tests are outlined. (Author Abstract)

INDUCTION FLOWMETER FOR DIELECTRIC FLUIDS—OPERATIONAL MODEL.
First Quarterly Report.
OTS: ph $3.60, mi $1.16.

A research program is under way to develop an electromagnetic flowmeter suitable for operational use with hydrogen (capable of passing one pps of liquid hydrogen) and suitable for calibration tests at the NASA Lewis Research Center. Unlike commercially available magnetic flowmeters which make use of electrically conducting liquids, the flowmeter under development will make use of the polarization currents in dielectric fluids to provide power for actuating an electronic voltage detector. Since polarization currents induced in a dielectric are proportional to the frequency of induction, it was necessary to employ a high frequency magnetic field in the flowmeter for use with dielectric liquids. Primarily because an accurate quantitative voltage measurement is limited by the state of the art to the audio frequency range, an induction frequency of 10 kcs was chosen, which should easily permit 100 or 200 cps resolution of flow oscillation.

The design requires a flow rate of one pps of liquid hydrogen and a pipe diameter of 1.5 in. (both for compatibility with Lewis Research Center facility), vacuum insulation wherever possible, and explosive proof construction.

Work completed during the first quarter involved the design, assembly, or testing of the following items: housing and fittings, magnet coil, magnetic circuit, pipe transducer, liquid nitrogen test circuit, amplifier, magnet power generator, and phase sensitive detector. (V.D.S.)

TRANSIENT PRESSURE MEASURING METHODS. TRANSIENT PRESSURE TRANSDUCER DESIGN AND EVALUATION.
OTS: ph $8.10, mi $2.66.

Owing to the need for improved dynamic pressure measurements in the combustion instability program at Princeton, consideration is given to transducer design, including the vibratory system, heat transfer characteristics, application to rocket chambers, and a description of a static and dynamic calibration system. Such shortcomings of present transducers as the lack of heat transferability and limited frequency response are discussed and are the targets of tests described. Details to be derived from the methods, procedures, and apparatus described will be used to report full details on several available transient pressure transducers. (V.D.S.)

N62-111466 Aeronautical Research Labs., Melbourne
MODIFICATIONS TO A HEIGHTLOCK PRESSURE TRANSDUCER FOR FLIGHT TESTS.

Modifications to a "heightlock" pressure transducer, mainly by fitting a high resolution potentiometer, and its applications in flight tests are described. When used in conjunction with a suitable recorder, changes of altitude of 2.5 feet at 10,000 feet can be detected. (Author Abstract)

INDUCTION FLOWMETER FOR DIELECTRIC FLUIDS: EXPERIMENTAL VERIFICATION.
Final Report.
The concept of an electromagnetic flowmeter for use with dielectric fluids, particularly cryogenic propellants, has been experimentally verified and found to be practicable. The test set-up and the individual components of the flowmeter are described in detail. The description of component parts includes the following: housing and fittings, magnetic circuit, pipe/transducer, amplifier, hum compensator, and associated electronic equipment. (J.R.C.)

N62-11666 National Aeronautics and Space Administration, Lewis Research Center, Cleveland
MEASUREMENTS OF FLOW DURATION IN A LOW-PRESSURE SHOCK TUBE.
OTS: $0.50.

Hot-wire signals were used to evaluate the duration of uniform flow in a shock tube. The measurements were in good agreement with similar measurements of Roshko. The similarity correlation derived by Roshko from a boundary-layer analysis was a good first-order representation of the data; however, at the extreme low pressures a systematic deviation from the correlation was noted. (Author Abstract)

N62-12133 Westinghouse Electric Corp., Elmira, N.Y.
RESEARCH ON OPTICAL AMPLIFICATION EMPLOYING ELECTRONIC SCANNING TECHNIQUES.
OTS: $4.00.
The objective of the investigation was to determine a basis for subsequent development of a highly sensitive optical to electrical transducer or television camera tube for obtaining useful images at extremely low levels of illumination. (Author Abstract)

N62-12249 Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
DYNAMIC TESTING OF PRESSURE TRANSDUCERS—A PROGRESS REPORT.
Testing methods and results are described for frequency response testing of pressure transducers and associated coupling tubing as part of a current program of dynamic testing of pressure measurement systems. A shock tube, low frequency tank, acoustic siren, and commercial testing equipment are used to excite pressure transducers. Results are analyzed either graphically or with a flying spot scanner/wave analyzer. Types of equipment are described in detail along with advantages of their use and problems encountered in their development and operation. Results of a test program to obtain maximum frequency response from a commonly used strain gauge pressure transducer are given along with general rules for selection of transducer types and coupling configurations. (Author Abstract)

N62-12358 National Aeronautics and Space Administration, Lewis Research Center, Cleveland
APPLICATION OF THE HOT-WIRE, RESISTANCE-TEMPERATURE TRANSDUCER TO THE MEASUREMENT OF TRANSIENT FLOW QUANTITIES.
OTS: ph $2.60, mi $1.04.
Properties of metallic conductors, semiconductors, thermistors, and insulators as resistance-temperature materials for use as transducers are investigated. Transient characteristics of resistance-temperature elements are discussed. Also, the use of transducers is outlined for flow fluctuation measurements such as anemometer application, free-molecule heat-transfer probe, hot-wire manometer, ion-beam hot-wire calorimeter, and temperature measurements. It is shown that, as a result of recent developments in heat-transfer correlation and electronic circuitry, resistance-temperature transducers, including semiconductors, can be introduced with good success in many new transient applications. 

John Dimeff, James W. Lane, and Grant W. Coon 119621 26 p. 

A NEW WIDE-RANGE PRESSURE TRANSDUCER. 


A new transducer has been developed that will measure pressure over a wide range by sensing the damping of a vibrating diaphragm immersed in the gas whose pressure is being measured. It is capable of measuring pressures from approximately 10 \(^{-1}\) to 200 mm Hg with an accuracy of about 1 percent over a large portion of the range. The device overcomes many of the shortcomings characteristic of other gages; it is small and rugged, with a fast response time at low pressures, and lends itself well to automatic operation. (Author Abstract) 

N62-12659 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. 

A PRESSURE-SENSITIVE DETECTOR FOR USE IN SHOCK VELOCITY MEASUREMENTS IN SHOCK TUBES AND TUNNELS. 


(NOL Tech. Rept. 61-117; Ballistics Res. Rept. 53.) 

The pressure-sensitive detector described in this report was designed to overcome various difficulties outlined herein. Two novel features of the design are absence of soldered connections to the transducer and quick-change components of working parts. The latter feature enables one to select the type of material and the thickness of the diaphragm to suit the pressure and temperature ranges expected. 

(Author Abstract) 

N62-12666 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. 

PITOT PRESSURE MEASUREMENTS IN THE NOL 4-IN. HYPERSONIC SHOCK TUNNEL NO. 3. 


(NavWeps-7329; Ballistics Res. Rept. 38.) 

This report discusses various instruments that have been used in the measurement of pitot pressure in the test section of the NOL 4-in. hypersonic shock tunnel no. 3. 

(Author Abstract) 

N62-12873 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. 

MEASUREMENT OF COOLING WATER TEMPERATURE OF AN ELECTRIC-ARC AIR HEATER. 


Instrumentation for measuring the temperature of cooling water in the vicinity of electric-arc air heaters encounters an environment of strong electric and magnetic fields, high pressure, and stray electric currents. In the transducer described here, a large signal-to-noise ratio was attained by multiplying tenfold the signal at the source and by extensively shielding against pickup. Recordings taken from the subject instrument showed rapid response and large deviation with no visible noise level. 

(Author Abstract)

N62-12988 Ballistic Research Labs., Aberdeen Proving Ground, Md. 

PROPAGATION OF LARGE AMPLITUDE WAVES IN PURE LEAD. 

J. Sperazza, Jan. 1962. 67 p. 21 refs. (BRL Rept. 1158) 

Under the experimental conditions reported herein is demonstrated that basic features of the longitudinal propagation of large amplitude waves in lead (Pb) circular rods (arising from the axial impact of two identical rods) can be predicted from a strain-rate independent theory. The primary measurements include (at different positions on the lateral surface of the rod) determinations of strain-time histories with both diffraction gratings and strain gauges. Subsidiary measurements include determinations of time of contact of the two rods; these data are not inconsistent with the strain-rate independent theory. 

A theoretically deduced dynamic stress-strain curve is verified experimentally by means of two types of transducer devices. One is a piezoelectric (quartz) transducer which measures the axial stress directly at the impact face of the two identical Pb rods undergoing axial impact. The other transducer consists of nonpermanently deforming rod of hard aluminum on whose lateral surface are mounted strain gauges; the aluminum rod is struck by a lead rod, and the axial stress is measured indirectly after the "elastic wave" in the aluminum has traveled a short distance down the rod. 

(Author Abstract) 

N62-13126 Radiation Incorporated, Melbourne, Fla. 

TELEMETRY TRANSDUCER HANDBOOK. 


Contract AF 33(616)-8309 (WADD-TR-61-67, Vol. II, Suppl. 1) 

A new "Telemetry Transducer Survey" was mailed to over 600 manufacturers. Literature search is continuing to obtain additional pertinent data for inclusion in the Handbook. Supplementary material has been prepared in standard format and is being distributed as supplements 1, 2, and 3 during 1962. The page numbering of each supplement is such that its pages are intended for insertion in Vol II of the Telemetry Transducer Handbook. Volume I will be completely rewritten. It is recognized that information on new transducer techniques, developments, and related areas must be distributed rapidly to maintain an up-to-date amount of the state-of-the-art of telemetry transducers. 

(Author Abstract) 


PRESSURE TRANSDUCER FOR MEASURING SHOCK WAVE PROFILES. 


Research is underway to develop a transducer for measuring pressure pulses in rocks and soils in the pressure range above 10 kilobars and with a rise time of the order of 0.01 microseconds. Pressures will be determined by recording the change in electrical resistance of the sensitive element of the transducer. The immediate objective of the research program is the selection of materials which can be used in this type of transducer. The resistance of an ideal material would vary smoothly with pressure, while this variation must be large enough to detect changes in pressure of a few kilobars, it must be small enough to permit measurements over a range of a few hundred kilobars. Although the resistance of many insulators (and semiconductors) varies with pressure, this project has been concerned mainly with conductors. Transducers should be easier to construct and calibrate than insulators or semiconductors. Preliminary measurements have been carried out on twelve different alloys, four of which seem suitable for use as transducer elements. 

(Author Abstract)
MECHANICAL TRANSDUCERS.

(WAL-TR-143.5/1) OTS: $0.50.

Two approaches were considered, one used semiconductor point which directly amplify the detected ultrasonic signal was investigated.

POINT-CONTACT TRANSDUCERS FOR ULTRASONIC TESTING.


Two port network representations are derived for the general linear magnetic and electric field transducers. The constraints imposed by linearity requirements are discussed. It is shown that, for the most general form of transducer, the conversion of energy leads to nonlinear relationships; and a method of solving these equations is suggested. Typical applications are included to illustrate the analysis procedure and, in particular, the case of the d.c. motor is discussed in detail.

(COAN-207)

DETERMINATION OF THE GEOMETRY OF HIDDEN DEFECTS BY ULTRASONIC PULSE ANALYSIS TESTING


The ultrasonic pulse echo method used in the detection of hidden defects in metals or other materials is investigated. In the ultrasonic pulse echo method, a single ultrasonic transducer acts as transmitter and as receiver of ultrasonic signals. The received echoes are amplified and displayed as vertical indications on a cathode ray tube. Experiments conducted indicate that the effectiveness of ultrasonic pulse echo testing can be greatly enhanced by the introduction of multifrequency signals and defect echo analysis. The main benefit derived from this innovation is that differences in the configuration or orientation of concealed defects can be determined. J.R.C.

PROPERTIES AND APPLICATIONS OF A SENSITIVE MAGNETIC TRANSDUCER


Magnetic properties of the Bonded NR Diode, whose sensitivity considerably exceeds that of conventional magnetic transducers, are discussed. Measurements of sensitivity have been made as a function of temperature, bias, and frequency. In terms of the figure of merit conventionally applied to Hall-effect devices, values as high as 155 v/amp-k gauss have been obtained at room temperature. Under proper biasing, the devices output is independent of temperature over the range 0° to 70° C. The device is particularly well suited for field probes due to its small size. Packaged units occupying a volume less than 10⁻³ cubic inches have been fabricated. Author

A NEW p-n JUNCTION STRAIN TRANSDUCER

A new strain transducer is described which is based on the sensitivity of shallow p-n junctions to suitably applied anisotropic stress. With the device subjected to forces of a few thousand dynes, resistance changes in excess of three orders of magnitude have been measured. The device can be operated at various impedance and sensitivity levels, depending on the electrical and mechanical stress biases applied. The fabrication and the results of some measurements of experimental structures serving as microphones are described. Inherently the p-n junction strain transducers can be fabricated in structures comparable in mass and size with present diodes and transistors.

1963

STAR ENTRIES

DESIGN AND DEVELOPMENT OF 3000°F TEMPERATURE-TRANSUDER SYSTEM Final Report
D. L. Rall Aug. 15, 1962 143 p 16 refs
(Contracts AF 33(657)-7132 and AF 33(600)-41517; P.O. 2-043005-9153)
(ATL-D-811)

The purpose of this program was to design, develop, and fabricate a transducer system, and method of installation, for measuring the skin temperature of the wing panel and leading edge of the Dyna-Soar vehicle during reentry into the earth's atmosphere. This system was intended for use in making temperature measurements during actual flight, as a means of developing a better understanding of the effect of descent rate, attack angle, and pitchup on aerodynamic heating during reentry. The specifications governing this system design, in general, require that the system be able to withstand skin temperatures up to 300°F and lead-wire temperatures of up to 2000°F.

N63-12272 Academy of Sciences (USSR). G. M. Krzhizhanovsky Inst. of Power Engineering, Moscow
THERMOCOUPLE MEASUREMENT OF THE TEMPERATURE IN A HIGH-VELOCITY GAS FLOW
E. V. Kudryavtsev In Israel Program for Scientific Translations, Ltd., Jerusalem Gas Dynamics and Physics of Combustion 1962 p 95-103 5 refs (See N63-12262 05-11) OTS: $1.75

The action of a high-velocity gas flow on a thermocouple is analyzed to determine the criteria for efficient design and use of transducers. Formulas are developed to compensate for the effect of heat conduction and radiation at the transducer. These are then applied to the design of transducers for both longitudinal and transverse measurements. The measurement error due to heat loss from the thermocouple junction is reduced to zero in both transducer designs by directing the thermocouple wires along an isotherm. Radiation transfer is eliminated by means of shields and the recovery factor is compensated for by standard calibration curves.

DESIGN AND DEVELOPMENT OF 3000°F TEMPERATURE-TRANSUDER SYSTEM Program Progress Report [May 1-31, 1962]

D. L. Rall May 1962 6 p 3 refs
(Contract AF 33(657)-7132)
(ATL-D-811)

Preliminary thermal-response tests of 0.012-inch-thick skin-panel assemblies have been completed. Results for skins with 1-inch-thick Q-felt insulation indicate a transient error of approximately 8.5 to 10.5% as compared with 5% predicted from electrical analog studies. These data are in contrast with results for skins with 0.1-inch insulation, which showed reasonable agreement with predicted performance. Design-verification tests have been initiated. Hot- and cold-vibration tests were completed on six panels (four with 0.012-inch skin and two with 0.030-inch skin). Results indicate that sensor performance is unaffected by the vibration environment.

N63-12634 France. Office National d'Etudes et de Recherches Aeronautiques, Chatillon-sur-Bagneux
MEASURE DES PRESSIONS RAPIDEMENT VARIABLES ET EN PARTICULIER DANS DES ECOULEMENTS A HAUTE TEMPERATURE (MEASUREMENT OF QUICKLY VARIABLE PRESSURES WITH SPECIAL APPLICATION TO HIGH TEMPERATURE FLOWS)
Jean Girvès Nov. 1962 11 p 4 refs In French; English summary
(ONERA-91)

In this paper are described O.N.E.R.A.-designed pressure pickups which have a broad bandwidth or which are in direct contact with media up to 3700°F. The various types are studied in detail as well as the detecting electronic systems. Besides the specifically aeronautical applications for which they have been developed, these pickups have wide applications in various domains because of their capability to give simultaneously the mean pressure and the fast variations of the instantaneous pressure. The electronic detector which works in conjunction with them allows telemetering over long distances; the practical use of these pickups is particularly simple with the transistorized versions.

B. J. C.

ULTRASONIC PHENOMENA AND METHODS OF MEASUREMENT: A BIBLIOGRAPHY
Charles A. Komar and J. Pasini III 1963 35 p 261 refs
(BM-IC-8146)

N63-13424 Ara, Inc., Arnold Air Force Station, Tenn.
THE DESIGN AND DYNAMIC CALIBRATION OF A PRESSURE TRANSDUCER SYSTEM FOR UNSTEADY PRESSURE MEASUREMENTS
(Contract AF 40(600)-1000)
(AEDC-TDR-63-29)

A specialized method is discussed for adapting conventional flush-mounted pressure transducers for measurement of unsteady pressures to 1000 cps. Details of the calibration apparatus are presented together with the measured effects of transducer-system geometry and environmental pressure level on the dynamic response of the system.

Author

N63-13604 Massachusetts Inst. of Tech. Electronic Systems Lab., Cambridge
CAPACITIVE TRANSDUCERS FOR NARROW-BAND VIBRATORY DISPLACEMENTS
(NASA Grant NsG-149-61)
(ESL-R-15) OTS: $3.60 ph, $1.40 mf

A sensitivity figure of merit for an electromechanical transducer is shown to be the energy density in its coupling field, and the special case of the parallel plate capacitive transducer is analyzed in detail. The limitations on the figure of merit for this transducer are calculated using the Paschen's law curve for the breakdown potential difference of an air gap and it is shown that the maximum attainable energy...
density in a uniform electric field is on the order of $4.4 \times 10^5$ ergs/cm$^2$ under conditions which can be maintained in a transducer application. A comparison of this figure with the energy densities used in existing high-sensitivity capacitive transducers shows that present designs fall short of their ultimate capabilities by approximately a factor of 25, and that their performance can be improved by close to this factor by either evacuating or pressuring the sensor package. The characteristics of electrical discharges in the region to the left of the minimum in the Paschen's law curve are discussed, and a capacitor plate design is proposed which will allow transducers to be operated in this region. An experimental program confirmed the main features of the theoretical analysis despite experimental difficulties encountered in determining accurate breakdown potentials in the region to the left of the minimum.

**N63-13937** Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio

**ENDORADIOSONDEs: A STATE OF THE ART SURVEY** [Final Report, June-Sept. 1962]

Michael McCally and George W. Barnard Dec. 1962 13 p 35 refs (AMRL-TDR-62-122) OTS: $0.50

Within the last 5 years endoradiosondes or "radio pills," have been developed employing tiny transducers and transmitters which can be swallowed or implanted in man and animals. The present state of the art of these instruments, including design, construction, uses, advantages, and limitations, is reviewed. The literature in this area, to date, consists largely of suggestions for design principles and aon be swallowed or implanted in man and animals. The present state of the art of these instruments, including design, construction, uses, advantages, and limitations, is reviewed. The literature in this area, to date, consists largely of suggestions for design principles and considerations of capacity. There is only the barest amount of useful data on equipment performance, reliability, response linearity, frequency response characteristics, and correlation with proven systems. The endoradiosonde promises to be a useful technique in physiological instrumentation, but much basic development remains to be done before this tool can be useful to any but the bioelectronic specialist.

**N63-14321** National Aeronautical Research Inst., Amsterdam (Netherlands)

**NON-DESTRUCTIVE AND DESTRUCTIVE TESTS ON REDUX BONDED SINGLE AND DOUBLE LAP-JOINTS WITH VARIOUS GLUE LINE THICKNESSES**

A. Hartman and J. B. de Jonge Mar. 1962 33 p 12 refs (Supported by Netherlands Aircraft Development Board) (NLR-TN M.2099)

A series of Redux-bonded single and double lap-joints with nonporous glue layers of various glueine thicknesses were tested ultrasonically by means of the Fokker Bond Tester. Tensile shear tests were carried out after completion of the ultrasonic tests. Bond Tester indications were in good agreement with theoretical results, indicating the instrument's ability to detect glueine stiffness. The static strength of double lapjoints turned out to be nearly independent of glueine thickness; for single lapjoints a strong dependence on glueine thickness was found. The analysis of the tensile shear test of adhesive bonded joints is discussed.

**N63-18139** California Inst. of Tech., Pasadena

I. DESIGN AND APPLICATION OF PIEZOCERAMIC TRANSUDERS TO TRANSIENT PRESSURE MEASUREMENTS. II. SOME MEASUREMENTS OF CURVATURE AND THICKNESS OF REFLECTING NORMAL SHOCKS AT LOW INITIAL PRESSURES Progress Report, Nov. 1, 1961-May 1, 1962


A small pressure transducer, using the piezoelectric properties of a manufactured ceramic, was designed, constructed, and installed in the end plate of the GALCIT 17-inch shock tube to obtain high-speed measurements of the pressure field behind a reflecting shock. The design problem for piezoceramic pressure transducers, and some possible solutions are discussed in detail. Results of transducer calibration and recommendations for improvement of the instrument are presented. An initial program to determine the curvature of a shock at low initial pressures was run concurrently with calibration of five...
of the above pressure transducers. The results of this program are described. At an initial pressure of 30 microns in the GALCIT 17-inch tube, the shock obtained at a Mach number of about 7.5 in argon is observed to have a total curvature of approximately 10 millimeters, or approximately two percent of the tube diameter. The shock thickness observed under these conditions is approximately 5 millimeters.

Author

N63-18749
Aro, Inc., Arnold Air Force Station, Tenn.

VARIABLE RELUCTANCE PRESSURE TRANSDUCER DEVELOPMENT

(Contract AF 40(600)-1000)

AEDC TDR 63-136

Pressure transducers whose time response and pressure ranges are suitable for test-section measurements in the hypervelocity tunnels of the von Kärman Gas Dynamics Facility have been developed by the Instrumentation Branch of that facility. A description of these transducers, their theory of operation, and their performance characteristics are presented.

Author

N63-18820
Royal Air Force, Inst. of Aviation Medicine, Farnborough (Gt. Brit.)

A SIMPLE TECHNIQUE FOR RECORDING SMALL EYE MOVEMENTS
G. H. Byford Air Ministry, Sept. 1961 21 p 7 refs

(FPRC/MEMO 162)

A contact lens photoelectric eye movement recording system is described. The transducer is carried on a dental bite. Sensitivities of the order of 40 sec arc per cm of trace deflection are readily obtainable with a dynamic range in excess of 50 db. Although primarily designed as a device for measuring the movements of eyes, the technique has been used for other purposes.

Author

N63-19134

MEASUREMENT OF SHOCK PRESSURES IN SOLIDS
D. G. Doran, Apr. 1963 47 p 57 refs

(Poulter Labs, TR-002-63)

This report reviews the techniques for determining the pressure exerted by shock waves in solid media. Optical, electrical, and X-ray techniques used to measure shock and free-surface velocities are described, and the deduction of shock pressure therefrom is discussed. Pressure-electric transducers are described which employ the piezoelectric and piezoresistive effects and also the shock polarization of a polar solid. The report concludes with a brief discussion of the problems encountered in the comparison of shock and static data.

Author

N63-21915
National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

STATUS OF FLIGHT LEAK MEASURING TRANSDUCERS
Internal Note
C. T. N. Paludan, July 5, 1962, 28 p

(NASA TM X-50421; M-ASTR-IN-62-14) OTS: $2.60 ph. $1.04 mf

Transducers capable of measuring small flow rates resulting from leaks in flanges in the Saturn engine systems are being developed. Principles of operation of three basic types are given in detail. The inhouse environmental tests were satisfactory, operational tests are now being made. Leakage rates up to 1000 standard cubic centimeters per minute may be measured with the present units. These units are specifically designed for liquid oxygen leaks, but are also inherently capable of operation with other cryogenic liquids, gases at less than 100°C, or even hot gases.

Author

N63-21974
Princeton U, N.J.

DYNAMIC RESPONSE TESTING OF TRANSIENT PRESSURE TRANSDUCERS FOR LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS
William C. Bentley and Joseph J. Walter, June 1963 164 p 45 refs

(NASA Contract NASr-36)

An investigation of the dynamic response of transient pressure transducers intended for use in liquid-propellant rocket combustion chambers was undertaken. Shock tube testing included optimization of operating techniques, especially of the tailored interface, and the effects of ground shock and other mounting influences. The Kistler 601 A quartz transducer was evaluated as a monitor for the Princeton Sinusoidal Pressure Generator (SPG), and a number of water-cooled transient transducers were evaluated for comparison with results from the SPG. An investigation was conducted which satisfactorily demonstrated the practical value of the SPG as a primary test device for transient pressure transducer evaluations to 10,000 cps. During evaluations, special consideration was given to developing operating techniques and improving SPG chamber design. The results from shock tube and the SPG show close agreement up to 10,000 cps, the present limit of usable SPG range. Transducers were then tested in experimental liquid-propellant rocket motors to compare laboratory measured characteristics with actual transducer performance.

Author

N63-22047
Princeton U, N.J.

J. P. Layton, R. C. Knauer, and J. P. Thomas, Sept. 1963 44 p 1 ref

(NASA Contract NASr-36)

(NASA CR-51515; Aeronautical Eng Rept-595f) OTS: $4.60 ph. $1.52 mf

Progress is reported on research in transient pressure measuring methods as applied to liquid-propellant rocket combustion chambers from 1 March through 31 December 1962. The discussion includes flush diagram transient pressure transducers for current liquid-propellant rocket combustion chambers, transducer heat-flux capability, a small passage technique for transient pressure measurements in large rocket motors, response of tubing connected pressure transducers, and dynamic response testing of transient pressure transducers for liquid-propellant rocket combustion chambers.

C.L.W.

N63-22048
Princeton U, N.J.

TRANSIENT PRESSURE MEASURING METHODS RESEARCH, AN ANALYTICAL AND EXPERIMENTAL STUDY OF THE RESPONSE OF A SMALL CHAMBER TO FORCED PRESSURE OSCILLATIONS
Clifton L. Carwile, Oct. 15, 1962 71 p 5 refs

(NASA Contract NASr-36)

(NASA CR-51517; Aeronautical Eng Rept 595d) OTS: $7.60 ph. $2.33 mf

The various resonant modes of gas pressure oscillations in a Sinusoidal Pressure Generator, featuring a closed, flat cylindrical chamber, were theoretically determined and experimentally verified, using Freon-12 and nitrogen as test media. For chamber length-to-diameter ratios less than 1.71, the transverse modes were shown to be dominant. Since the test chamber of the Sinusoidal Pressure Generator had a length-to-diameter ratio of only 0.38, it was predicted analytically that the lowest obtainable resonant frequencies would be the first
and second tangential modes. Strong transverse, nearly sinusoidal waves corresponding to these two modes were obtained in the tests, but with frequencies somewhat less than those predicted by acoustic theory. The Sinusoidal Pressure Generator was evaluated for its designed function of determining pressure transducer frequency response. With helium as the test gas, the character of the pressure waves was shown to be essentially sinusoidal, and the amplitudes of the oscillations were adequate for transducer testing throughout a test range from 1,800 to 21,600 cps. However, a departure from uniform sinusoidal response was apparent as the frequency was increased, limiting the applicable range of the Sinusoidal Pressure Generator as currently designed to about 10,000 cps for pressure transducer evaluation.

Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y.

TRANSUDER FOR DIRECT MEASUREMENT OF SKIN FRICTION IN THE HYPERSONIC SHOCK TUNNEL
R. C. Mac Arthur Aug 1963 33 p 4 refs (CAL-129)
The design considerations, construction details and operating characteristics are presented for a skin-friction transducer suitable for use in a hypersonic shock tunnel. The transducer consists of a flush diaphragm connected through a flange to a lead-zirconium-titanate piezoelectric bimorph crystal which develops a charge when placed in bending by a surface shear on the diaphragm. An inactive diaphragm-flexure-crystal arrangement is provided within the case for acceleration shear on the diaphragm. An inactive diaphragm-flexure-crystal arrangement is provided within the case for acceleration compensation. The transducer is relatively insensitive to normal pressure, to surface forces applied transverse to the sensitive axis, and to thermal effects. The transducer is adaptable to contoured surfaces by the attachment to the diaphragms of lightweight, foam-plastic buttons that conform to the local surface contour of the model.

Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.

PHYSICAL TRANSDUCERS FOR SENSING OXYGEN
A continuous oxygen analyzer based on polarography or electrochemical principles is described. The device requires no applied polarizing voltage, and its operation is feasible throughout wide ranges in environmental conditions because the electrolyte is completely encapsulated along with the electrodes. Gold is used as the indicator or polarizable electrode, and the reference electrode is made of cadmium. The overall cell reaction can be written as, 2Cd + O2 → 2CdO, so that the electrolyte solution is not depleted and does not limit the useful life of the device. The device used is a cylinder about 3 1/2 cm in diameter and 2 1/2 cm in length. The electrical output of the device depends on the area of the gold electrode exposed to the electrochemical action of oxygen, and the units normally used produce about 2.5 × 10⁻⁸ amperes per 1 mm Hg of oxygen.

1964 STAR ENTRIES
recording failed for reasons other than anticipated. A technique for obtaining Hugoniot and cross characteristic data with the pressure gage was used satisfactorily. A general technique for examining the piezoresistive behavior of conductors at high pressures has also been developed. Author

N64-14096 Aerojet-General Corp., Sacramento, Calif.

Absolute pressure transducers, Model PA334TC-2.5, were subjected to performance, frequency response, motor static firing, and safety reliability tests. The remainder of the qualification tests, including vibration, acceleration, temperature-altitude, altitude, humidity, hermetic seal, radiofrequency, interference, and performance reliability, were performed on transducer Model PA334TC-750 and are considered applicable to Model PA334TC-2.5M based on the similarity of the two parts. Successful completion of the tests has qualified the transducer for use on second-stage Minuteman motors. Author

N64-14635 Navy Electronics Lab., San Diego, Calif.

The directivity factor computer (DFC) is described. A direct current is modified electrically in correspondence with the variations in the pressure level of the transducer, at the same time, an equal area sampling is obtained for varying orientations. The dc output is converted to a proportional frequency, and all cycles are counted to provide a measure of the integrated power radiated by the transducer referenced to an equivalent sphere of 2-meter diameter. Author

N64-14761 Bell Helicopter Co., Fort Worth, Tex.
DEVELOPMENT OF A SUBMINIATURE SURFACE MOUNTED PRESSURE TRANSDUCER Summary Report F. Burpo Jan. 1963 78 p refs (Contract Nonr. 2877(00)) (Rept. 299-099-200; AD-297483)

The results of the development work and tests indicate that the subminiature pressure transducers are suitable for measuring air loads on helicopter rotors as well as in laboratory, wind tunnel, and other flight test work. These new gages measure absolute pressure, may use a.c. or d.c. excitation, are surface mounted, and require no structural modification for installation. Author

N64-16239* Dresser Electronics, Houston, Tex. Southwestern Industrial Electronics Div.
APPROXIMATE METHODS OF LINEAR TRANSDUCERS L. C. Eichberger In its Methods for the Dyn. Calibration of Pressure Transducers, 12 Dec. 1963 p 11-29 refs (See N64-16236 08-15) GPO: $0.60

The procedural steps of analytical analysis are introduced. These steps are applied to a linear transducer, which, for simplicity, is assumed to be a single-degree-of-freedom system. The characteristic differential equation of motion for this system is given. Response functions for the system are obtained for a given input function by both the classical and operational methods of analysis. The periodic (sine, square wave, and rectangular pulse) and aperiodic (rectangular pulse and step) functions are the input functions considered. Author

CONTENTS:
2. ANALYTIC METHODS FOR LINEAR TRANSDUCERS L. C. Eichberger p 11-29 refs (See N64-16238 08-15)
3. APPROXIMATE METHODS OF LINEAR TRANSDUCER ANALYSIS L. C. Eichberger p 31-51 refs (See N64-16239 08-15)
4. ANALYSIS OF NONLINEAR TRANSDUCERS D. Muster p 53-67 refs (See N64-16240 08-15)
5. SIMPLE APERIODIC-FUNCTION GENERATORS J. L. Schweppe p 69-75 refs (See N64-16241 08-15)
6. SHOCK TUBE METHODS J. L. Schweppe p 77-86 refs (See N64-16242 08-10)
7. PERIODIC-FUNCTION GENERATORS D. F. Muster p 87-95 refs (See N64-16243 08-15)
8. THE ELECTRONIC COMPENSATOR E. L. Michaels and G. F. Paskusz p 97-104 refs (See N64-16244 08-09)
Fourier integral equation. To relieve the tedious and time-consuming task of computing the integral and finding the solution in elementary situations, different approximations and/or computing aids are introduced to simplify the evaluation. Some of the approximations considered are harmonic analysis, staircase function, straight-line segment, trapezoidal, sin x/x, number series transformation, and the pseudorectangular pulse. The computing aids considered are Henderson's analyzer, Montgomery's optical Fourier analyzer, a photoelectric Fourier transformer, and an electronic analyzer with magnetic transient storage.

C.L.W.

**N64-16240** Dresser Electronics, Houston, Tex. Southwestern Industrial Electronics Div.

**ANALYSIS OF NONLINEAR TRANSDUCERS**

D. F. Muster In its Methods for the Dyn. Calibration of Pressure Transducers, 12 Dec. 1963 p 53-67 refs (See N64-16236 08-15) GPO: $0.60

The physical and analytical aspects of nonlinearity are discussed. The discussion focuses on the physical parameters of damping and stiffness and the manner of their representation in the analysis of transducer systems. Consideration is also given to analytical methods as they are applied to nonlinear systems. Particular attention is given to those methods and solutions of systems where the nonlinearity is confined to the restoring force term only and to those where it is confined to the damping term only. Among the methods of analysis, the describing-function method, the bilinear approximation, and the phase-plane method are discussed in detail. C.L.W.

C.L.W.

**N64-16241** Dresser Electronics, Houston, Tex. Southwestern Industrial Electronics Div.

**SIMPLE APERIODIC-FUNCTION GENERATORS**

J. L. Schweppe In its Methods for the Dyn. Calibration of Pressure Transducers, 12 Dec. 1963 p 69-75 refs (See N64-16236 08-15) GPO: $0.60

All methods of transducer calibration require that a known input be applied and that the output be measured precisely. Some methods of producing the required input and of evaluating the measured response are discussed. This paper covers three types of simple aperiodic-function generators: the dropping ball, the quick-opening device, and the explosive device. Author

C.L.W.

**N64-16243** Dresser Electronics, Houston, Tex. Southwestern Industrial Electronics Div.

**PERIODIC-FUNCTION GENERATORS**

D. F. Muster In its Methods for the Dyn. Calibration of Pressure Transducers, 12 Dec. 1963 p 87-95 refs (See N64-16236 08-15) GPO: $0.60

Primary concern is given to generators capable of producing pressure changes that closely approximate one of the waveforms of specific periodic functions of primary use in the dynamic calibration of pressure transducers. These waveforms are sinusoid, square-wave, and impulse functions. The generators include acoustical shock type, rotating valve and piston in-cylinder devices, sirens, and electrical, mechanical, and electromechanical exciters. C.L.W.

**THE ELECTRONIC COMPENSATOR**

E. L. Michaels and G. F. Paskusz In its Methods for the Dyn. Calibration of Pressure Transducers, 12 Dec. 1963 p 97-104 refs (See N64-16236 08-15) GPO: $0.60

An electronic device designed to provide a transfer function, which is the inverse of the transfer function of a given transducer, is described. With the aid of this device the usable frequency range of a transducer system is extended, and the labor involved in the determination of the driving function is reduced. The discussion includes the principles upon which the device is based, a description of the circuit, and the frequency response of the device. C.L.W.

**REFERENCE**

Methods for the Dyn. Calibration of Pressure Transducers, 12 Dec. 1963 p 53-67 refs (See N64-16236 08-15) GPO: $0.60

The physical and analytical aspects of nonlinearity are discussed. The discussion focuses on the physical parameters of damping and stiffness and the manner of their representation in the analysis of transducer systems. Consideration is also given to analytical methods as they are applied to nonlinear systems. Particular attention is given to those methods and solutions of systems where the nonlinearity is confined to the restoring force term only and to those where it is confined to the damping term only. Among the methods of analysis, the describing-function method, the bilinear approximation, and the phase-plane method are discussed in detail. C.L.W.

**REFERENCES**

Simple Aperiodic-Function Generators

J. L. Schweppe


All methods of transducer calibration require that a known input be applied and that the output be measured precisely. Some methods of producing the required input and of evaluating the measured response are discussed. This paper covers three types of simple aperiodic-function generators: the dropping ball, the quick-opening device, and the explosive device. Author

Periodic-Function Generators

D. F. Muster


Primary concern is given to generators capable of producing pressure changes that closely approximate one of the waveforms of specific periodic functions of primary use in the dynamic calibration of pressure transducers. These waveforms are sinusoid, square-wave, and impulse functions. The generators include acoustical shock type, rotating valve and piston in-cylinder devices, sirens, and electrical, mechanical, and electromechanical exciters. C.L.W.

Electronic Compensator

E. L. Michaels and G. F. Paskusz


An electronic device designed to provide a transfer function, which is the inverse of the transfer function of a given transducer, is described. With the aid of this device the usable frequency range of a transducer system is extended, and the labor involved in the determination of the driving function is reduced. The discussion includes the principles upon which the device is based, a description of the circuit, and the frequency response of the device. C.L.W.
located 2 cm from the distal end. This results in a tip that follows the bloodstream without special manipulation. During implantation, its position is monitored by the use of a pressure transducer, thus eliminating the need for fluoroscopy. Since the catheter is self-guiding, it may be implanted with ease from such distal locations as the femoral vein. It can be used to inject substances directly into the heart or pulmonary artery, or to withdraw blood samples. It also can be used to make pressure recordings of high quality from these areas. Author

N64-19015* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. MEASUREMENT OF THE HEARTBEAT OF BIRD EMBRYOS WITH A MICRO-METEORITE TRANSDUCER Technology Utilization Report Vern L. Rogallo Washington, NASA. Apr. 1964 16 p (NASA-SP-5007) OTS: $0.50 A new ultrasensitive momentum transducer has been successfully adapted as a ballistocardiograph to measure the heartbeat of avian embryos. Experiments have demonstrated that life can be detected as early as 4 days in the incubation period and monitored to maturity without damage to the avian embryo. Changes in heart-beat rate and intensity resulting from temperature changes, or other external stimuli, were readily detected by the instrument. The technique appears to open new avenues of investigation for application in such areas as vaccine production and drug research. Author

N64-22660 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div. MEASURING PULSATING PressURES WITH THE AID OF MEMBRANE TRANSDUCERS Yu. G. Zakharov 2 Jan. 1964 21 p refs Transl. into ENGLISH from Prom. Aerodinamika (Oborongiz). no. 19, 1960 p9-20 (FTD-TT-63-737/1+2; AD-433076) When using a transducer to measure pressure changes in an airstream it is not always possible to place the transducer directly at the point of interest. Under these conditions the pressure that is being studied is brought to the transducer through a channel consisting of an input nipple, a connecting tube, and an air cavity formed by the transducer housing and the membrane. An attempt is made to determine experimentally the correction factors for the measured amplitude and phase of a pulsating pressure, by considering the transducer and the inlet tube as a single oscillating system. P.V.E.

N64-23527* Southwest Research Inst., San Antonio, Tex. A RESISTIVE WHEATSTONE BRIDGE LIQUID WAVE HEIGHT TRANSDUCER Technical Report No. 3 Daniel D. Kana 10 May 1964 18 p refs (Contract NASB-11045; SwRl Proj. 02-1391) (NASA-CR-56551) OTS: $1.60 ph The resistive-Wheatstone bridge liquid displacement transducer used in present liquid dynamics studies is a reliable device, well suited to liquid amplitude and frequency ranges usually employed for such studies. It appears that at frequencies below 4 cps, its accuracy is within about 3% to 5% when used in ordinary tap water, most of the errors being caused by surface tension effects. If it is possible to use fixed wires without a supporting glass rod, the error due to surface tension effects would be greatly diminished. A number of parameters of the system that can be changed to adapt this transducer to different experimental requirements are listed. N.E.A.

N64-24243 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div. MEASUREMENTS OF STRESSES IN MACHINERY COMPONENTS V. F. Yakovlev and I. S. Inyutin 30 Jan. 1964 145 p refs Transl. into ENGLISH of the book "Izmereniya Napryazheniy Detaley Mashin" Moscow, Gos. Nauchno-Tekhn. Izd. Mashinostroj. Lit., 1960 p 1-114 (FTD-TT-63-731/1+2; AD-437115) This volume considers methods for experimental measurement of stresses within machinery components. The fundamentals of stress measurement by means of baseless wire pickups at internal points in components are set forth. Examples in which a number of problems are solved experimentally under the conditions of linear, two-dimensional, and three-dimensional stressed states with static and dynamic loads are given. Author

N64-28352* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. VIBRATING MEMBRANE ELECTROMETER WITH HIGH CONVERSION GAIN John Dimeff and James W. Lane Repr from The Rev. of Sci. Instr., v. 35, no. 6, Jun. 1964 p666-668 refs (NASA-RP-289) A vibrating membrane transducer is used as the sensing element for a high sensitivity electrometer. The method of operation provides an increased conversion gain by using a special circuit in which the electrometer current controls the displacement amplitude of a membrane forced to vibrate at its resonant frequency. The experimental transducer produces an alternating output voltage, is small and rugged, and has a conversion gain three orders of magnitude greater than electrometer transducers in current use. Author

N64-29389 National Aeronautical Lab., Bangalore (India) PRESSURE TRANSDUCERS USING THE LINEAR DIFFERENTIAL TRANSFORMER S. Balakrishna and S. Srinathkumar Jul. 1963 16 p refs (TN-SE-3-63) A pressure transducer is described that uses a linear variable differential transformer to sense the displacement at the center of a diaphragm subjected to the pressure being measured. Design details of the transducer are given, including complete specifications for the differential transformer and the electronic circuit used for indication. The diaphragm of the transducer is changed to get different full-scale pressure ranges. The accuracy of the transducer in all ranges is better than ± 1 percent. Author

N64-29393 George Washington U., Washington, D.C. Center for Measurement Science TWO-PORT FORMULATION OF ELECTROMECHANICAL TRANSDUCERS Louis de Pian and Robert M. Moore 10 Jul. 1964 37 p refs (Contract Nonr-761(09)) (Rept.-1; AD-602216) This report begins with a discussion of analogies as they pertain to electromechanical transducers. Following this discussion, the linear operating equations of the general transducer are formulated as matrix equations, and the various possible matrix parameters and equivalent networks for such devices are presented. The concept of reciprocity, nonreciprocity, and antireciprocity are then introduced, and their significance is discussed. Finally, a general development of the salient properties of linear electromechanical transducers, including natural (transient) and forced (steady state) response behavior, is developed, and the techniques are illustrated. Author
Six electromechanical pressure transducer systems consisting of variable reluctance transducers, tubing, valves, and fittings with water as the pressure transmitting fluid were designed, built, and tested. The systems were used to measure transient pressure drops caused by transient flow conditions in thermal and hydraulic experiments, which simulate nuclear heating of pressurized water reactors through electrical heating of test sections. The frequency response and damping factor measurements for 21 combinations of transducer rating and system design are tabulated. The effect upon response and damping of various sizes of orifices is also tabulated. Author

The piezoresistance gage initially permitted recording of pressure profiles of 10- to 150-kbar peak gage pressure, and the insulator was reasonably matched to the shock impedance of desert surface. At the time of cancellation of Project Coach, work had been initiated to design, construct, and test gages matched to the shock impedance and, if possible, to the Hugoniot of salt. Matching the shock impedance proved quite feasible, and work was begun on matching the Hugoniot of salt. Matching procedures and materials are listed. D.E.W.

A new method of converting thermal energy to electricity has been investigated and the results are presented. The method employs electrochemical principles, and the device has been named the Electrothermally Regenerative Transducer. The study has shown a limiting efficiency of 35% conversion of heat. A transducer system capable of providing 500 A continuously at 28 V, with a maximum current of 5000 A at 18 V, has been designed. The average efficiency calculated for the design is 24% and the weight is 811 lb. Laboratory data obtained on single electrodes show current densities of more than 25 A/in.² to be possible. Author
1963

IAA ENTRIES

A63-10758

DRAG-BODY FLOWMETER.

Mead Stapler (Ramapo Instrument Co., Inc., Bloomingdale, N.J.)


Description of a drag-type flowmeter for measuring the impact force of a moving stream in terms of flow rate in gallons per minute (0.1 to 10,000 gpm). In the design of a drag-body flowmeter the following basic features are considered: sensitivity, stability, infinite resolution, negligible hysteresis, insensitivity to variations in line pressure and temperature, resistance to corrosion, and compatibility of materials. The flowmeter employs a magnetic fluid transducer system which is isolated from the fluid, and is compatible with existing strain gages. It should not have any wearing or rotating parts. Suggested areas of application include measurement of transient-flow response in servovalve testing and flow recording of high-temperature, cryogenic, or corrosive fluids.

A63-11187

PERFORMANCE CHARACTERISTICS OF TURBINE FLOWMETERS.


Discussion of the general performance of turbine-type or propeller flowmeters operating on liquid hydrocarbons in the range 0.5 to 250 gpm. Particular characteristics investigated include the effects of flow rate, viscosity, pressure level, entrance flow pattern, and orientation on the performance of these meters. It is shown that metering precision better than 0.2% can be attained for selected ranges of flow rate and viscosity when entrance conditions and meter orientation are suitably controlled. Other factors briefly reviewed include dynamic response, totalization considerations, and the readout instrumentation.

A63-11224

SURVEY OF PRESSURE TRANSDUCERS.

K. S. Lion (Massachusetts Institute of Technology, Cambridge, Mass.)


Brief review of transducer-system principles and design parameters, applicable to measurements of static and dynamic pressures in fluid-flow fields. Types of pressure transducers discussed and illustrated include resistive (Bridge), capacitive, piezoelectric, and electrokinetic. The development of some new types of capacitive transducers, with elastic deformation of the dielectric layer, is noted.

A63-12250

MESURE DES PRESSIONS RAPIDEMENT VARIABLES ET EN PARTICULIER DANS LES ECULEMENTS A HAUTE TEMPERATURE [MEASUREMENT OF QUICKLY VARIABLE PRESSURES WITH SPECIAL APPLICATION TO HIGH TEMPERATURE FLOWS].

Jean Girvès (ONERA, Chatillon-sous-Bagneux, Seine, France)


Description of progress achieved by ONERA in the design of pressure pickups which have a broad bandwidth or which will be brought into direct contact with media heated to 3,700°K. Various types of pickups and the electronic detecting systems are considered in detail. It is pointed out that, in addition to the specifically aeronautical applications, these pickups are adaptable to a wide range of problems, due to their capability to give simultaneously the mean pressure and the rapid variations of the instantaneous pressure. The transducerized versions of these pickups are of particular interest. The electronic detector which operates in conjunction with these pickups allows telemetering over long distances.

A63-12478

INSTRUMENTATION FOR SHOCK TESTING.

J. E. Rhodes (Endevco Corp., Pasadena, Calif.)


Discussion of methods for measuring transient shock motion, emphasizing acceleration determinations. The distortion of rectangular pulses by low- and high-frequency, first- and second-order transfer functions is described. Frequency response requirements are considered in relation to accelerometers and flowmeter recorders and filters. It is seen that, in addition to high resonant frequency, an accelerometer should follow the characteristic response for the unamplified single-degree-of-freedom mechanical system without spurious minor resonances. The galvanometer resonance frequency should be high so that minimum distortion of the basic transient is introduced. A review of shock transducers includes the following: (1) variable-potentiometer transducers, (2) seismic differential-transformer and variable-reluctance transducers, (3) strain-gage accelerometers, and (4) piezoelectric accelerometers. The calibration of transducers and the effects of mounting techniques in transducer resonance frequency are briefly discussed.

A63-13024

THE TOROIDAL DISPLACEMENT TRANSDUCER.

Rolf K. Brodersen (Martin-Marietta Corp., Orlando, Fla.)


Survey of the principles, characteristics, and relative merits of electrodynamic displacement transducers of both the variable-reluctance and constant-reluctance types, with particular reference to a novel toroidal displacement transducer of the latter type. This transducer has the salient features of operating with constant air-gap reluctance, independent of rotor angular position, so that no tangential forces due to rotor angular displacement are developed. Both the primary and the secondary coils are stationary, and since
they are wound on the same stator ring, no flexleads are required. The combination of the following two features is novel: (1) the primary coils can be tuned to provide magnetic support of the rotor, and (2) if magnetic suspension is not desired, the primary coils can be tuned so that the rotor is completely force-free in the radial direction. A schematic diagram of a circuit for four-pole toroidal pickoff, with tuned primary coils, is presented.

A63-13914

RESOLUTION OF PRESSURE IN TURBULENCE.

G. M. Corcos (University of California, Dept. of Aeronautical Sciences, Berkeley, Calif.)


Contract No. NSF-G-88115.
The discussion of the ability of a transducer to resolve the spatial details of a turbulent pressure field, with particular reference to two applications. The first is an evaluation of the adequacy of contemporary measurements of the properties of turbulent pressure fields in shear flows, and the second is an assessment of the possible discrimination by a sonar receiver between sound and local turbulent pressure fluctuations which act as background noise. To this effect, an example of the mapping of a random function of several variables by a linear operator is examined. Making use of a formalism and of recent experimental information on the spatial structure of turbulent pressure fields in boundary layers, the mapping or distortion of statistical quantities associated with the second-order moments of the pressure fields is demonstrated. The attenuation of the frequency-spectral density and of the cross-spectral density is presented in a table, in asymptotic form. The numerical results indicate that the attenuation caused by the finite size of transducers is generally more severe than is suggested by previous computations, mainly because the lateral correlation of pressure is highly frequency-dependent. Referred to the applications under consideration, these findings indicate the type of spatial relations required for the evaluation of transducer resolution.

A63-13649

ERROR BAND CONCEPT DEFINES TRANSDUCER PERFORMANCE.

Harry N. Norton (General Dynamics Corp., Astronautics Div., San Diego, Calif.)


Brief discussion of the error-band concept which simplifies specifications and performance verification of transducers. The inadequacy of the instrument-oriented specifications in terms of individual errors is briefly considered. The factors included in an error-band specification, which is the band of maximum deviations of output values from a specified reference line or curve, are presented. The reference line is found to remain unchanged for all error bands of a transducer regardless of environmental or test conditions applicable for them.

A63-15141

SURVEY OF PRESSURE TRANSDUCERS.

G. Tegerdine.


Brief summary of the design, principles of operation, and applications of small displacement-force pressure transducers. Considered are the piezoelectric-, the variable inductance-, and the variable capacitance-types of transducers, as well as the vibrating-cylinder and strain-gage pressure transducers. Specifications are presented for the commercially available transducers of these types which are manufactured by 10 British instrument firms.

A63-15342

A FAMILY OF DIGITAL TRANSDUCERS.

Myron L. Feistman and Paul Ursieke Brown (Radio Corporation of America, Camden, N. J.)


Discussion of the function of digital transducers, the applications for which they are especially required, and the variables which they are best adapted to measure. A brief survey of methods of digitizing is given in which the principles used in this system are presented. The practical problems involved in the design of a usable transducer are considered, and several transducers are described. It is concluded that with a 90-yr half-life material such as Pu238, and a count rate of 1 x 10^9 cps, the accuracy is expected to be better than ± 1%. The solid-state amplifier and counter, which weighs less than 0.5 lb and occupies less than 15 in. 3, transducer volume is less than 4 in. 3, and power requirements are less than 1 watt.

A63-15853

A STRAIN GAGE PRESSURE TRANSDUCER WITH ALL-ROUND PERFORMANCES.

Ya T. Li (Massachusetts Institute of Technology, Dept. of Aeronautics and Astronautics, Cambridge, Mass.)

IN: Air, Space, and Instruments — Draper Anniversary Volume.


Description of a pressure transducer, the pressure-sensing element of which consists of a pair of concentric cylinders. Pressure is admitted to the space between the two cylinders to expand the outside one while compressing the inside one. A strain gage of wire foil, or solid-state material, is bonded to the outside of the outside cylinder and the inside of the inside cylinder to form the standard Wheatstone bridge. This configuration allows good temperature compensation and provides for four active arms. The reciprocal dimensional change of the inner and outer cylinders provides linearity compensation. The device has high accuracy, high overload characteristics, and high response speed with good damping properties.

A63-15940

TWISTED BEAM TRANSDUCER: FREQUENCY SHIFTS IN VIBRATING MODES OF BEAMS UNDER TWIST.


Brief summary of the design, principles of operation, and applications of small displacement-force pressure transducers. Considered are the piezoelectric-, the variable inductance-, and the variable capacitance-types of transducers, as well as the vibrating-cylinder and strain-gage pressure transducers. Specifications are presented for the commercially available transducers of these types which are manufactured by 10 British instrument firms.

A63-16327

HALL-EFFECT TRANSDUCERS.

Joseph Star (Instrument Systems Corp., Halford Div., Westbrook, N. Y.)


Study of the application of Hall-effect devices and of the characteristics associated with them. The principal fields of application are in the measurement and control of magnetic fields and currents, and in the multiplication of currents. These applications are described, and the requirements which must be satisfied for semiconductors in the Hall generator are discussed.
MODE THEORY OF MULTITERMINAL TRANSDUCER CHAINS.


Application of the mode concept to the analysis of linear multiterminal transducers operating at a discrete frequency. The transducer matrix is examined, with restrictions on reciprocity, symmetry, and losslessness introduced as special cases. The proper modes of signal transmission are classified into reactive, pseudo-active, and power-handling modes. Single and multiple mode operation is studied, and a mode-sorter termination developed for the multiple mode. An analysis of special multiterminal transducers shows that qualitative restrictions, such as losslessness and reciprocity, impose orthogonality relations upon the modes, and restrictions upon the properties and applications of various classes of transducers are demonstrated by an example. Mode sorters are shown to be realizable transformer banks in symmetrical chains. Appendices include the calculation of mode constants.

A TRANSDUCER AS A DEVICE FOR MEASURING HEAT TRANSFER RATES IN HYPERVELOCITY WIND TUNNELS.

R. L. Ledford (ARO, Inc., von Kármán Gas Dynamics Facility, Tullahoma, Tenn.)

University of Denver, Denver Research Institute, Symposium on Hypervelocity Techniques, 3rd, Proceedings, Denver, Colo., Mar. 20, 21, 1962.)


Appendix No. AF 40(600)-800.

Description of a heat-transfer-rate transducer which may be employed to measure transient heat-transfer rates ranging upward to approximately 1,000 Btu/ft²sec in intermittent, electric-arc-driven wind tunnels. The transducer utilizes a copper disk as a calorimetric mass and a thermocouple as a temperature sensor. A detailed description of its associated instrumentation is also given along with results of an evaluation test conducted on the entire system.

A METHOD FOR DEFECT DISCRIMINATION IN AUTOMATIC, MULTIPLE TRANSDUCER INSPECTION SYSTEMS.

Walter A. Gunkel (Southwest Research Institute, San Antonio, Tex.)

(Society for Nondestructive Testing, Inc., South Texas Sect., and Southwest Research Institute, San Antonio, Tex., Feb. 27-Mar. 1, 1963.)


Description of a multiple-transducer system designed and tested for automatic defect discrimination. Covered are primary discrimination, multiple-transducer inspection systems, and combinatorial discrimination. The latter is obtained by an analysis of the combinations of signals existing on the nine output channels.

CRYOGENIC ACCELERATION AND TEMPERATURE TRANSDUCTION.


Description of the design and calibration techniques for accelerometers at low temperatures. Also discussed is a temperature probe based upon the utilization of a carbon element, and capable of providing measurement and control of temperatures near absolute zero.

THE DEVELOPMENT OF AN IMPLANTABLE, NONOCCLUSIVE, NON-INVASIVE BLOOD PRESSURE MEASURING SYSTEM.

H. A. Gorman, R. Grau, J. Craig, and F. La Rue (Martin Marietta Corp., Martin Co., Denver, Colo.).


Members, $5.50; nonmembers, $1.60.

Review of hemodynamic investigations to develop an accurate, implantable blood-pressure transducer-transmitter system for sensing both the systolic and the diastolic pressures within intact arteries of subjects in orbiting vehicles, and for delivering the data from the subject to receiving-recording equipment. The feasibility of a nonoccluding, noninvasive system is established. The transducer developed is a silicone-rubber split cuff on which strain gages are bonded to give a circumferential deflecting wave during the entire pulse wave. The signal is fed to the transmitter by a braided cable enclosed in the silicone rubber which isolates the strain gages and wiring from the humeral fluids of the body. The surgical implantation and calibration of the system are described.

A HALL EFFECT ACCELEROMETER.

Maciej Nałęcz and Henryk Ziomecki (Polish Academy of Sciences, Institute of Automatic Control, Electrotechnical Dept., Warsaw, Poland).


Description of a new measurement technique for accelerometers, using the Hall effect in semiconductors. The mechanical system of the accelerometer consists of a mass suspended from the frame by a flat spring. The accelerations to be measured are proportional to the deflection of the other end of the spring. The mechanical displacements are measured by the Hall voltage, with the Hall generator mounted at the end of the spring and moving in a nonuniform magnetic field. When the gradient of the magnetic field is linear the Hall voltage is proportional to the measured acceleration. Two magnetic systems with permanent magnets are discussed. Using the Hall generator with the gradient equal to about 10,000 gauss/mm, Earth accelerations from 1 g to 10⁻² g can be measured on the linear scale.

WHERE ULTRASONIC TRANSDUCERS ARE TODAY.

Erhard Sittig (Dura-Bond Bearing Co., Durasonics Division, Palo Alto, Calif.).


Description of the properties and applications of various classes of ultrasonic transducers. The classes discussed are piezoelectric single crystals, ferroelectric electrostrictive ceramics, and magnetostrictive metals. Various characteristics of these types of transducers are tabulated, among them density and piezoelectric constant. The application of ultrasonic transducers for electrical circuit components, passive vibration and sound signal pickups, sound and vibration generation, and modulators of electromagnetic radiation are discussed, as are the power output and operating frequency limitations of these devices.

ALIGNMENT AND MEASUREMENT WITH ELECTRONIC LEVELS.

John M. Miller (Grumman Aircraft Engineering Corp., Bethpage, N.Y.).

Tool and Manufacturing Engineer, vol. 51, July 1963, p. 75-78.

Abridged.

Description of the electronic level, which incorporates the sighting of vertical and horizonal lines for attitude information and the measurement of angular increments. The device is designed for use in alignment and surveying work. Machine alignment, layout work, and measurement of bedrock in construction sites are examples of applications. The system is used to align and measure building and machine components, and to establish benchmark surveys.
that is recorded on a meter in seconds of arc. The application of an
electronic level in checking bearing race alignment is illustrated in
detail. Also described is the application for checking surfacetables
The checking method is called isoleveling because lines of equal
level are applied to the surface with easily-removed grease pencil. It is noted that elec-
tronic levels cost less than autocollimation equipment and can be
used by less-skilled personnel.

A64-15885
THE LIFT AND DRAG FORCES ON A CIRCULAR CYLINDER
OSCILLATING IN A FLOWING FLUID.
R. E. D. Bishop and A. Y. Hassan (London, University, University
College, Dept. of Mechanical Engineering, London, England),
Royal Society (London), Proceedings, Series A, vol. 277, Jan. 7,
1964, p. 51-75.

Description of a transducer used to measure the fluctuating lift
and drag forces, and the steady drag force, acting on a circular
cylinder placed transversely to a fluid flow. The theory of the
transducer is reviewed, and the method used to determine the lift
forces at different amplitudes and frequencies is discussed. Response
diagrams, obtained by keeping the flow rate constant and varying the
amplitude of the oscillations, are presented.

A64-16625
LOW-PRESSURE MARVELS - SOLID-STATE TRANSDUCERS.
J. C. Sanchez (Micro Systems, Inc., Pasadena, Calif.).

Review of small-diaphragm transducers developed to improve
the reliability, precision, sensitivity, and size of instrumentation
for low-pressure measurements. Possible applications are: re-entry
measurements on ablation heat shields of advanced space vehicles,
transfer standard for condensible-vapor calibrations of gas-sensitive
gages, measurement of model and tunnel pressures in hypersonic
helium blowdown tunnels, replacement of radioactive
sensitive thermal conductivity gages, replacement of radioactive
ionisation gages, and similar uses. Some promising approaches to
the design and manufacture of such instruments are discussed, with
particular reference to the bonded semiconductor (piezo-resistant)
strain gage, and capsule (or diaphragm-type) transducers.

A64-17210
EXPERIMENTAL MECHANICS IN THE DEVELOPMENT OF A NEW
MINIATURE PRESSURE TRANSDUCER.
Charles W. Bent and Nelson A. Crites (Battelle Memorial Institute,
Solid and Structural Mechanics, Columbus, Ohio).
IN: EXPERIMENTAL MECHANICS, PROCEEDINGS OF THE FIRST
INTERNATIONAL CONGRESS ON EXPERIMENTAL MECHANICS,
NEW YORK, NOVEMBER 1-3, 1961.
Edited by B. E. Rossi.
pp. 107-322. 16 refs.
Contract No. NO 01-2877-08.
Development of a miniature pressure transducer of the dia-
phragm type, with strain elements based on a new concept, to
measure in flight the air pressure acting on a helicopter rotor blade.
With a number of these transducers installed along the blade chord,
the pressure distribution can be measured under various flight
conditions. This information is of importance in connection with a
study of the aerodynamics of the blade and possible improvement in
the blade design. With an overall volume of less than 6.00 in.3, the
instrument is believed to be the smallest pressure transducer that
can measure static pressures as well as relatively high-frequency
pressure fluctuations. It is also believed to offer promise for
investigations of strain distributions in such small parts as gears,
bearings, housings, and switches.

A64-17295
WHAT'S AHEAD IN BIOMEDICAL MEASUREMENTS?
L. E. Slater (Case Institute of Technology, Cleveland, Ohio).
ISA Journal, vol. 11, Feb. 1964, p. 95-60. 23 refs.
Presentation of the design concept of biomedical measuring
devices that may ultimately approach microsc size. Removable
probes having been used for measurements within living tissue; it
is suggested that the transducer itself could be implanted as a semi-
permanent device, transmitting information by radio. Semiconductor
device technology is considered a promising source for micro-sized
transducers. Spectroscopy is made concerning the possibility of
uniting the concepts of biomagnetism with quantum mechanics. A
second speculation suggests that micronsize sensing systems may
permit extension of man's homeostatic (self-regulating) capa-
bilities to permit adaptation to unusual environmental stresses.
A64-22505

A MAGNETODYNAMIC MOTION TRANSDUCER.

M. N. Kaplan (North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.).

IN: NATIONAL CONVENTION ON MILITARY ELECTRONICS, 7TH, WASHINGTON, D. C., SEPT. 9-11, 1963, PROCEEDINGS.

Conference sponsored by the Professional Technical Group on Military Electronics, Institute of Electrical and Electronics Engineers.

Edited by B. J. Goldfarb.


Recommendation of a means for measuring a physical characteristic of space known to exist, but never before measured by direct means. An MDM transducer is described which employs moving solid dielectric media to physically convey charge; it is stated that liquid or gaseous dielectrics could be employed, where quantitative correction could be made for the effects of ion mobility. It is concluded that, when the motion vector is finite, it should be measurable by means of a shielded MDM transducer in the geotric twan of a superposed potential gradient. The MDM-transducer should find numerous uses, including passive airborne ground speed sensing, as well as motion sensing deep in magnetized space. It might also find use as a surface means for sensing geographic north.

A64-22766

A NEW METHOD FOR MEASURING THE PRESSURE DISTRIBUTION ON HARMONICALLY OSCILLATING WINGS OF ARBITRARY PLANFORM.

H. Bergh (National Aeronautical and Astronautical Research Institute, Amsterdam, Netherlands).


Members, $0.50; nonmembers, $1.00.

Description of a method of measuring the pressure distribution by means of a pressure transducer mounted inside a scanning valve. The scanning valve, located outside the test section, is connected to the model orifices by equal pressure leads. The correction procedure is specially simplified so as to eliminate the influence of the pressure leads. The equipment, developed to measure a large number of pressures automatically, is described. Examples are presented which are considered to demonstrate the usefulness of the technique.

A64-23179

TRANSDUCERS FOR DYNAMIC MEASUREMENTS.

R. R. Bouche (Endevco Corp., Pasadena, Calif.).

IN: INSTITUTE OF ENVIRONMENTAL SCIENCES, ANNUAL TECHNICAL MEETING, PHILADELPHIA, PA., APRIL 13-15, 1964, PROCEEDINGS.

Mt. Prospect, Ill., Institute of Environmental Sciences, 1964, p. 97-110. 17 refs.

Discussion of the applications, principles, and performance of various types of transducers. Although some of the transducers described measure constant mechanical stimulus - i.e., zero frequency, the discussion is directed toward their use for dynamic measurements. The transducer types covered are: seismic transducers, variable resistance transducers, variable inductive transducers, piezoelectric transducers, and piezoresistive transducers. A variety of calibration methods is also presented.

A64-24231

TRANSDUCERS FOR MEASUREMENT. I: INTRODUCTION AND THEORY OF PRESSURE MEASUREMENT.

L. E. Bollinger (Ohio State University, Dept. of Aeronautical and Astronautical Engineering, Columbus, Ohio).

Symposium on Environmental Measurements, Cincinnati, Ohio, Sept. 4-6, 1963.


Discussion of pressure-sensing devices that can be actuated by waves from one or more transmission systems or media and that can supply related waves to one or more other transmission systems or media. In a brief introduction to transducers in general, the author
indicates that, ideally, transducers should respond instantaneously with respect to time. That is, for a step-function input, the output signal should follow the input signal without distortion in amplitude, frequency, or phase. Over a limited range, many actual transducers are said to approach this ideal. The type of transducer selected to obtain measurements of pressure in fluids is indicated to depend on a number of aspects of the particular application, including: range, accuracy, frequency response, location of detector and indicator, reliability, simplicity, availability, fluid temperature, fluid velocity, fluid corrosiveness, adaptability to automatic control, and cost. Discussions are also presented on Newtonian and non-Newtonian fluids, the influence of Reynolds number on flow, laminar and turbulent types of flow, fluid dynamics, and Bernoulli’s equation.

A64-24737

A PIEZOELECTRIC ACCELEROMETER.
Jack Willis and Bruce Darrel Jimerson (California, University, Dept. of Engineering, Los Angeles, Calif.).

Presentation of a design for an accelerometer thought to have a potential sensitivity of 1.5 g for a 1-lb inertial mass. The proposed accelerometer is assumed to have: (1) a proof mass of 1 lb; (2) a frequency shift that is linear over the range of interest; (3) a constant operating temperature; (4) oscillator stability of about one part in 10^7 (achieved by controlling temperature); (5) a maximum range of 20 g; (5) a pair of crystals ( 实际保耦合在频 率范围内); and (7) ideal coupling between the proof mass and the transducer. The change in frequency expected when acceleration changes from 0 to 20 g is said to be of the order of 4 Kc. Methods of improving both sensitivity and linearity are discussed, including the application of a dc bias voltage to the crystal.

A64-24919

MEASUREMENTS OF INTERNAL STRESS IN ELECTRONIC ENCAPSULATING RESINS WITH A SMALL SOLID STATE TRANS-DUCER.
G. Dallimore, F. Stucki, and D. Kasper (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Research Laboratories, Palo Alto, Calif.).

Description of a small solid-state thermomagnetic pressure transducer which can be embedded in an electronic package. Internal pressure data during thermal cycling and thermal shock, measured by the transducer on three types of resins, are provided. The effect of a silicone rubber coat on the transducer is also discussed. It is concluded that the transducer described offers the resin chemist, electronic packaging engineer, and design engineer a new tool for determining the effects of various catalysts, fillers, flexibilizers, diluents, and other modifying agents on the cure shrinkage and internal stresses generated during thermal cycling and thermal shock. In addition, it is anticipated that this device can be used to measure the effects of vacuum and radiation environments on electronic embedding materials.

A64-25349

ACCURATE PRESSURE TRANSDUCERS FOR EXTREME ENVIRONMENTS.

Description of a recently developed, self-contained, force-balance pressure transducer. The instrument, complete with electronics, is said to operate over a temperature range of -40 to +150°C, to have errors limited to 1/3% of full scale, and to measure absolute pressures up to 150 psi. It is reportedly withstand high vibration levels without transmitting erroneous readings and can be mounted in an aircraft without vibration mounts. Its response time is indicated to be of the order of 20 msec and its output is 1 vdc/pa from 1 kohms. The choice of the force-balance element and of the pressure-sensitive element is described, and characteristics of the null detector and the amplification and stabilization techniques are discussed.

A64-25773

TRANSDUCERS FOR MEASUREMENT. II - DEVICES FOR MEASURING PRESSURE.
L. E. Bollinger (Ohio State University, Columbus, Ohio).

Discussion of pressure-measuring devices. The following transducers are considered: (1) Manometers. The meniscus problem and the height of a column of liquid are mentioned; (2) Pilot and pilot-static tubes. A schematic diagram is given along with the specifications for making a good tube; (4) Resistance and capacitance gages; and (5) Piezoelectric gages. The last two change their physical values with a change in pressure.

A64-26403

TRANSDUCERS FOR MEASUREMENT. III - TEMPERATURE FROM ONE EXTREME TO THE OTHER.
L. E. Bollinger (Ohio State University, Columbus, Ohio).

Review of the history, theory, and applications of modern temperature-measuring equipment. Beginning with the conventional mercury-in-glass thermometer, the following specific types of temperature transducers are discussed: liquid-in-glass thermometers, bimetallic thermometers, resistance thermometers, thermistors, and thermocouples. The typical optical pyrometer, thermistor circuit, the Seebeck, Peltier, and Thomson effects, and voltage output of various thermocouple metals vs platinum as a function of temperature are diagrammed. Basic laws governing a thermoelectric circuit are defined: the law of homogeneous circuits, the law of intermediate metals, and the law of intermediate temperature.

A64-26453

NATIONAL TELEMETERING CONFERENCE, LOS ANGELES, CALIF., JUNE 2-4, 1964, PROCEEDINGS.

CONTENTS:
PREFACE. Fred M. Riddle. 1 p.
SESSION I - SENSORS AND DATA COMPRESSION.
PRESSURE AND TEMPERATURE TRANSDUCERS FOR HIGH TEMPERATURE AND NUCLEAR RADIATION ENVIRONMENTS.
AN ADVANCED AEROSPACE TELEMETRY TRANSDUCER.
R. H. Russell (Micro Systems, Inc., Pasadena, Calif.). 6 p. [See A64-26455 22-09]
REDUNDANCY REDUCTION - THE KEY TO ADAPTIVE TELEMETRY.
BUFFERS CONTROL IN DATA COMPRESSION SYSTEMS FOR NON-STATIONARY DATA.
Richard S. Simpson (Alabama University, University, Ala.). 7 p. [See A64-26456 22-08]
THE USE OF QUANTILES FOR SPACE TELEMETRY DATA COMPRESSION.
Edward C. Posner (California Institute of Technology, Pasadena, Calif.). 6 p. [See A64-26454 22-09]

SESSION II - BIOTELEMETRY.
A TRANSISTORIZED SELF-PULSING OSCILLATOR FOR TELEMETRY.
E. Lonsdale, I. Dunmire, and S. Brown (Wyoming University, Laramie, Wyo.). 5 p. 8 refs. [See A64-26457 22-08]
MINIATURE HIGH FREQUENCY PRESSURE SENSING TRANSMITTER FOR BIO-MEDICAL RESEARCH.
W. K. and E. Yon (Case Institute of Technology, Cleveland, Ohio). 8 p.
SESSION III - MULTIPLEXING AND SYNCHRONIZING

DEVELOPMENT OF OPTIMUM FRAME SYNCHRONIZATION CODES FOR GODDARD SPACE FLIGHT CENTER PCM TELEMETRY STANDARDS. Jesse L. Maury, Jr. and Frederick J. Styles (NASA, Goddard Space Flight Center, Md.). 10 p. 6 refs. [See A64-26460 22-08]

A SIMPLIFIED APPROACH TO OPTIMAL PCM FRAME SYNCHRONIZATION FORMATS. Robert C. Masching (Lockheed Aircraft Corp., Sunnyvale, Calif.). 17 p. [See A64-26461 22-08]

THE EFFECT OF BIT AND GROUP SYNCHRONIZATION ON THE RECESSION OF PCM/FM TELEMETRY SIGNALS. F. A. Perkins (Radiation, Inc., Melbourne, Fla.). 18 p. 20 refs. [See A64-26462 22-08]


THE METAL-OXIDE-SEMICONDUCTOR TRANSISTOR IN PCM TELEMETRY SYSTEMS. L. Berner (Radio Corporation of America, Camden, N. J.). 16 p. 8 refs. [See A64-26463 22-09]

SESSION IV - TELEMETRY'S NEW FRONTIER - OCEANOGRAPHY

A METER BURST COMMUNICATION SYSTEM FOR SHORT-RANGE MASTER-SLAVE APPLICATIONS. J. E. Sparks and Q. C. Wilson (Ball Brothers Research Corp., Boulder, Colo.). 9 p. 13 refs. [See A64-26464 22-08]

ACQUISITION OF OCEANOGRAPHIC DATA VIA METEOR TRAIL FORWARD SCATTER. R. E. Johnson (Boeing Co., Seattle, Wash.). 7 p.

AN EXPERIMENT WITH A SHORT PATH LENGTH UNATTENUATED SCATTER TELEMETRY LINK IN THE ARCTIC OCEAN. Beaumont M. Buck and Walter P. Brown (General Motors Corp., Santa Barbara, Calif.). 8 p. 7 refs. [See A64-26465 22-08]

RADIO REFRACTION BY THE MARINE LAYER AND ITS EFFECT ON MICROWAVE PROPAGATION. Earl E. Gossard (U.S. Navy, San Diego, Calif.). 7 p. 7 refs. [See A64-26466 22-08]

SATELLITE TELEMETRY OF OCEANOGRAPHIC OBSERVATIONS. George E. O'Rourke (Sylvania Electric Products, Inc., W. Island, Mass.). 5 p.


HIGH FREQUENCY TELEMETRY AND COMMUNICATIONS FOR OCEANOGRAPHY. James M. Shinotra (California, University, La Jolla, Calif.). 7 p. 5 refs. [See A64-26468 22-08]

SESSION V - MODULATION AND DETECTION - THEORY AND TECHNIQUES

ON THE ALLOCATION OF POWER IN A SYNCHRONOUS BINARY PSK COMMUNICATION SYSTEM. J. J. Stiffler (California Institute of Technology, Pasadena, Calif.). 11 p. [See A64-26469 22-08]

IMPLEMENTATION OF AN ORTHOGONAL MULTIPLEXED COMMUNICATION SYSTEM. S. Karp and J. Rampacke (Douglas Aircraft Co., Inc., Santa Monica, Calif.). 7 p. [See A64-26470 22-08]

THE USE OF DOUBLE SIDEBAND SUPPRESSED CARRIER MODULATION AS A SUBCARRIER FOR VIBRATION TELEMETRY. A. C. Roche (Dynatronics, Inc., Orlando, Fla.). 8 p. [See A64-26471 22-08]

LABORATORY COMPARISON OF TANLOCK AND PHASELOCK RECEIVERS. M. Balodis (North American Aviation, Inc., Downey, Calif.). 11 p. [See A64-26472 22-09]

A PCM-PAM HYBRID TELEMETRY SYSTEM. Tamiya Nomura and Yasuhiko Yasuda (Tokyo, University, Tokyo, Japan). 7 p.

SESSION VI - THE SWITCH TO UHF

AN OPERATIONAL 2200 MC TELEMETRY TRANSMITTER. Ronald B. Tipton (U.S. Army, White Sands Missile Range, N. Mex.). 4 p. [See A64-26473 22-09]

USE OF MODIFIED AN/GMD-1, -2 AS A S-BAND TRACKING AND TELEMETRY SYSTEM. Al Schaffer, Jr., Harold D. Goodman, and Dean E. McDowell (Electro-Optical Systems, Inc., Pasadena, Calif.). 5 p. [See A64-26474 22-09]

ON THE APPLICATION OF ELECTRONICALLY STEerable ANNA RAY ARRAYS TO SPACE TELEMETRY SYSTEMS. W. M. Maser and B. W. Kit (International Telephone and Telegraph Corp., Falls Church, Va.). 5 p. 8 refs. [See A64-26475 22-09]

HIGHER POWER AMPLIFICATION AMPLIFIERS AND REDUNDANCY CONCEPTS. William T. Brandon (Raytheon Co., Bedford, Mass.). 4 p. [See A64-26476 22-09]

5 WATT ALL SOLID STATE 2.25 KMC TELEMETRY TRANSMITTER. Sam Slone (Preston Scientific, Inc., Fullerton, Calif.). 3 p. [See A64-26477 22-09]

SESSION VII - HARDWARE FOR THE COMMUNICATION OF DATA

A SYSTEM FOR VERY HIGH-SPEED CONVERSION FROM ANALOG VOLTAGE TO BINARY GRAY CODE. Philip E. Shafer (Burroughs Corp., Paoli, Pa.). 9 p. [See A64-26478 22-09]

HIGH ACCURACY ANALOG-TO-DIGITAL CONVERSION UNDER SEVERE ENVIRONMENTS. Philip A. Toney (Dynatronics, Inc., Orlando, Fla.). 9 p. [See A64-26479 22-09]

HIGH FREQUENCY MULTIPLEXER. J. K. Pulfer and A. E. Lindsay (National Research Council, Ottawa, Canada). 4 p. [See A64-26480 22-09]

A NOVEL ADAPTATION OF A SOLID STATE MOPA TELEMETRY TRANSMITTER TO HIGH PRODUCTION TECHNIQUES. L. F. Lyons and J. N. Lapasinski (Lockheed Aircraft Corp., Los Angeles, Calif.). 4 p. [See A64-26481 22-09]

TELEMETRY FOR NUCLEAR WEAPON TRIALS. F. L. Hill (United Kingdom Atomic Energy Authority, Aldermaston, Berks., England). 5 p. [See A64-26482 22-08]

SESSION VIII - INDUSTRIAL USES OF TELEMETRY


SESSION IX - THE GROUND TERMINAL - DATA STORAGE AND PROCESSING

EFFECT OF MAGNETIC TAPE RECORDER PERFORMANCE ON PREDETECTION SIGNALS. J. C. Crosby and C. E. Wright (Consolidated Electrodynamics Corp., Pasadena, Calif.). 6 p. [See A64-26483 22-08]

ON-LINE TELEMETRY DATA PROCESSOR FOR THE ATLANTIC MISSILE RANGE. Fred B. Cox and Lee A. Bechtel (Beckman Instruments, Inc., Fullerton, Calif.). 14 p. [See A64-26484 22-08]

A UNVERSAL DATA PROCESSING SYSTEM FOR THE MARK I AEROSPACE SYSTEMS ENVIRONMENTAL CHAMBER. Ralph E. Klautsch and James W. Shenk (ARO, Inc., Tullahoma, Tenn.; Consolidated Systems Corp., Monrovia, Calif.). 11 p. [See A64-26485 22-10]

A HIGH-DENSITY DIGITAL MAGNETIC TAPE SYSTEM. S. C. Cheung (Ampex Corp., Redwood City, Calif.). 8 p. [See A64-26486 22-09]

AN ADVANCED AEROSPACE TELEMETRY TRANSDUCER.
R. H. Russell (Micro Systems, Inc., Pasadena, Calif.).
IN: NATIONAL TELEMETERING CONFERENCE, LOS ANGELES, CALIF., JUNE 1-4, 1964, PROCEEDINGS.
Conference sponsored by the American Institute of Aeronautics and Astronautics, Institute of Electrical and Electronics Engineers, and Instrument Society of America.

Description of a design approach to a second-generation aerospace telemetry transducer. The transducer described is for measurement of pressure, but the discussion is said to apply equally to temperature-sensing versions. The transducer uses a solid-state signal conditioner and solid-state sensors within the mechanical pickup. The signal conditioning module utilizes a dc-dc converter to provide dc isolation, and the associated problems of ac isolation and common mode output noise are discussed. The problems of a design compatible with specified operation under thermal shock conditions are considered, and a solution is indicated and applied to the system design. A very low mean time between failures was set as a design goal; through the use of ultralow power circuitry and careful parts choice, a significant improvement was found possible. The same approach permitted an excitation power requirement reduction of almost one order of magnitude.
Listing of Subject Headings of Reports

The following subject index has been prepared to enable the user to locate a particular reference as rapidly as possible. A brief statement, describing the content of a given reference, appears under each appropriate subject heading. An accession number, e.g., N65-12345 or A65-13456, assigned for purposes of identification, is located below and to the right of the descriptive statement. The same reference may be found under several different subject headings so that the user has a choice of more than one approach in his search for information.

### A

**ACCELEROMETER**

- **DESIGN AND CALIBRATION TECHNIQUES FOR ACCELEROMETERS AND TEMPERATURE PROBES AT CRYOGENIC TEMPERATURES**
  - A63-18304
- **HALF EFFECT IN SEMICONDUCTORS TO MEASURE MECHANICAL DISPLACEMENTS AS A FUNCTION OF ACCELERATION**
  - A63-19670
- **SENSITIVITY AND LINEARITY OF ACCELEROMETER USING PIEZOELECTRIC CRYSTALS**
  - A64-24737

**AEROSPACE MEDICINE**

- **BLOOD PRESSURE TRANSDUCER-TRANSMITTER SYSTEM FOR MEASURING PRESSURES WITHIN INTACT ARTERIES OF SUBJECTS IN ORBITING VEHICLES AND TO RELAY DATA TO RECEIVING-RECORDING EQUIPMENT**
  - AIAA PAPER 63-167
  - A63-19640
- **AIR COOLANT WATER TEMPERATURE MEASUREMENT IN ELECTRIC ARC AIR HEATER**
  - N62-12873
- **AIR CURRENT**
  - MEMBRANE TRANSDUCERS TO MEASURE PRESSURE PULSE IN AIR STREAM
    - FTD-76-1737/16264
    - N64-22660
- **AIRBORNE ELECTRONIC EQUIPMENT**
  - TRANSISTORIZED TRANSDUCER SELECTION FOR AIRCRAFT APPLICATIONS, EMphasizing COUPLING WITH TRANSFORMERS
    - A64-13598

**AIRCRAFT**

- **ELECTRONIC TACHOMETER AND SYNCHROSCOPE FOR RECIPROCATING ENGINES OF LIGHT AIRCRAFT, DESCRIBING TRANSDUCER AND INDICATOR**
  - A64-21755
- **ALIGNMENT**
  - ELECTRONIC LEVEL, INCORPORATING A TRANSDUCER, TO CONVERT MECHANICAL DISPLACEMENT OF PENDULUM INTO ELECTRIC SIGNAL USED IN ALIGNMENT AND MEASUREMENT TECHNIQUES AT LOW INVESTMENT FOR LESS SKILLED PERSONNEL
  - A63-20914
- **ALTITUDE**
  - HEIGHTLOCK PRESSURE TRANSDUCER FOR FLIGHT TESTS
    - ARL/F-13
    - N62-11466

### B

**BALLISTOCARDIOGRAPHY**

- **HEARTBEAT MEASUREMENT OF BIRD EMBRYOS WITH MICROMETEORITE TRANSDUCER AS BALLISTOCARDIOGRAPH**
  - NASA-SP-5007
  - N64-19015
- **BERNOULLI EQUATION**
  - TRANSDUCERS ARE PRESSURE SENSING DEVICES THAT CONVERT THEIR INPUT INSTANTANEOUSLY INTO ELECTRICAL SIGNALS WITHOUT DISTORTION
    - A64-24231

**BIBLIOGRAPHY**

- **ULTRASONIC PHENOMENA AND METHODS OF MEASUREMENT - BIBLIOGRAPHY**
  - BM-IC-8146
  - N63-12769
- **TELEMETRY TRANSDUCER HANDBOOK WITH BIBLIOGRAPHY**
  - WADD-TR-61-67, VOL. 1, REV. 1
  - N64-12704
- **BIRD**
  - **HEARTBEAT MEASUREMENT OF BIRD EMBRYOS WITH MICROMETEORITE TRANSDUCER AS BALLISTOCARDIOGRAPH**
    - NASA-SP-5007
    - N64-19015

**BLOOD PRESSURE**

- **REMOTE BLOOD PRESSURE MEASURING AND MONITORING SYSTEM ON MAN IN FLIGHT**
  - N62-10487
- **TRANSDUCER FOR THE CONTINUOUS EXTERNAL MEASUREMENT OF ARTERIAL BLOOD PRESSURE**
  - N62-13733
- **BLOOD PRESSURE TRANSDUCER-TRANSMITTER SYSTEM FOR MEASURING PRESSURES WITHIN INTACT ARTERIES OF SUBJECTS IN ORBITING VEHICLES AND TO RELAY DATA TO RECEIVING-RECORDING EQUIPMENT**
  - AIAA PAPER 63-167
  - A63-19640
- **EXTERNAL, ARTERIAL BLOOD PRESSURE TRANSDUCER**
  - NASA-CR-53362
  - N64-17815

**BULOMETER**

- **HOT WIRE RESISTANCE TEMPERATURE TRANSDUCER FOR MEASUREMENT OF TRANSIENT FLOW**
  - N62-12358
BONDING

USE OF FOKKER BONO TESTER IN DESTRUCTIVE AND NONDESTRUCTIVE TEST ON REDUX BONDED SINGLE AND DOUBLE LAP JOINTS
NRL-TN-M.2099 N63-14321

C

CADMIUM SULFIDE
ULTRASONIC TRANSDUCERS PRODUCED BY DIFFUSING COPPER INTO SURFACE OF CADMIUM SULFIDE SINGLE-CRYSTALS, FORMING THIN PIEZO-ELECTRICALLY ACTIVE LAYERS
A64-10619

CALIBRATION
CALIBRATION OF PRESSURE TRANSDUCER SYSTEM FOR UNSTEADY PRESSURE MEASUREMENTS
AEDC-TDR-63-29 N63-13424
DYNAMIC CALIBRATION OF PRESSURE TRANSDUCERS
NBS-MONOGRAPH-67 N64-16236
TYPES AND CHARACTERISTICS OF PRESSURE TRANSDUCERS AND CONCEPTS OF CALIBRATION AND ANALYSIS
N64-16237

CALORIMETER
HOT WIRE RESISTANCE TEMPERATURE TRANSDUCER FOR MEASUREMENT OF TRANSIENT FLOW N62-12358

CAPACITANCE
CAPACITIVE TRANSDUCERS FOR NARROW BAND VIBRATORY DISPLACEMENT OUTPUT OF ANGULAR MOTION SENSORS - ENERGY DENSITY CALCULATION FOR PARALLEL PLATE TYPE ESL-R-153 N63-13604

CARBON
HOT WIRE RESISTANCE TEMPERATURE TRANSDUCER FOR MEASUREMENT OF TRANSIENT FLOW N62-12358

CERAMICS
PIEZO-CERAMIC PRESSURE TRANSDUCERS FOR SHOCK TUBE PRESSURE MEASUREMENT - SHOCK WAVE PROFILES OF REFLECTED WAVES, THICKNESS AND CURVATURE NASA-CR-50495 N63-18139

CIRCULATORY SYSTEM
CATHETER FOR RIGHT HEART AND PULMONARY ARTERY IMPLANTATION SAM-TDR-64-10 N64-18918

COMBUSTION CHAMBER
DYNAMIC RESPONSE OF TRANSIENT PRESSURE TRANSDUCERS FOR LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS NASA-CR-51516 N63-21974
TRANSIENT PRESSURE MEASURING METHODS APPLIED TO LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS NASA-CR-51515 N63-22047

COMPENSATOR
ELECTRONIC COMPENSATOR DESIGNED TO EXTEND USABLE FREQUENCY RANGE OF TRANSDUCER SYSTEM N64-16244

DIRECT CURRENT /DC/
THIRD-PORT NETWORK REPRESENTATION OF DC ELECTROMECHANICAL TRANSDUCERS COA-N-121 N62-13814

COOLANT
COOLANT WATER TEMPERATURE MEASUREMENT IN ELECTRIC ARC AIR HEATER N62-12873

COUPLING
DYNAMIC TESTING OF PRESSURE TRANSDUCERS JPL-TR-32-248 N62-12249

CRYOGENIC PROPELLANT
INDUCTION FLOWMETER FOR DIELECTRIC FLUIDS A64-23179

CUTONIC TEMPERATURE
DESIGN AND CALIBRATION TECHNIQUES FOR ACCELEROMETERS AND TEMPERATURE PROBES AT CRYOGENIC TEMPERATURES A63-18304

DATA ACQUISITION
INSTRUMENTATION FOR DYNAMIC DATA ACQUISITION ON ARTILLERY AND ROCKET LAUNCHER WEAPONS - TRANSDUCERS AND RECORDERS N63-16606

DESTRUCTIVE TESTING
USE OF FOKKER BONO TESTER IN DESTRUCTIVE AND NONDESTRUCTIVE TEST ON REDUX BONDED SINGLE AND DOUBLE LAP JOINTS NRL-TN-M.2099 N63-14321

DETECTION
ULTRASONIC PULSE ECHO DETECTION OF DEFECTS IN METAL N62-17120
PRESSURE SENSITIVE DETECTOR FOR USE IN SHOCK VELOCITY MEASUREMENTS IN SHOCKTUBES AND TUNNELS NOLTR-61-117 N62-12659

DIELECTRIC MATERIAL
INDUCTION FLOWMETER FOR DIELECTRIC FLUIDS N62-11123

DIFFERENTIAL EQUATION
CORRESPONDING RESPONSE FUNCTIONS FOR INPUTS FROM CHARACTERISTIC DIFFERENTIAL EQUATIONS OF MOTION OF TRANSDUCER SYSTEMS N64-16239
ANALYSIS OF PHYSICAL NONLINEAR TRANSDUCERS BY MATHEMATICAL MODELS CHARACTERIZED BY DIFFERENTIAL EQUATIONS N64-16240

DIGITAL TRANSDUCER
DESIGN AND APPLICATION OF A FAMILY OF TRANSDUCERS WHICH PRODUCE A DIRECT DIGITAL OUTPUT, WITH PARTICULAR REFERENCE TO AEROSPACE UTILIZATION A63-15342

DIODE
A SENSITIVE MAGNETIC TRANSDUCER WESCON PAPER-3-2 N62-17796

DIRECT CURRENT /DC/
SECOND-PORT NETWORK REPRESENTATION OF DC ELECTROMECHANICAL TRANSDUCERS COA-N-121 N62-13814

DISPLACEMENT
CAPACITIVE TRANSDUCERS FOR NARROW BAND VIBRATORY DISPLACEMENT OUTPUT OF ANGULAR MOTION SENSORS - ENERGY DENSITY CALCULATION FOR PARALLEL PLATE TYPE ESL-R-153 N63-13604

DRAG
HEIGHTLOCK PRESSURE TRANSDUCER FOR FLIGHT TESTS ARL/F-13 N62-11466
DRAG MEASUREMENT
DRAG-TYPE FLOWMETER FOR MEASURING IMPACT FORCE OF MOVING STREAM A63-10750
LIFT AND DRAG FORCE MEASUREMENTS ON A CIRCULAR CYLINDER, OSCILLATING TRANSVERSELY IN FLOWING FLUID A64-13885

DUCED FAN
MEASUREMENT OF TIME DEPENDENT SHROUD PRESSURE OF A DUCED PROPELLER TAR-TR-612 N62-11007

DYNAMIC RESPONSE
DYNAMIC RESPONSE OF TRANSIENT PRESSURE TRANSDUCERS FOR LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS NASA-CR-51516 N63-21974
TRANSDUCERS FOR DYNAMIC MEASUREMENTS COVERING OPERATION, CALIBRATION AND APPLICATIONS A64-23179
DYNAMICS
DYNAMIC TESTING OF PRESSURE TRANSDUCERS
JPL-TR-32-268 N62-12249

ECHO
ULTRASONIC PULSE ECHO DETECTION OF DEFECTS IN METAL
N62-11120

ELECTRIC ARC
COOLANT WATER TEMPERATURE MEASUREMENT IN ELECTRIC ARC AIA HEATER
N62-12873

ELECTRIC EQUIPMENT
STUDY OF THE APPLICATION OF HALL EFFECT TRANSDUCERS AND THE CHARACTERISTICS ASSOCIATED WITH THEM
A63-16327

ELECTROACOUSTIC WAVE
COMPUTER FOR MEASURING DIRECTIVITY FACTOR FOR ELECTROACOUSTIC TRANSDUCERS
N64-14635

ELECTROCHEMICAL CELL
THERMAL ENERGY CONVERSION TO ELECTRICITY - ELECTROTHERMALLY REGENERATIVE TRANSDUCER DEVICE
AD-403290 N64-30900

ELECTROMAGNETISM
INDUCTION FLUIDMETER FOR DIELECTRIC FLUIDS
N62-11541

ELECTROMAGNETIC MEASUREMENT
MAGNETODYNAMIC MOTION TRANSDUCER FOR MEASURING MOTION VECTOR FOR MAGNETIC TO ELECTRIC FIELD TRANSFORMATION
A64-22505

ELECTRONICS
VIBRATING MEMBRANE ELECTROMETER WITH HIGH CONVERSION GAIN
NASA-RP-289 N64-28352

FIBER
HOT WIRE RESISTANCE TEMPERATURE TRANSDUCER FOR MEASUREMENT OF TRANSIENT FLOW N62-12358

FLOW
MEASUREMENTS OF FLOW DURATION IN A LOW PRESSURE SHOCK TUBE
NASA-TN-D-1218 N62-11666

MULTITERMINAL TRANSDUCER CHAINS AT A DISCRETE FREQUENCY
A63-16703

METHOD FOR DEFECT DISCRIMINATION IN AUTOMATIC MULTIPLE TRANSDUCER INSPECTION SYSTEMS
A63-17170

GONED PIEZORESISTIVE STRAIN GAUGE AND CAPSULE OR DIAPHRAGM-TYPE TRANSDUCERS FOR LOW PRESSURE MEASUREMENTS
A64-16625

AEROSPACE TELEMETRY TRANSDUCER DESIGN FOR MEASUREMENT OF PRESSURE AND TEMPERATURE
A64-26444
FLOW MEASUREMENT
ONERA-91 N63-12634

FLOW MEASUREMENT
SURVEY OF TRANSDUCERS USED TO MEASURE STATIC AND DYNAMIC PRESSURES IN FLUID-FLOW FIELDS
A63-11204

FLOW METER
INDUCTION FLOWMETER FOR DIELECTRIC FLUIDS
N62-11123

INDUCTION FLOWMETER FOR DIELECTRIC FLUIDS
N62-11541

DRAG-TYPE FLOWMETER FOR MEASURING IMPACT FORCE OF MOVING STREAM
A63-10758

DISCUSSION OF THE PERFORMANCE OF TURBINE-TYPE OR PROPELLER FLOWMETERS, OPERATING ON LIQUID HYDROCARBONS, IN THE RANGE 0.5 TO 250 GPM
A63-11187

FLOW RATE
TRANSDUCERS CAPABLE OF SMALL FLOW RATE MEASUREMENT FROM LEAKS IN FLANGES OF SATURN ENGINE SYSTEMS
NASA-TM-X-50421 N63-21915

FLOW VELOCITY
TRANSDUCERS FOR HIGH VELOCITY GAS FLOW TEMPERATURE MEASUREMENT WITH DESIGN CRITERIA DETERMINED FROM THERMOCOUPLE MEASUREMENTS
N63-12272

FLUID MECHANICS
HOT WIRE RESISTANCE TEMPERATURE TRANSDUCER FOR MEASUREMENT OF TRANSIENT FLOW
N62-12358

TRANSDUCERS ARE PRESSURE SENSING DEVICES THAT CONVERT THEIR INPUT INSTANTANEOUSLY INTO ELECTRICAL SIGNALS WITHOUT DISTORTION
A64-24231

FOKKER BOND TESTER
USE OF FOKKER BOND TESTER IN DESTRUCTIVE AND NONDESTRUCTIVE TEST ON REDUX BONOEO SINGLE AND DOUBLE LAP JOINTS
NRL-TN-M.2099 N63-14321

FREE MOLECULE
HOT WIRE RESISTANCE TEMPERATURE TRANSDUCER FOR MEASUREMENT OF TRANSIENT FLOW
N62-12358

FREQUENCY
ELECTRONIC COMPENSATOR DESIGNED TO EXTEND USABLE FREQUENCY RANGE OF TRANSDUCER SYSTEM
N64-16244

GAS FLOW
TRANSDUCERS FOR HIGH VELOCITY GAS FLOW TEMPERATURE MEASUREMENT WITH DESIGN CRITERIA DETERMINED FROM THERMOCOUPLE MEASUREMENTS
N63-12272

GAS STREAM
MEMBRANE TRANSDUCERS TO MEASURE PRESSURE PULSE IN AIR STREAM
FTD-IT-63-737/12264 N64-22660

GENERATOR
RESONANT MODES OF GAS PRESSURE OSCILLATIONS IN SINUSOIDAL PRESSURE GENERATOR WITH FLAT CYLINDRICAL CHAMBER
N63-22048

TYPES OF APERIODIC FUNCTION GENERATORS
N64-16241

TYPES OF PERIODIC FUNCTION GENERATORS
N64-16243

GROUND EFFECT MACHINE
ANNULAR NOZZLE TYPE GROUND EFFECT MACHINE, PRESSURE TRANSDUCER
IER SER. 187, ISSUE 2 N62-14759

HALL EFFECT
STUDY OF THE APPLICATION OF HALL EFFECT

HALL GENERATOR
HALL EFFECT IN SEMICONDUCTORS TO MEASURE MECHANICAL DISPLACEMENTS AS A FUNCTION OF ACCELERATION
A63-16227

HEART
CATHETER FOR RIGHT HEART AND PULMONARY ARTERY IMPLANTATION
SAM-TOR-64-10 N64-18918

HEART RATE
HEARTBEAT MEASUREMENT OF BIRD EMBRYOS WITH MICROMETEORITE TRANSDUCER AS BALLISTOCARDIOGRAPH
NASA-SP-5007 N64-19015

HEAT TRANSFER
HOT WIRE RESISTANCE TEMPERATURE TRANSDUCER FOR MEASUREMENT OF TRANSIENT FLOW
N62-12358

TRANSDUCER WHICH MEASURES HEAT TRANSFER RATES IN HYPERSONIC WIND TUNNELS
A63-16881

HEATER
COOLANT WATER TEMPERATURE MEASUREMENT IN ELECTRIC ARC AIR HEATER
N62-12073

HEMODYNAMIC RESPONSE
BLOOD PRESSURE TRANSDUCER-TRANSMITTER SYSTEM FOR MEASURING PressURES WITHIN INTACT ARTERIES OF SUBJECTS IN ORBITING VEHICLES AND TO RELAY DATA TO RECEIVING-RECORDING EQUIPMENT
AIAA PAPER 63-167 A63-19640

HIGH TEMPERATURE
TEMPERATURE TRANSDUCER FOR IN-FLIGHT MONITORING OF SKIN PANEL SURFACE TEMPERATURES - EFFECTS OF INSULATION AND VIBRATION ON ACCURACY
ATL-D-811 N63-12288

TRANSDUCER FOR VARIABLE Pressures IN HIGH TEMPERATURE FLOWS
ONERA-91 N63-12634

HIGH TEMPERATURE GAS
EVALUATION OF DUEL ELEMENT TRANSDUCER FOR HIGH TEMPERATURE GAS MEASUREMENTS
ARL-63-58 N63-17470

HOT-WIRE
MEASUREMENTS OF FLOW DURATION IN A LOW PRESSURE SHOCK TUBE
N62-11666

HOT-WIRE ANEMOMETER
HOT WIRE RESISTANCE TEMPERATURE TRANSDUCER FOR MEASUREMENT OF TRANSIENT FLOW
N62-12358

HYDRAULIC ACTUATOR
HYDRAULIC ACTUATORS AND AMPLIFIERS WITH AND WITHOUT FEEDBACK, AND ELECTROMECHANICAL TRANSDUCERS
FTD-IT-62-1226/122
N64-11150

HYDRODYNAMICS
TRANSDUCERS ARE PRESSURE SENSING DEVICES THAT CONVERT THEIR INPUT INSTANTANEOUSLY INTO ELECTRICAL SIGNALS WITHOUT DISTORTION
A64-24231

HYPERSONIC SHOCK
SKIN FRICTION TRANSDUCER FOR USE IN HYPERSONIC SHOCK TUNNEL
CAL-129 N63-22395

HYPERSONIC WIND TUNNEL
PITOT PRESSURE MEASUREMENTS IN HYPERSONIC SHOCK TUNNEL
NAWEP-7329 N64-11150

TRANSDUCER WHICH MEASURES HEAT TRANSFER RATES IN HYPERSONIC WIND TUNNELS
A63-16881

HYPERVERSITY WIND TUNNEL
DEVELOPMENT OF PRESSURE TRANSDUCER FOR PRESSURE MEASUREMENT IN HYPERSONIC WIND TUNNEL TESTING
AEDC-TOR-63-135 N63-18749
**SUBJECT INDEX**

<table>
<thead>
<tr>
<th>A</th>
<th>SUBJECT</th>
<th>DOCUMENT</th>
<th>REPORT NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implantation</td>
<td>Catheter for right heart and pulmonary artery</td>
<td>SAM-TR-64-10</td>
<td>N64-18918</td>
</tr>
<tr>
<td>In flight monitoring</td>
<td>Temperature transducer for in-flight monitoring of skin panel surface temperatures — effects of insulation and vibration on accuracy</td>
<td>ATL-D-811</td>
<td>N63-12288</td>
</tr>
<tr>
<td>Induction</td>
<td>Induction flowmeter for dielectric fluids</td>
<td>N62-11123</td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>Input, output, and transfer function relations of linear transducers</td>
<td>N64-16238</td>
<td></td>
</tr>
<tr>
<td>Instrumentation</td>
<td>Measurement of time dependent shroud pressure of a ducted propeller</td>
<td>TAR-TR-612</td>
<td>N62-11007</td>
</tr>
<tr>
<td></td>
<td>Pitot pressure measurements in hypersonic shock tunnel</td>
<td>NAVWEPS-7329</td>
<td>N62-12666</td>
</tr>
<tr>
<td></td>
<td>Coolant water temperature measurement in electric arc air heater</td>
<td>N62-12873</td>
<td></td>
</tr>
<tr>
<td>Ion beam</td>
<td>Hot wire resistance temperature transducer for measurement of transient flow</td>
<td>N62-12358</td>
<td></td>
</tr>
<tr>
<td>Jet stream</td>
<td>Utilizing a transducer &amp; tensometer to measure pressures of jetstreams</td>
<td>JPRS-23920</td>
<td>N64-17713</td>
</tr>
<tr>
<td>Lap joint</td>
<td>Use of Fokker bond tester in destructive and nondestructive test on redux bonded single and double lap joints</td>
<td>NRL-TR-2099</td>
<td>N63-14321</td>
</tr>
<tr>
<td>Lead</td>
<td>Propagation of large amplitude waves in pure lead</td>
<td>BRL-1158</td>
<td>N62-12980</td>
</tr>
<tr>
<td>Leading edge</td>
<td>Transducer system for measuring skin temperature of wing panel and leading edge of Dyna-soar vehicle during reentry</td>
<td>ATL-D-861</td>
<td>N63-11421</td>
</tr>
<tr>
<td>Leakage</td>
<td>Transducers capable of small flow rate measurement from leaks in flanges of Saturn engine systems</td>
<td>NASA-TM-X-50421</td>
<td>N63-21915</td>
</tr>
<tr>
<td>Lift force</td>
<td>Lift and drag force measurements on a circular cylinder, oscillating transversely in flowing fluid</td>
<td>A64-13885</td>
<td></td>
</tr>
<tr>
<td>Linear transformation</td>
<td>Pressure transducer using linear differential transformer</td>
<td>TN-56-3-63</td>
<td>N64-29389</td>
</tr>
<tr>
<td>Liquid flow</td>
<td>Discussion of the performance of turbine-type or propeller flowmeters, operating on liquid hydrocarbons, in the range 0.5 to 250 GPM</td>
<td>A63-11187</td>
<td></td>
</tr>
<tr>
<td>Liquid propellant rocket engine</td>
<td>Dynamic response of transient pressure transducers for liquid propellant rocket combustion chambers</td>
<td>NASA-CR-51516</td>
<td>N63-21974</td>
</tr>
<tr>
<td>Magentic Induction</td>
<td>Magnetic flowmeter for dielectric fluids</td>
<td>N62-11123</td>
<td></td>
</tr>
<tr>
<td>Magnetic property</td>
<td>A sensitive magnetic transducer</td>
<td>WESCON PAPER-3.2</td>
<td>N62-17796</td>
</tr>
<tr>
<td>Magnetostriiction</td>
<td>Piezoelectric single crystals, ferroelectric electrostrictive ceramics and magnetostriictive metals for use as ultrasonic transducers</td>
<td>A63-20741</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equivalent circuit of a magnetostriictive transducer working near the fundamental resonance and the electrical equivalent circuit of a step transformer for longitudinal and torsional vibrations</td>
<td>A63-24318</td>
<td></td>
</tr>
<tr>
<td>Manned spacecraft</td>
<td>Remote blood pressure measuring and monitoring system on man in flight</td>
<td>N62-10687</td>
<td></td>
</tr>
<tr>
<td>Manometer</td>
<td>Hot wire resistance temperature transducer for measurement of transient flow</td>
<td>N62-12358</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure transducers describing manometers, pitot tubes, bourdon tubes and resistance, capacitance and piezoelectric gauges</td>
<td>A64-25773</td>
<td></td>
</tr>
<tr>
<td>Material testing</td>
<td>Method for defect discrimination in automatic multiple transducer inspection systems</td>
<td>A63-17170</td>
<td></td>
</tr>
<tr>
<td>Mathematical model</td>
<td>Analysis of physical nonlinear transducers by mathematical models characterized by differential equations</td>
<td>N64-16240</td>
<td></td>
</tr>
<tr>
<td>Matrix Analysis</td>
<td>Application of the mode theory to the analysis of signal transmission properties of linear multiterminal transducer chains at a discrete frequency</td>
<td>A63-16703</td>
<td></td>
</tr>
<tr>
<td>Measuring apparatus</td>
<td>Electronic level, incorporating a transducer, to convert mechanical displacement of pendulum into electric signal used in alignment and measurement techniques at low investment for less skilled personnel</td>
<td>A63-20914</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transducer system for measuring skin temperature of wing panel and leading edge of Dyna-soar vehicle during reentry</td>
<td>ATL-D-861</td>
<td>N63-11421</td>
</tr>
<tr>
<td></td>
<td>Book on performance and design of instrument transducers for measurement applications</td>
<td>A64-17660</td>
<td></td>
</tr>
<tr>
<td>Semiconductor transducer for shear strain measurement in low modulus propellant-like materials</td>
<td>AIAA Paper 64-4506</td>
<td>A64-20505</td>
<td></td>
</tr>
<tr>
<td>High accuracy self-contained force balance pressure transducer for extreme environments</td>
<td>A63-25349</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical electronics</td>
<td>Blood pressure transducer-transmitter system for</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MEMBRANE

MEASURING PRESSURES WITHIN INTACT ARTERIES OF SUBJECTS IN ORBITING VEHICLES AND TO RELAY DATA TO RECEIVING-RECORDING EQUIPMENT
AIAA PAPER 63-167 A63-19640

ENDORADIOSONDES - STATE OF THE ART SURVEY
AMRL-TDR-62-122 N63-13937

MEMBRANE
VIBRATING MEMBRANE ELECTROMETER WITH HIGH CONVERSION GAIN
NASA-RP-289 N64-28352

METAL
ULTRASONIC PULSE ECHO DETECTION OF DEFECTS IN METAL
N62-17120

MODE SEQUENCE
APPLICATION OF THE MODE THEORY TO THE ANALYSIS OF SIGNAL TRANSMISSION PROPERTIES OF LINEAR MULTITERMINAL TRANSDUCER CHAINS AT A DISCRETE FREQUENCY
A63-16703

MONITOR
REMOTE BLOOD PRESSURE MEASURING AND MONITORING SYSTEM ON MAN IN FLIGHT
N62-10687

MOTION EQUATION
CORRESPONDING RESPONSE FUNCTIONS FOR INPUTS FROM CHARACTERISTIC DIFFERENTIAL EQUATIONS OF MOTION OF TRANSDUCER SYSTEMS
N64-16239

NETWORK
TWO PORT NETWORK REPRESENTATION OF DC ELECTROMECHANICAL TRANSDUCERS
CODA-N-121 N62-13814

NOISE
INDUCTION FLOWMETER FOR DIELECTRIC FLUIDS
N62-11541

NONDESTRUCTIVE TESTING
POINT-CONTACT TRANSDUCERS FOR ULTRASONIC TESTING
WAL-TR-143.5/1 N62-14557

USE OF FOKKER BOND TESTER IN DESTRUCTIVE AND NONDESTRUCTIVE TEST ON REDUX BONDED SINGLE AND DOUBLE LAP JOINTS
NRL-TR-2009 N63-14321

NONLINEAR SYSTEM
ANALYSIS OF PHYSICAL NONLINEAR TRANSDUCERS BY MATHEMATICAL MODELS CHARACTERIZED BY DIFFERENTIAL EQUATIONS
N64-16240

NOZZLE
ANNULAR NOZZLE TYPE GROUND EFFECT MACHINE, PRESSURE TRANSDUCER
JPL-SR-187, ISSUE 2 N62-14759

OPTICAL AMPLIFIER
OPTICAL AMPLIFICATION Employing ELECTRONIC SCANNING TECHNIQUES
ARL-154 N62-12133

OPTICAL MEASUREMENT
ELECTRONIC LEVEL, INCORPORATING A TRANSDUCER, TO CONVERT MECHANICAL DISPLACEMENT OF PENDULUM INTO ELECTRIC SIGNAL USED IN ALIGNMENT AND MEASUREMENT TECHNIQUES AT LOW INVESTMENT FOR LESS SKILLED PERSONNEL
A63-20914

PRESSURE EXERTED BY SHOCK WAVES IN SOLID MEDIA - OPTICAL, ELECTRICAL AND X-RAY TECHNIQUES USED TO MEASURE SHOCK AND FREE SURFACE VELOCITIES
POULTER LABS. TR-002-63 N63-19134

OSCILLATING CYLINDER
LIFT AND DRAG FORCE MEASUREMENTS ON A CIRCULAR CYLINDER, OSCILLATING TRANSVERSLY IN FLOWING FLUID
A64-13885

OSCILLATING WING
PRESSURE DISTRIBUTION MEASUREMENT ON HARMONICALLY OSCILLATING WINGS
A64-22411

P

P-N JUNCTION
P-N JUNCTION STRAIN TRANSDUCER
WESCOP PAPER-3.4 N62-17790

PANEL
TEMPERATURE TRANSDUCER FOR IN-FLIGHT MONITORING OF SKIN PANEL SURFACE TEMPERATURES - EFFECTS OF INSULATION AND VIBRATION ON ACCURACY
NTL-D-811 N63-12288

PARALLEL PLATE
CAPACITIVE TRANSDUCERS FOR NARROW BAND VIBRATORY DISPLACEMENT OUTPUT OF ANGULAR MOTION SENSORS - ENERGY DENSITY CALCULATION FOR PARALLEL PLATE TYPE
N64-13604

PERIODIC FUNCTION
TYPES OF PERIODIC FUNCTION GENERATORS
N64-16243

PHOTOELECTRIC APPARATUS
CONTACT LENS PHOTOELECTRIC EYE MOVEMENT RECORDING SYSTEM
FPRC/MEM/3-162 N63-18820

PHYSIOLOGY
TRANSDUCER FOR THE CONTINUOUS EXTERNAL MEASUREMENT OF ARTERIAL BLOOD PRESSURE
N62-13733

ENDORADIOSONDES - STATE OF THE ART SURVEY
AMRL-TOR-62-122 N63-13937

PIEZOELECTRIC CRYSTAL
PIEZOELECTRIC SINGLE CRYSTALS, FERROELECTRIC ELECTROSTRICTIVE CERAMICS AND MAGNETOSTRICTIVE METALS FOR USE AS ULTRASONIC TRANSDUCERS
A63-20741

ULTRASONIC TRANSDUCERS PRODUCED BY DIFFUSING COPPER INTO SURFACE OF CADMIUM SULFIDE SINGLE-CRYSTALS, FORMING THIN PIEZOELECTRICALLY ACTIVE LAYERS
A64-10619

SENSITIVITY AND LINEARITY OF ACCELEROMETER USING PIEZOELECTRIC CRYSTALS
A64-24737

PIEZOELECTRICITY
PIEZOCERAMIC PRESSURE TRANSDUCERS FOR SHOCK TUBE PRESSURE MEASUREMENTS - SHOCK WAVE PROFILES OF REFLECTED WAVES, THICKNESS AND CURVATURE
NASA-CR-50495 N63-18139

PIEZORESISTIVE DEVICE
TRANSDUCERS FOR TRANSIENT HIGH PRESSURE MEASUREMENTS - SHOCK IMPEDANCE MATCHING OF PIEZORESISTIVE GAUGE INSULATOR TO SALT ENVIRONMENT
AD-44269 N64-30204

PILOT
PITOT PRESSURE MEASUREMENTS IN HYPERSONIC SHOCK TUNNEL
NAVWEPS-7329 N62-12666

PITOT TUBE
PRESSURE TRANSDUCERS DESCRIBING MANOMETERS, PITOT TUBES, BOURDON TUBES AND RESISTANCE, CAPACITANCE AND PIEZOELECTRIC GAUGES
A64-25773

PLATE
MEASUREMENT OF TORSIONAL RIGIDITY OF STIFFENED PLATES
SM-61-14 N62-10591

POTENSIOMETER
HEIGHTLOCK PRESSURE TRANSDUCER FOR FLIGHT TESTS
ARL/F-13 N62-11466
PRESSURE MEASUREMENT OF TIME DEPENDENT SHROUD PRESSURE OF A DUCTED PROPELLER N62-11007

TRANSIENT PRESSURE MEASURING METHODS - TRANSDUCER DESIGN AND EVALUATION AERONAUTICAL ENGR. REPT.-595B N62-11126

DYNAMIC TESTING OF PRESSURE TRANSDUCERS JPL-TR-32-268 N62-12249

PRESSURE SENSITIVE DETECTOR FOR USE IN SHOCK VELOCITY MEASUREMENTS IN SHOCKTUBES AND TUNNELS NOLTR-61-117 N62-12659

PITOT PRESSURE MEASUREMENTS IN HYPERSONIC SHOCK TUNNEL NAVWEPS-7329 N62-12666

TRANSDUCER FOR VARIABLE PRESSURES IN HIGH TEMPERATURE FLOWS DNERA-91 N63-12634

PRESSURE DISTRIBUTION MEASUREMENT ON HARMONICALLY OSCILLATING WINGS ICAS PAPER 64-28 164-22766

PRESSURE FIELD ABILITY OF A TRANSDUCER TO RESOLVE SPATIAL DETAILS OF TURBULENT PRESSURE FIELDS IN SHEAR FLOWS AND IN SONAR RECEIVERS A63-13194

PRESSURE GAUGE PRESSURE EXERTED BY SHOCK WAVES IN SOLID MEDIA - OPTICAL, ELECTRICAL AND X-RAY TECHNIQUES USED TO MEASURE SHOCK AND FREE SURFACE VELOCITIES POULTER LABS. TR-002-63 N63-19134

PRESSURE MEASUREMENT CALIBRATION OF PRESSURE TRANSDUCER SYSTEM FOR UNSTEADY PRESSURE MEASUREMENTS AEDC-TDR-63-29 N63-13424

PIEZOCERAMIC PRESSURE TRANSDUCERS FOR SHOCK TUBE PRESSURE MEASUREMENT - SHOCK WAVE PROFILES OF REFLECTED WAVES, THICKNESS AND CURVATURE NASA-CR-50495 N63-18139

DEVELOPMENT OF PRESSURE TRANSDUCER FOR PRESSURE MEASUREMENT IN HYPERSONIC WIND TUNNEL TESTING AEDC-TDR-63-135 N63-18749

PRESSURE EXERTED BY SHOCK WAVES IN SOLID MEDIA - OPTICAL, ELECTRICAL AND X-RAY TECHNIQUES USED TO MEASURE SHOCK AND FREE SURFACE VELOCITIES POULTER LABS. TR-002-63 N63-19134

TRANSIENT PRESSURE MEASURING METHODS APPLIED TO LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS NASA-CR-51515 A64-22047

BONDED PIEZORESISTIVE STRAIN GAUGE AND CAPSULE OR DIAPHRAGM-TYPE TRANSDUCERS FOR LOW PRESSURE MEASUREMENTS A64-16625

UTILIZING A TRANSDUCER & TENSOMETER TO MEASURE PRESSURES OF JETSTREAMS JPRS-23920 N64-17173

ELECTROMECHANICAL TRANSDUCER SYSTEMS FOR TRANSIENT PRESSURE MEASUREMENTS WAPD-TM-343 N64-30127

PRESSURE OSCILLATION RESONANT MODES OF GAS PRESSURE OSCILLATIONS IN SINEGODAL PRESSURE GENERATOR WITH FLAT CYLINDRICAL CHAMBER NASA-CR-51517 N63-22048

PRESSURE PROBE DESCRIPTION OF PRESSURE PICKUPS WHICH HAVE A BROAD BANDWIDTH OR WHICH ARE IN DIRECT CONTACT WITH MEDIA UP TO 3700 DEGREES KELVIN A63-12250

PRESSURE PULSE MEMBRANE TRANSDUCERS TO MEASURE PRESSURE PULSE
PROBE

AIR LOAD MEASUREMENTS DURING FLIGHT USING PRESSURE TRANSDUCER MOUNTED ON ROTOR BLADE SURFACE
REPT.-299-099-200 N64-14761

DYNAMIC CALIBRATION OF PRESSURE TRANSDUCERS
NBS-MONOGRAPH-67 N64-16236

TYPES AND CHARACTERISTICS OF PRESSURE TRANSDUCERS AND CONCEPTS OF CALIBRATION AND ANALYSIS
N64-16237

EXTERNAL, ARTERIAL BLOOD PRESSURE TRANSDUCER
NASA-CR-53362 N64-17815

PRESSURE TRANSDUCER USING LINEAR DIFFERENTIAL TRANSFORMER
TN-SE-3-63 N64-29389

TRANSDUCERS FOR TRANSIENT HIGH PRESSURE MEASUREMENTS - SHOCK IMPEDANCE MATCHING OF PIEZORESISTIVE GAUGE INSULATOR TO SALT ENVIRONMENT
AD-442689 N64-30204

PROBE
HOT WIRE RESISTANCE TEMPERATURE TRANSDUCER FOR MEASUREMENT OF TRANSIENT FLOW
N62-12358

PROPELLANT INDUCTION FLOWMETER FOR DIELECTRIC FLUIDS
N62-11541

PROPELLER MEASUREMENT OF TIME DEPENDENT SHROUD PRESSURE OF A DUCTED PROPELLER
TAR-TR-612 N62-11007

PULSE ULTRASONIC PULSE ECHO DETECTION OF DEFECTS IN METAL
N62-17120

PURITY PROPAGATION OF LARGE AMPLITUDE WAVES IN PURE LEAD BRL-1158 N62-12988

QUALITY CONTROL METHOD FOR DEFECT DISCRIMINATION IN AUTOMATIC MULTIPLE TRANSDUCER INSPECTION SYSTEMS
A63-17170

RADIATION EFFECT TRANSIENT RADIATION EFFECTS IN PRESSURE TRANSDUCERS
AFSWC-TOR-62-63 N62-16174

RADIATION PYROMETER THERMOMETERS, RADIATION PYROMETERS, THERMISTORS AND THERMOCOUPLES, DISCUSSING THEIR CALIBRATION, RANGE AND MEASURING ACCURACY
A64-26403

RECIPIROTATING ENGINE ELECTRONIC TACHOMETER AND SYNCHROSCOPE FOR RECIPROCATING ENGINES OF LIGHT AIRCRAFT, DESCRIBING TRANSDUCER AND INDICATOR
A64-21755

RECORDING INSTRUMENT INSTRUMENTATION FOR DYNAMIC DATA ACQUISITION ON ARTILLERY AND ROCKET LAUNCHER WEAPONS - TRANSDUCERS AND RECORDERS
N63-16606

CONTACT LENS PHOTOELECTRIC EYE MOVEMENT RECORDING SYSTEM
PPMC/MEMO-162 N63-18820

REFLECTED WAVE PIEZOCERAMIC PRESSURE TRANSDUCERS FOR SHOCK TUBE PRESSURE MEASUREMENT - SHOCK WAVE PROFILES OF REFLECTED WAVES, THICKNESS AND CURVATURE
NASA-CR-50995 N63-18139

REGENERATIVE FUEL CELL THERMAL ENERGY CONVERSION TO ELECTRICITY - ELECTROTHERMALLY REGENERATIVE TRANSDUCER DEVICE
AD-403290 N64-30900

RESISTANCE TEMPERATURE TRANSDUCER MEASUREMENTS OF FLOW DURATION IN A LOW PRESSURE SHOCK TUBE
NASA-TN-D-1218 N62-11666

HOT WIRE RESISTANCE TEMPERATURE TRANSDUCER FOR MEASUREMENT OF TRANSIENT FLOW
N62-12358

RESISTANCE THERMOMETER THERMOMETERS, RADIATION PYROMETERS, THERMISTORS AND THERMOCOUPLES, DISCUSSING THEIR CALIBRATION, RANGE AND MEASURING ACCURACY
A64-26403

REYNOLDS NUMBER TRANSDUCERS ARE PRESSURE SENSING DEVICES THAT CONVERT THEIR INPUT INSTANTANEOUSLY INTO ELECTRICAL SIGNALS WITHOUT DISTORTION
A64-24231

RIGIDITY MEASUREMENT OF TORSIONAL RIGIDITY OF STIFFENED PLATES
SM-81-14 N62-10591

ROCKET LAUNCHING DEVICE INSTRUMENTATION FOR DYNAMIC DATA ACQUISITION ON ARTILLERY AND ROCKET LAUNCHER WEAPONS - TRANSDUCERS AND RECORDERS
N63-16606

ROTOR BLADE AIR LOAD MEASUREMENTS DURING FLIGHT USING PRESSURE TRANSDUCER MOUNTED ON ROTOR BLADE SURFACE
REPT.-299-099-200 N64-14761

SATURN LAUNCH VEHICLE TRANSDUCERS CAPABLE OF SMALL FLOW RATE MEASUREMENT FROM LEAKS IN FLANGES OF SATURN ENGINE SYSTEMS
NASA-TM-X-50421 N63-21915

SCANNING DEVICE OPTICAL AMPLIFICATION EMPLOYING ELECTRONIC SCANNING TECHNIQUES
ARL-154 N62-12133

SEMICONDUCTOR HOT WIRE RESISTANCE TEMPERATURE TRANSDUCER FOR MEASUREMENT OF TRANSIENT FLOW
N62-12358

HALL EFFECT IN SEMICONDUCTORS TO MEASURE MECHANICAL DISPLACEMENTS AS A FUNCTION OF ACCELERATION
A63-19670

SEMICONDUCTOR DEVICE SEMICONDUCTOR TRANSDUCER FOR SHEAR STRAIN MEASUREMENT IN LOW MODULUS PROPELLANT-LIKE MATERIALS
AIAA PAPER 64-506 A64-20505

SENSOR ANNULAR NOZZLE TYPE GROUND EFFECT MACHINE, PRESSURE TRANSDUCER
IRF SER. 197, ISSUE 2 N62-14759

SHEAR FLOW ABILITY OF A TRANSDUCER TO RESOLVE SPATIAL DETAILS OF TURBULENT PRESSURE FIELDS IN SHEAR FLOWS AND IN SONAR RECEIVERS
A63-13194

SHEAR STRAIN SEMICONDUCTOR TRANSDUCER FOR SHEAR STRAIN MEASUREMENT IN LOW MODULUS PROPELLANT-LIKE MATERIALS
AIAA PAPER 64-506 A64-20505

SHOCK PRESSURE SENSITIVE DETECTOR FOR USE IN SHOCK VELOCITY MEASUREMENTS IN SHOCKTUBES AND TUNNELS
NOLTR-61-117 N62-12659

SHOCK MEASURING APPARATUS ANALYSIS OF INSTRUMENTATION FOR SHOCK AND VIBRATION MEASUREMENTS
A63-12478

SHOCK TESTING MACHINE DISCUSSION OF THE INSTRUMENTATION FOR SHOCK TESTING AND MEASUREMENT OF TRANSIENT MOTION, WITH EMPHASIS ON ACCELERATION DETERMINATIONS
A64-24231
SAE PAPER 62-585A  A63-12412

SHOCK TUNNEL
MEASUREMENTS OF FLOW DURATION IN A LOW PRESSURE
SHOCK TUBE  NASA-TN-D-1218  N62-11666

PRESSURE SENSITIVE DETECTOR FOR USE IN SHOCK
VELOCITY MEASUREMENTS IN SHOCKTUBES AND TUNNELS
NOLTR-61-117  N62-12659

PIGOT PRESSURE MEASUREMENTS IN HYPERSONIC SHOCK
TUNNEL  NAVWSPS-7329  N62-12666

PIEZOCERAMIC PRESSURE TRANSDUCERS FOR SHOCK TUBE
PRESSURE MEASUREMENT - SHOCK WAVE PROFILES OF
REFLECTED WAVES, THICKNESS AND CURVATURE
NASA-CR-50495  N63-18139

SKIN FRICTION TRANSDUCER FOR USE IN HYPERSONIC
SHOCK TUNNEL  CAL-129  N63-22395

SHOCK WAVE
PRESSURE TRANSDUCER FOR MEASURING SHOCK WAVE
PROFILES  POULTER LABS. TECH. REPT. 004- N62-13285

PRESSURE EXERTED BY SHOCK WAVES IN SOLID MEDIA -
OPTICAL, ELECTRICAL AND X-RAY TECHNIQUES USED TO
MEASURE SHOCK AND FREE SURFACE VELOCITIES
POULTER LABS. TR-002-63  N63-19134

PRESSURE TRANSDUCER FOR MEASURING SHOCK WAVE
PROFILES  DASA-1414  N64-14033

TRANSUCERS FOR TRANSIENT HIGH PRESSURE
MEASUREMENTS - SHOCK IMPEDANCE MATCHING OF
PIEZORESISTIVE GAUGE INSULATOR TO SALT ENVIRONMENT
AD-442649  N64-30204

SHOCK WAVE PROFILE
PIEZOCERAMIC PRESSURE TRANSDUCERS FOR SHOCK TUBE
PRESSURE MEASUREMENT - SHOCK WAVE PROFILES OF
REFLECTED WAVES, THICKNESS AND CURVATURE
NASA-CR-50495  N63-18139

SHROUD
MEASUREMENT OF TIME DEPENDENT SHROUD PRESSURE OF A
DUCTED PROPELLER  TAR-TR-612  N62-11007

SIGNAL ANALYZER
APPLICATION OF THE MODE THEORY TO THE ANALYSIS OF
SIGNAL TRANSMISSION PROPERTIES OF LINEAR
MULTITERMINAL TRANSDUCER CHAINS AT A DISCRETE
FREQUENCY  A63-16703

SINGLE CRYSTAL
ULTRASONIC TRANSDUCERS PRODUCED BY DIFFUSING
COPPER INTO SURFACE OF CADMIUM SULFIDE SINGLE-
CRYSTALS, FORMING THIN PIEZO-ELECTRICALLY ACTIVE
LAYERS  A64-10619

SKIN FRICTION
SKIN FRICTION TRANSDUCER FOR USE IN HYPERSONIC
SHOCK TUNNEL  CAL-129  N63-22395

SKIN TEMPERATURE
TRANSUCER SYSTEM FOR MEASURING SKIN TEMPERATURE OF
WING PANEL AND LEADING EDGE OF DYNAX-50AR
VEHICLE DURING REENTRY
ATL-D-811  N63-11421

TEMPERATURE TRANSDUCER FOR IN-FLIGHT MONITORING
OF SKIN PANEL SURFACE TEMPERATURES - EFFECTS OF
INSULATION AND VIBRATION ON ACCURACY
ATL-D-811  N63-12288

SOLID PROPELLANT ROCKET ENGINE
SEMICONDUCTOR TRANSUCER FOR SHEAR STRAIN
MEASUREMENT IN LOW MODULUS PROPELLANT-LIKE
MATERIALS  AIAA PAPER 64-506  A64-20505

SOLID STATE DEVICE
SMALL SOLID STATE FERRIMAGNETIC TRANSDUCER FOR
MEASURING INTERNAL STRESS IN ELECTRONIC
ENCAPSULATING RESINS  A64-24919

AEROSPACE TELEMETRY TRANSDUCER DESIGN FOR
MEASUREMENT OF PRESSURE AND TEMPERATURE
A64-26454

STIFF STRUCTURE
MEASUREMENT OF TORSIONAL RIGIDITY OF STIFFENED
PLATES  SW-61-14  N62-10591

STRAIN GAUGE
P-N JUNCTION STRAIN TRANSDUCER
WESCQS PAPER-3.4  N62-17798

DESCRIPTION OF A STRAIN GAGE PRESSURE TRANSDUCER
A63-15855

BONDED PIEZORESISTIVE STRAIN GAUGE AND CAPSULE OR
DIAPHRAGM-TYPE TRANSDUCERS FOR LOW PRESSURE
MEASUREMENTS  A64-16625

MINIATURE PRESSURE TRANSDUCER OF DIAPHRAGM TYPE
FOR MEASUREMENT OF STATIC PRESSURE AND HF PRESSURE
FLUCTUATIONS  A64-17216

STRESS MEASUREMENT
MEASUREMENT OF STRESS IN MACHINERY COMPONENTS
USING BASELESS WIRE PICKUP
FTD-TT-63-731/1&2  N64-24243

STRUCTURAL DYNAMICS
INSTRUMENTATION FOR DYNAMIC DATA ACQUISITION ON
ARTILLERY AND ROCKET LAUNCHER WEAPONS -
TRANSDUCERS AND RECORDERS  N63-16606

SURFACE TEMPERATURE
TEMPERATURE TRANSDUCER FOR IN-FLIGHT MONITORING
OF SKIN PANEL SURFACE TEMPERATURES - EFFECTS OF
INSULATION AND VIBRATION ON ACCURACY
ATL-D-811  N63-12288

TACHOMETER
ELECTRONIC TACHOMETER AND SYNCHROSCOPE FOR
RECRIPROCATING ENGINES OF LIGHT AIRCRAFT,
DESCRIBING TRANSDUCER AND INDICATOR
A64-21755

TELEMETRY
TELEMETRY TRANSDUCER HANDBOOK
WADD-TR-61-67, VOL. II SUPP. 1  N62-13126

TELEMETRY TRANSDUCER HANDBOOK WITH BIBLIOGRAPHY
WADD-TR-61-67, VOL. I, REV. 1  N64-12704

TELEVISION CAMERA
OPTICAL AMPLIFICATION EMPLOYING ELECTRONIC
SCANNING TECHNIQUES  A63-154  N62-12133

TEMPERATURE
COOLANT WATER TEMPERATURE MEASUREMENT IN ELECTRIC
ARC AIR HEATER  N62-12873

TEMPERATURE INDICATOR
TRANSDUCERS FOR HIGH VELOCITY GAS FLOW TEMPERATURE
MEASUREMENT WITH DESIGN CRITERIA DETERMINED FROM
THERMOCOUPLE MEASUREMENTS  N63-12272

TEMPERATURE TRANSDUCER FOR IN-FLIGHT MONITORING
OF SKIN PANEL SURFACE TEMPERATURES - EFFECTS OF
INSULATION AND VIBRATION ON ACCURACY
ATL-D-811  N63-12288

TEMPERATURE PROBE
DESIGN AND CALIBRATION TECHNIQUES FOR
ACCELEROMETERS AND TEMPERATURE PROBES AT CRYOGENIC
TEMPERATURE TRANSDUCER

TEMPERATURE TRANSDUCER
THERMOMETERS, RADIATION PYROMETERS, THERMISTORS AND THERMOCOUPLES, DISCUSSING THEIR CALIBRATION, RANGE AND MEASURING ACCURACY A64-26403
AEROSPACE TELEMETRY TRANSDUCER DESIGN FOR MEASUREMENT OF PRESSURE AND TEMPERATURE A64-26454

TENSIOMETER
UTILIZING A TENSIOMETER & TENSOMETER TO MEASURE PRESSURES OF JETSTREAMS JPRS-23920 N64-17713

THERMAL ENERGY
THERMAL ENERGY CONVERSION TO ELECTRICITY - ELECTROHERMALLY REGENERATIVE TRANSDUCER DEVICE AD-463290 N64-30900

THERMAL INSULATION
TEMPERATURE TRANSDUCER FOR IN-FLIGHT MONITORING OF SKIN PANEL SURFACE TEMPERATURES - EFFECTS OF INSULATION AND VIBRATION ON ACCURACY ATL-D-811 N63-12288

THERMAL SHOCK
SMALL SOLID STATE FERRIMAGNETIC TRANSDUCER FOR MEASURING INTERNAL STRESS IN ELECTRIC ENCAPSULATING RESINS A64-24919

THERMOCOUPLE
COOLANT WATER TEMPERATURE MEASUREMENT IN ELECTRIC ARC AIR HEATER N62-12873
THERMOCOUPLES FOR HIGH VELOCITY GAS FLOW TEMPERATURE MEASUREMENT WITH DESIGN CRITERIA DETERMINED FROM THERMOCOUPLE MEASUREMENTS N63-12272
THERMOMETERS, RADIATION PYROMETERS, THERMISTORS AND THERMOCOUPLES, DISCUSSING THEIR CALIBRATION, RANGE AND MEASURING ACCURACY A64-26403

THERMOMETER
WIRE RESISTANCE TEMPERATURE TRANSDUCER FOR MEASUREMENT OF TRANSIENT FLOW N62-12358
THERMOMETERS, RADIATION PYROMETERS, THERMISTORS AND THERMOCOUPLES, DISCUSSING THEIR CALIBRATION, RANGE AND MEASURING ACCURACY A64-26403

THOMSON EFFECT
THERMOMETERS, RADIATION PYROMETERS, THERMISTORS AND THERMOCOUPLES, DISCUSSING THEIR CALIBRATION, RANGE AND MEASURING ACCURACY A64-26403

TORSION
MEASUREMENT OF TORSIONAL RIGIDITY OF STIFFENED PLATES SM-61-14 N62-10591

TORSIONAL STRESS
FREQUENCY SHIFTS IN VIBRATING MODES OF BEAMS UNDER TWIST DETERMINED BY A MINIATURE ELECTROMECHANICAL DEVICE KNOWN AS A TWISTED BEAM TRANSDUCER A63-15940

TRANSFER FUNCTION
INPUT, OUTPUT, AND TRANSFER FUNCTION RELATIONS OF LINEAR TRANSDUCERS N64-16238

TRANSFORMER
PRESSURE TRANSDUCER USING LINEAR DIFFERENTIAL TRANSFORMER TN-SE-3-63 N64-29389

TRANSIENT PRESSURE
TUBING CONNECTION EFFECTS ON TRANSDUCER RESPONSE FOR TRANSIENT PRESSURE MEASUREMENT N64-10071
TRANSIENT PRESSURE MEASURING METHODS - TRANSDUCER DESIGN AND EVALUATION AERONAUTICAL ENGR. REPT. 595 N62-11126
DYNAMIC RESPONSE OF TRANSIENT PRESSURE TRANSDUCERS FOR LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS NASA-CR-51516 N63-21974

TRANSPORTATION SYSTEM
TRANSIENT PRESSURE MEASURING METHODS APPLIED TO LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS NASA-CR-51515 N63-22047
ELECTROMECHANICAL TRANSDUCER SYSTEMS FOR TRANSIENT PRESSURE MEASUREMENTS NAV-TR-14351 N64-30127

TUBE
TUBING CONNECTION EFFECTS ON TRANSDUCER RESPONSE FOR TRANSIENT PRESSURE MEASUREMENT N62-10071
DYNAMIC TESTING OF PRESSURE TRANSDUCERS JPL-TR-32-268 N62-12249

TUNNEL
PITOT PRESSURE MEASUREMENTS IN HYPERSONIC SHOCK TUNNEL NAWEPS-7329 N62-12666
TURBINE INSTRUMENT DISCUSSION OF THE PERFORMANCE OF TURBINE-TYPE OR PROPELLER FLOWMETERS, OPERATING ON LIQUID HYDROCARBONS, IN THE RANGE 0.5 TO 250 GPM A63-11187
TURBULENT FLOW ABILITY OF A TRANSDUCER TO RESOLVE SPATIAL DETAILS OF TURBULENT PRESSURE FIELDS IN SHEAR FLOWS AND IN SONAR RECEIVERS A63-13194

ULTRASONIC SPEED
POINT-CONTACT TRANSDUCERS FOR ULTRASONIC TESTING WAL-TR-14351/1 N62-14557
ULTRASONIC PULSE ECHO DETECTION OF DEFECTS IN METAL N62-11120

ULTRASONICS
ULTRASONIC PHENOMENA AND METHODS OF MEASUREMENT - BIBLIOGRAPHY BM-IC-8146 N63-12769
ULTRASONIC TRANSDUCERS PRODUCED BY DIFFUSING COPPER INTO SURFACE OF CADMIUM SULFIDE SINGLE-CRYSTALS, FORMING THIN PIEZO-ELECTRICALLY ACTIVE LAYERS A64 10619

VELOCITY
PRESSURE SENSITIVE DETECTOR FOR USE IN SHOCK VELOCITY MEASUREMENTS IN SHOCKTUBES AND TUNNELS NOLTR-61-117 N62-12659

VIBRATION
TEMPERATURE TRANSDUCER FOR IN-FLIGHT MONITORING OF SKIN PANEL SURFACE TEMPERATURES - EFFECTS OF INSULATION AND VIBRATION ON ACCURACY ATL-D-811 N63-12288
CAPACITIVE TRANSDUCERS FOR NARROW BAND VIBRATORY DISPLACEMENT OUTPUT OF ANGULAR MOTION SENSORS - ENERGY DENSITY CALCULATION FOR PARALLEL PLATE TYPE ECL-R-153 N63-13604
VIBRATION PICKUP DISCUSSION OF THE INSTRUMENTATION FOR SHOCK TESTING AND MEASUREMENT OF TRANSIENT MOTION, WITH EMPHASIS ON ACCELERATION DETERMINATIONS SAE PAPER 62-585A A63-12412
VIBRATION TESTING EQUIVALENT CIRCUIT OF A MAGNETOSTRICTIVE TRANSDUCER WORKING NEAR THE FUNDAMENTAL RESONANCE AND THE ELECTRICAL EQUIVALENT CIRCUIT OF A STEP TRANSFORMER FOR LONGITUDINAL AND TORSIONAL VIBRATIONS A63-24318
SUBJECT INDEX

VIBRATION TESTING MACHINE
ANALYSIS OF INSTRUMENTATION FOR SHOCK AND VIBRATION MEASUREMENTS A63-12478

VIBRATIONAL STRESS
FREQUENCY SHIFTS IN VIBRATING MODES OF BEAMS UNDER TWIST DETERMINED BY A MINIATURE ELECTROMECHANICAL DEVICE KNOWN AS A TWISTED BEAM TRANSDUCER A63-15940

VISCOUS FLOW
DRAG-TYPE FLOWMETER FOR MEASURING IMPACT FORCE OF MOVING STREAM A63-10758

WAVE
PROPAGATION OF LARGE AMPLITUDE WAVES IN PURE LEAD BRL-1158 N62-12988

WEAPON
INSTRUMENTATION FOR DYNAMIC DATA ACQUISITION ON ARTILLERY AND ROCKET LAUNCHER WEAPONS - TRANSDUCERS AND RECORDER N63-16606

WEAPON SYSTEM 133A
STATHAM DIFFERENTIAL PRESSURE TRANSDUCER - WEAPON SYSTEM 133A AD-421712 N64-12171
QUALIFICATION TESTING OF STATHAM ABSOLUTE PRESSURE TRANSDUCER FOR WEAPON SYSTEM 133A REPT.-0162-010R-26 N64-14096

WHEATSTONE BRIDGE
RESISTIVE-WHEATSTONE BRIDGE LIQUID DISPLACEMENT TRANSDUCER USED TO MONITOR LIQUID SURFACE OSCILLATIONS NASA-CR-56551 N64-23527

WIND TUNNEL
TRANSDUCER WHICH MEASURES HEAT TRANSFER RATES IN HYPERSONIC WIND TUNNELS A63-16801

WING PANEL
TRANSDUCER SYSTEM FOR MEASURING SKIN TEMPERATURE OF WING PANEL AND LEADING EDGE OF DYNASOAR VEHICLE DURING REENTRY ATL-D-861 N63-11421

X

X-RAY
PRESSURE EXERTED BY SHOCK WAVES IN SOLID MEDIA - OPTICAL, ELECTRICAL AND X-RAY TECHNIQUES USED TO MEASURE SHOCK AND FREE SURFACE VELOCITIES POULTER LABS. TR-002-63 N63-19134

X-20 AIRCRAFT
TRANSDUCER SYSTEM FOR MEASURING SKIN TEMPERATURE OF WING PANEL AND LEADING EDGE OF DYNASOAR VEHICLE DURING REENTRY ATL-D-861 N63-11421
# Personal Author Index

## Bibliography on ELECTROMECHANICAL TRANSDUCERS / with indexes

**FEBRUARY 1966**

**Listing of Personal Authors of Reports**

The following index has been prepared to enable the user to locate references written by a particular author. The last name of each author is listed alphabetically. Immediately below the name appears a brief statement describing the content of each reference. An accession number, e.g. N65-12345 or A65-13456, assigned for purposes of identification, is located below and to the right of the descriptive statement. When an author has written more than one report or article that is included in the bibliography, the references are listed in chronological order based on their accession numbers.

<table>
<thead>
<tr>
<th>Author</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALLEN, T. H.</td>
<td><strong>OXYGEN DETECTOR USING PHYSICAL TRANSDUCERS</strong>  N63-22411</td>
</tr>
<tr>
<td>ARMSTRONG, R. W.</td>
<td><strong>STATHAM DIFFERENTIAL PRESSURE TRANSDUCER - WEAPON SYSTEM 133A</strong> AD-421712 N64-12171</td>
</tr>
<tr>
<td></td>
<td><strong>QUALIFICATION TESTING OF STATHAM ABSOLUTE PRESSURE TRANSDUCER FOR WEAPON SYSTEM 133A</strong> REPT.-0162-01DR-26 N64-14096</td>
</tr>
<tr>
<td>AUSTIN, R. F.</td>
<td><strong>CALIBRATION OF PRESSURE TRANSDUCER SYSTEM FOR UNSTEADY PRESSURE MEASUREMENTS</strong> AEDC-TDR-63-29 N63-13424</td>
</tr>
<tr>
<td>BALAKRISHNA, S.</td>
<td><strong>PRESSURE TRANSDUCER USING LINEAR DIFFERENTIAL TRANSFORMER</strong> TN-5E-3-63 N64-29389</td>
</tr>
<tr>
<td>BANCROFT, R. W.</td>
<td><strong>OXYGEN DETECTOR USING PHYSICAL TRANSDUCERS</strong>  N63-22411</td>
</tr>
<tr>
<td>BAR-DAVID, I.</td>
<td><strong>APPLICATION OF THE MODE THEORY TO THE ANALYSIS OF SIGNAL TRANSMISSION PROPERTIES OF LINEAR MULTITERMINAL TRANSDUCER CHAINS AT A DISCRETE FREQUENCY</strong> A63-16703</td>
</tr>
<tr>
<td>BARNARD, G. W.</td>
<td><strong>ENDRADIOSONDES - STATE OF THE ART SURVEY</strong>  AMRL-TDR-62-122 N63-13937</td>
</tr>
<tr>
<td>BECKER, H.</td>
<td><strong>MEASUREMENT OF TORSIONAL RIGIDITY OF STIFFENED PLATES</strong> SM-61-14 N62-10591</td>
</tr>
<tr>
<td>BENTLEY, W. G.</td>
<td><strong>DYNAMIC RESPONSE OF TRANSIENT PRESSURE TRANSDUCERS FOR LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS</strong> NASA-CR-51516 N63-21974</td>
</tr>
<tr>
<td>BERGH, H.</td>
<td><strong>PRESSURE DISTRIBUTION MEASUREMENT ON HARMONICALLY OSCILLATING WINGS</strong> ICAS PAPER 64-28 A64-22766</td>
</tr>
<tr>
<td>BERNSTEIN, D.</td>
<td><strong>PRESSURE TRANSDUCER FOR MEASURING SHOCK WAVE PROFILES</strong> POULIER LABS. TECH. REPT.-004- N62-13285</td>
</tr>
<tr>
<td>BERT, C. W.</td>
<td><strong>MINIATURE PRESSURE TRANSDUCER OF DIAPHRAGM TYPE FOR MEASUREMENT OF STATIC PRESSURE AND HF PRESSURE FLUCTUATIONS</strong> A64-17216</td>
</tr>
<tr>
<td>BISHOP, R. E.</td>
<td><strong>LIFT AND DRAG FORCE MEASUREMENTS ON A CIRCULAR CYLINDER, OSCILLATING TRANSVERSELY IN FLOWING FLUID</strong> A64-13085</td>
</tr>
<tr>
<td>BOLLINGER, L. E.</td>
<td><strong>TRANSDUCERS ARE PRESSURE SENSING DEVICES THAT CONV.ERT THEIR INPUT INSTANTANEOUSLY INTO ELECTRICAL SIGNALS WITHOUT DISTORTION</strong> A64-24231</td>
</tr>
<tr>
<td></td>
<td><strong>PRESSURE TRANSDUCERS DESCRIBING MANOMETERS, PITOT TUBES, BOURDON TUBES AND RESISTANCE, CAPACITANCE AND PIEZOELECTRIC GAUGES</strong> A64-25773</td>
</tr>
<tr>
<td></td>
<td><strong>THERMOMETERS, RADIATION PYROMETERS, THERMISTORS AND THERMOCOUPLES, DISCUSSING THEIR CALIBRATION, RANGE AND MEASURING ACCURACY</strong> A64-26403</td>
</tr>
<tr>
<td>BORODIN, V. P.</td>
<td><strong>UTILIZING A TRANSDUCER &amp; TENSOMETER TO MEASURE PRESSURES OF JETSTREAMS</strong> JPRS-23920 N64-17713</td>
</tr>
<tr>
<td>BOUCHE, R. R.</td>
<td><strong>ANALYSIS OF INSTRUMENTATION FOR SHOCK AND VIBRATION MEASUREMENTS</strong> A63-12478</td>
</tr>
<tr>
<td></td>
<td><strong>TRANSDUCERS FOR DYNAMIC MEASUREMENTS COVERING OPERATION, CALIBRATION AND APPLICATIONS</strong> A64-23179</td>
</tr>
<tr>
<td>BRODERSEN, R. K.</td>
<td><strong>SURVEY OF THE PRINCIPLES, CHARACTERISTICS, AND RELATIVE MERITS OF THE CONSTANT-RELUCTANCE TYPE TGROIDAL DISPLACEMENT TRANSDUCER</strong> A63-13024</td>
</tr>
<tr>
<td>BROWN, P. E.</td>
<td><strong>DESIGN AND APPLICATION OF A FAMILY OF TRANSDUCERS WHICH PRODUCE A DIRECT DIGITAL OUTPUT, WITH PARTICULAR REFERENCE TO AEROSPACE UTILIZATION</strong> A63-15342</td>
</tr>
<tr>
<td>BURPO, F.</td>
<td><strong>AIR LOAD MEASUREMENTS DURING FLIGHT USING PRESSURE TRANSDUCER MOUNTED ON ROTOR BLADE SURFACE</strong> REPT.-299-099-200 N64-14761</td>
</tr>
<tr>
<td>BYFORD, G. H.</td>
<td><strong>CONTACT LENS PHOTOELECTRIC EYE MOVEMENT RECORDING SYSTEM</strong> FPCR/REMO-162 N63-18820</td>
</tr>
<tr>
<td>CARNWILE, C. L.</td>
<td><strong>RESONANT MODES OF GAS PRESSURE OSCILLATIONS IN SINUSOIDAL PRESSURE GENERATOR WITH FLAT CYLINDRICAL CHAMBER</strong> NASA-CR-51517 N63-22048</td>
</tr>
</tbody>
</table>
CHAMBERS, J. T.

CHAMBERS, J. T.
EVALUATION OF DUEL ELEMENT TRANSDUCER FOR HIGH FLUX NATURAL GAS MEASUREMENTS
ARL-63-58

N63-17470

COLBURN, P., J.
HIGH ACCURACY SELF-CONTAINED FORCE BALANCE PRESSURE TRANSDUCER FOR EXTREME ENVIRONMENTS
A64-25349

CODN, G. W.
A WIDE RANGE PRESSURE TRANSDUCER
N62-12482

CORBIN, T.
HEMUL BLOOD PRESSURE MEASURING AND MONITORING SYSTEM ON MAN IN FLIGHT
N62-10687

COON, G. W.
A WIDE RANGE PRESSURE TRANSDUCER
N62-12482

CORBIN, T.
REMULT BLOOD PRESSURE MEASURING AND MONITORING SYSTEM ON MAN IN FLIGHT
N62-10687

CORCOS, G. M.
ABILITY OF A TRANSDUCER TO RESOLVE SPATIAL DETAILS OF TURBULENT PRESSURE FIELDS IN SHEAR FLOWS AND IN SONAR RECEIVERS
A63-13194

CRAIG, J.
HIGH PRESSURE TRANSIENT TRANSMITTER SYSTEM FOR MEASUREMENT OF INTERNAL STRESS IN ELECTRONIC ENCAPSULATING RESINS
A64-24919

CUMMING, J. D.
ANNUAL NOZZLE TYPE GROUND EFFECT MACHINE, PRESSURE TRANSDUCER
ELR SER. 187, ISSUE 2
N62-14759

CUSHING, V.
ANNUAL NOZZLE TYPE GROUND EFFECT MACHINE, PRESSURE TRANSDUCER
ELR SER. 187, ISSUE 2
N62-14759

CUSHING, V.
INDUCTION FLOWMETER FOR DIELECTRIC FLUIDS
N62-11123

DELANEY, M. J.
ELECTRONIC TACHOMETER AND SYNCHROSCOPE FOR RECIPIRENTING ENGINES OF LIGHT AIRCRAFT, DESCRIBING TRANSDUCER AND INDICATOR
A64-21755

DICKEN, G. W.
SEMICONDUCTOR TRANSDUCER FOR SHEAR STRAIN MEASUREMENT IN LOW MODULUS PROPELLANT-LIKE MATERIALS
AIAA PAPER 64-506

N64-20505

DIMEFF, J.
A WIDE RANGE PRESSURE TRANSDUCER
N62-12482

VIBRATING MEMBRANE ELECTROMETER WITH HIGH CONVERSION GAIN
NASA-RP-289

N64-28352

DORAN, D. G.
PRESSURE EXERTED BY SHOCK WAVES IN SOLID MEDIA — OPTICAL, ELECTRICAL AND X-RAY TECHNIQUES USED TO MEASURE SHOCK AND FREE SURFACE VELOCITIES
POULTER LABS. TR-002-63
N63-19134

EICHHBERGER, L. C.
DYNAMIC CALIBRATION OF PRESSURE TRANSDUCERS
N85-MONOGRAPH-67

N64-16236

FEISTMAN, M. L.
DYNAMIC CALIBRATION OF PRESSURE TRANSDUCERS
N85-MONOGRAPH-67

N64-16236

FIFE, W. P.
CATHERETER FOR RIGHT HEART AND PULMONARY ARTERY IMPLANTATION
SAM-TDR-64-10
N64-18918

FISHER, H. F., JR.
TELEMTRY TRANSDUCER HANDBOOK
WADD-TR-61-67, VOL. I

FISHER, H. F., JR.
TELEMTRY TRANSDUCER HANDBOOK WITH BIBLIOGRAPHY
WADD-TR-61-67, VOL. I

FOSTER, N. F.
ULTRASONIC TRANSDUCERS PRODUCED BY DIFFUSING COPPER INTO SURFACE OF CADMIUM SULFIDE SINGLE-CRYSTALS, FORMING THIN PIEZO-ELECTRICALLY ACTIVE LAYERS
A64-10119

GERARD, G.
MEASUREMENT OF TORSIONAL RIGIDITY OF STIFFENED PLATES
SM-61-14

N62-10591

GERICKE, G. R.
POINT-CONTACT TRANSDUCERS FOR ULTRASONIC TESTING
WAL-TR-143,5/1

N62-14557

ULTRASONIC PULSE ECHO DETECTION OF DEFECTS IN METAL
N62-17120

GIEDT, M. H.
EVALUATION OF DUEL ELEMENT TRANSDUCER FOR HIGH TEMPERATURE GAS MEASUREMENTS
ARL-63-58

N63-17470

GIRVES, J.
DESCRIPTION OF PRESSURE PICKUPS WHICH HAVE A WIDE BANDWIDTH OR WHICH ARE IN DIRECT CONTACT WITH MEDIA UP TO 3700 DEGREES KELVIN
A63-12250

I-14
PERSONAL AUTHOR INDEX

TRANSDUCER FOR VARIABLE PRESSURES IN HIGH TEMPERATURE FLOWS
ONERA-91 A63-12634

GORMAN, H. A.
BLOOD PRESSURE TRANSDUCER-TRANSMITTER SYSTEM FOR MEASURING PRESSURES WITHIN INTACT ARTERIES OF SUBJECTS IN ORBITING VEHICLES AND TO RELAY DATA TO RECEIVING-RECORDING EQUIPMENT
AIAA PAPER 63-167 A63-19640

GRAU, R.
BLOOD PRESSURE TRANSDUCER-TRANSMITTER SYSTEM FOR MEASURING PRESSURES WITHIN INTACT ARTERIES OF SUBJECTS IN ORBITING VEHICLES AND TO RELAY DATA TO RECEIVING-RECORDING EQUIPMENT
AIAA PAPER 63-167 A63-19640

GREEN, C. E.
COMPUTER FOR MEASURING DIRECTIVITY FACTOR FOR ELECTROACOUSTIC TRANSDUCERS
NEL-1196 N64-14635

GUNKEL, W.-A.
METHOD FOR OEFECT DISCRIMINATION IN AUTOMATIC MULTIPLE TRANSDUCER INSPECTION SYSTEMS
N63-17170

HALL, J. A.
OPTICAL AMPLIFICATION EMPLOYING ELECTRONIC SCANNING TECHNIQUES
ARL-154 N62-12133

HANSON, J. C.
INSTRUMENTATION FOR DYNAMIC DATA ACQUISITION ON ARTILLERY AND ROCKET LAUNCHER WEAPONS - TRANSDUCERS AND RECORDER
N63-16606

HARTILL, D. L.
PRESSURE TRANSDUCER FOR MEASURING SHOCK WAVE PROFILES
POULTER LABS. TECH. REPT.-004- N62-13285

HARTMAN, A.
USE OF FOKKER BOND TESTER IN Destructive AND NONDESTRUCTIVE TEST ON REDUX BONDED SINGLE AND DOUBLE LAP JOINTS
NRL-TN-M.2099 N63-14321

HASSAN, A. Y.
LIFT AND DRAG FORCE MEASUREMENTS ON A CIRCULAR CYLINDER, OSCILLATING TRANSVERSELY IN FLOWING FLUID
A64-13085

HORNING, D. O.
ANNULAR NOZZLE TYPE GROUND EFFECT MACHINE, PRESSURE TRANSDUCER
IER SER. 187, ISSUE 2 N62-14759

HOUGH, G. R.
MEASUREMENT OF TIME DEPENDENT SHROUD PRESSURE OF A DUCTED PROPELLER
TAR-TR-612 N62-11007

HUNT, T. W.
ELECTROMECHANICAL TRANSDUCER SYSTEMS FOR TRANSIENT PRESSURE MEASUREMENTS
WAPD-TM-343 N64-30127

INSKEEP, J.
DYNAMIC TESTING OF PRESSURE TRANSDUCERS
JPL-TR-32-268 N62-12249

INYUTIN, I. S.
MEASUREMENT OF STRESS IN MACHINERY COMPONENTS USING BASELESS WIRE PICKUP
FD-63-731/162 N64-24243

JIMERSON, B. D.
SENSITIVITY AND LINEARITY OF ACCELEROMETER USING PIEZOELECTRIC CRYSTALS
A64-24737

JOHNSON, D. S.
PZEOCERAMIC PRESSURE TRANSDUCERS FOR SHOCK TUBE PRESSURE MEASUREMENT - SHOCK WAVE PROFILES OF REFLECTED WAVES, THICKNESS AND CURVATURE
NASA-CR-50495 N63-18139

JOHNSON, L. F., JR.
OXYGEN DETECTOR USING PHYSICAL TRANSDUCERS
N63-22411

JONES, H. B., JR.
TUBING CONNECTION EFFECTS ON TRANSDUCER RESPONSE FOR TRANSIENT PRESSURE MEASUREMENT
N62-10071

JONES, H. E.
TRANSIENT PRESSURE MEASURING METHODS - TRANSDUCER DESIGN AND EVALUATION
AERONAUTICAL ENGR. REPT.-5958 N62-11126

KANA, O. D.
RESISTIVE-WHEATSTONE BRIDGE LIQUID DISPLACEMENT TRANSDUCER USED TO MONITOR LIQUID SURFACE OSCILLATIONS
NASA-CR-56551 N64-23527

KAPLAN, H. N.
MAGNETODYNAMIC MOTION TRANSDUCER FOR MEASURING MOTION VECTOR FOR MAGNETIC TO ELECTRIC FIELD TRANSFORMATION
A64-22505

KAPLAN, H. N.
SMAK SOLID STATE FERRIMAGNETIC TRANSDUCER FOR MEASURING INTERNAL STRESS IN ELECTRONIC ENCAPSULATING RESINS
A64-24919

KEDUGH, D. D.
PRESSURE TRANSDUCER FOR MEASURING SHOCK WAVE PROFILES
ASA-1414 N64-14033

KAWARA, R.
TRANSDUCERS FOR TRANSIENT HIGH PRESSURE MEASUREMENTS - SHOCK IMPEDANCE MATCHING OF PIEZORESISTIVE GAUGE INSULATOR TO SALT ENVIRONMENT
AD-442689 N64-30204

KHOKHLOV, V. A.
HYDRAULIC ACTUATORS AND AMPLIFIERS WITH & WITHOUT FEEDBACK, AND ELECTROMECHANICAL TRANSDUCERS
FD-IT-62-1226/162 N64-11150

KNAUER, R. C.
TRANSIENT PRESSURE MEASURING METHODS APPLIED TO LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS
NASA-CR-51515 N63-22047

KOMAR, C. A.
ULTRASONIC PHENOMENA AND METHODS OF MEASUREMENT - BIBLIOGRAPHY
DM-IC-8146 N63-12769

KUDRAYATSEV, E. V.
TRANSUDERS FOR HIGH VELOCITY GAS FLOW TEMPERATURE MEASUREMENT WITH DESIGN CRITERIA DETERMINED FROM THERMOCouple MEASUREMENTS
N63-12272

LANE, J. W.
A WIDE RANGE PRESSURE TRANSDUCER
N62-12482

VIBRATING MEMBRANE ELECTROMETER WITH HIGH CONVERSION GAIN
NASA-AR-289 N64-28352

LARUE, F.
BLOOD PRESSURE TRANSDUCER-TRANSMITTER SYSTEM FOR MEASURING PRESSURES WITHIN INTACT ARTERIES OF SUBJECTS IN ORBITING VEHICLES AND TO RELAY DATA TO RECEIVING-RECORDING EQUIPMENT
AIAA PAPER 63-167 A63-19640

LAYTON, J. P.
TRANSIENT PRESSURE MEASURING METHODS APPLIED TO LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS
NASA-CR-51515 N63-22047

LAYTON, J. P.
PERSONAL AUTHOR INDEX

JOHNSON, D. S.
PZEOCERAMIC PRESSURE TRANSDUCERS FOR SHOCK TUBE PRESSURE MEASUREMENT - SHOCK WAVE PROFILES OF REFLECTED WAVES, THICKNESS AND CURVATURE
NASA-CR-50495 N63-18139

JOHNSON, L. F., JR.
OXYGEN DETECTOR USING PHYSICAL TRANSDUCERS
N63-22411

JONES, H. B., JR.
TUBING CONNECTION EFFECTS ON TRANSDUCER RESPONSE FOR TRANSIENT PRESSURE MEASUREMENT
N62-10071

JONES, H. E.
TRANSIENT PRESSURE MEASURING METHODS - TRANSDUCER DESIGN AND EVALUATION
AERONAUTICAL ENGR. REPT.-5958 N62-11126

KANA, O. D.
RESISTIVE-WHEATSTONE BRIDGE LIQUID DISPLACEMENT TRANSDUCER USED TO MONITOR LIQUID SURFACE OSCILLATIONS
NASA-CR-56551 N64-23527

KAPLAN, H. N.
MAGNETODYNAMIC MOTION TRANSDUCER FOR MEASURING MOTION VECTOR FOR MAGNETIC TO ELECTRIC FIELD TRANSFORMATION
A64-22505

KAPLAN, H. N.
SMAK SOLID STATE FERRIMAGNETIC TRANSDUCER FOR MEASURING INTERNAL STRESS IN ELECTRONIC ENCAPSULATING RESINS
A64-24919

KEDUGH, D. D.
PRESSURE TRANSDUCER FOR MEASURING SHOCK WAVE PROFILES
ASA-1414 N64-14033

KAWARA, R.
TRANSDUCERS FOR TRANSIENT HIGH PRESSURE MEASUREMENTS - SHOCK IMPEDANCE MATCHING OF PIEZORESISTIVE GAUGE INSULATOR TO SALT ENVIRONMENT
AD-442689 N64-30204

KHOKHLOV, V. A.
HYDRAULIC ACTUATORS AND AMPLIFIERS WITH & WITHOUT FEEDBACK, AND ELECTROMECHANICAL TRANSDUCERS
FD-IT-62-1226/162 N64-11150

KNAUER, R. C.
TRANSIENT PRESSURE MEASURING METHODS APPLIED TO LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS
NASA-CR-51515 N63-22047

KOMAR, C. A.
ULTRASONIC PHENOMENA AND METHODS OF MEASUREMENT - BIBLIOGRAPHY
DM-IC-8146 N63-12769

KUDRAYATSEV, E. V.
TRANSUDERS FOR HIGH VELOCITY GAS FLOW TEMPERATURE MEASUREMENT WITH DESIGN CRITERIA DETERMINED FROM THERMOCouple MEASUREMENTS
N63-12272

LANE, J. W.
A WIDE RANGE PRESSURE TRANSDUCER
N62-12482

VIBRATING MEMBRANE ELECTROMETER WITH HIGH CONVERSION GAIN
NASA-AR-289 N64-28352

LARUE, F.
BLOOD PRESSURE TRANSDUCER-TRANSMITTER SYSTEM FOR MEASURING PRESSURES WITHIN INTACT ARTERIES OF SUBJECTS IN ORBITING VEHICLES AND TO RELAY DATA TO RECEIVING-RECORDING EQUIPMENT
AIAA PAPER 63-167 A63-19640

LAYTON, J. P.
TRANSIENT PRESSURE MEASURING METHODS APPLIED TO LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS
NASA-CR-51515 N63-22047

L-15
LEDFORD, R. L.
TRANSDUCER WHICH MEASURES HEAT TRANSFER RATES IN HYPERSONIC WIND TUNNELS
A63-16881

LIVY, T.
DESCRIPTION OF A STRAIN GAGE PRESSURE TRANSDUCER
A63-15695

LION, K. S.
SURVEY OF TRANSDUCERS USED TO MEASURE STATIC AND DYNAMIC PRESSURES IN FLUID-FLOW FIELDS
A63-11204

MAC ARTHUR, R. C.
SKIN FRICTION TRANSDUCER FOR USE IN HYPERSONIC SHOCK TUNNEL
CAL-129 N63-22395

MACPHERSON, W. V.
DEVELOPMENT OF PRESSURE TRANSDUCER FOR PRESSURE MEASUREMENT IN HYPERSONIC WIND TUNNEL TESTING
AEDC-TOR-63-135 N63-18749

MAKULSKI, W.
TRANSISTORIZED TRANSDUCER SELECTION FOR AIRCRAFT APPLICATIONS, EMPHASIZING COUPLING WITH TRANSFORMERS
A64-13598

MARSHALL, J. M.
PRESSURE SENSITIVE DETECTOR FOR USE IN SHOCK VELOCITY MEASUREMENTS IN SHOCKTUBES AND TUNNELS
NOLTR-61-117 N62-12659

MC CALLY, M.
ENDORADIOSONDES - STATE OF THE ART SURVEY
AMRL-TDR-62-122 N63-13937

MICHAELS, E. L.
DYNAMIC CALIBRATION OF PRESSURE TRANSDUCERS
NBS-MONOGRAPH-67 N64-16236

ELECTRONIC COMPENSATOR DESIGNED TO EXTEND USABLE FREQUENCY RANGE OF TRANSDUCER SYSTEM
N64-16244

MILLER, J. M.
ELECTRONIC LEVEL, INCORPORATING A TRANSDUCER, TO CONVERT MECHANICAL DISPLACEMENT OF PENDULUM INTO ELECTRIC SIGNAL USED IN ALIGNMENT AND MEASUREMENT TECHNIQUES AT LOW INVESTMENT FOR LESS SKILLED PERSONNEL
A63-20914

MORRIS, F. M.
ELECTROMECHANICAL TRANSDUCERS AS LINEAR TWO-PORT DEVICES
A64-29193

MUSTERT, D. F.
DYNAMIC CALIBRATION OF PRESSURE TRANSDUCERS
NBS-MONOGRAPH-67 N64-16236

ANALYSIS OF PHYSICAL NONLINEAR TRANSDUCERS BY MATHEMATICAL MODELS CHARACTERIZED BY DIFFERENTIAL EQUATIONS
N64-16240

TYPES OF PERIODIC FUNCTION GENERATORS
N64-16243

NALECZ, M.
HALL EFFECT IN SEMICONDUCTORS TO MEASURE MECHANICAL DISPLACEMENTS AS A FUNCTION OF ACCELERATION
A63-19670

NELSON, R.
P-N JUNCTION STRAIN TRANSDUCER
WESCON PAPER-3.4 N62-17798

NEUBERT, H. K. P.
BOOK ON PERFORMANCE AND DESIGN OF INSTRUMENT TRANSDUCERS FOR MEASUREMENT APPLICATIONS
A64-17660

NEVILLE, J. R.
OXYGEN DETECTOR USING PHYSICAL TRANSDUCERS
N63-22411

NEWGARD, P. M.
TRANSDUCER FOR THE CONTINUOUS EXTERNAL MEASUREMENT OF ARTERIAL BLOOD PRESSURE
N62-13733

EXTERNAL, ARTERIAL BLOOD PRESSURE TRANSDUCER
NASA-CR-53362 N64-17815

NORTON, H. N.
DISCUSSION OF THE ERROR-BAND CONCEPT WHICH SIMPLIFIES SPECIFICATIONS AND PERFORMANCE VERIFICATION OF TRANSDUCERS
A63-13649

DESIgn AND PERFORMANCE CHARACTERISTICS OF PRESSURE TRANSDUCERS
A64-12403

PALUDAN, C. T. N.
TRANSDUCERS CAPABLE OF SMALL FLOW RATE MEASUREMENT FROM LEAKS IN FLANGES OF SATURN ENGINE SYSTEMS
NASA-TM-X-50421 N63-21915

PASINI, J., III
ULTRASONIC PHENOMENA AND METHODS OF MEASUREMENT - BIBLIOGRAPHY
AMS-IC-8146 N63-12769

PASKUSZI G.
DYNAMIC CALIBRATION OF PRESSURE TRANSDUCERS
NBS-MONOGRAPH-67 N64-16236

ELECTRONIC COMPENSATOR DESIGNED TO EXTEND USABLE FREQUENCY RANGE OF TRANSDUCER SYSTEM
N64-16244

PAUL, R. J. A.
TWO PORT NETWORK REPRESENTATION OF DC ELECTROMECHANICAL TRANSDUCERS
COA-N-121 N62-13814

POULY, R. A.
TRANSIENT RADIATION EFFECTS IN PRESSURE TRANSDUCERS
AFSWC-TOR-62-63 N62-16174

PRESSMAN, G. L.
TRANSDUCER FOR THE CONTINUOUS EXTERNAL MEASUREMENT OF ARTERIAL BLOOD PRESSURE
N62-13733

EXTERNAL, ARTERIAL BLOOD PRESSURE TRANSDUCER
NASA-CR-53362 N64-17815

RAILL, D. L.
TRANSDUCER SYSTEM FOR MEASURING SKIN TEMPERATURE OF WING PANEL AND LEADING EDGE OF DYNASUDAR VEHICLE DURING REENTRY
ATL-0-2461 N63-11421

TEMPERATURE TRANSDUCER FOR IN-FLIGHT MONITORING OF SKIN PANEL SURFACE TEMPERATURES - EFFECTS OF INSULATION AND VIBRATION ON ACCURACY
ATL-0-601 N63-12288

EVALUATION OF DUEL ELEMENT TRANSDUCER FOR HIGH TEMPERATURE GAS MEASUREMENTS
ARL-63-58 N63-17470

REILLY, D.
INDUCTION FLOWMETER FOR DIELECTRIC FLUIDS
N62-11123

INDUCTION FLOWMETER FOR DIELECTRIC FLUIDS
N62-11541

RHODES, J. E.
DISCUSSION OF THE INSTRUMENTATION FOR SHOCK TESTING AND MEASUREMENT OF TRANSIENT MOTION, WITH EMPHASIS ON ACCELERATION DETERMINATIONS
SAE PAPER 62-3953 A63-12412

RINDNER, W.
A SENSITIVE MAGNETIC TRANSDUCER
WESCON PAPER-3.2 N62-17796

P-N JUNCTION STRAIN TRANSDUCER
WESCON PAPER-3.4 N62-17798

I-16
PERSONAL AUTHOR INDEX

WOLFE, R.

4

ROGILLD, V. L.

HEARTBEAT MEASUREMENT OF BIRD EMBRYOS WITH MICROMETERDIFITE TRANSUDER AS BALLISTOCARDIOGRAPH NASA-SP-5007 N64-19015

ROGIL, J. R.

COMPUTER FOR MEASURING DIRECTIVITY FACTOR FOR ELECTROACOUSTIC TRANSUDERS
NEL-1196 N64-14635

RUSSELL, R. H.

AEROSPACE TELEMETRY TRANSUDER DESIGN FOR MEASUREMENT OF PRESSURE AND TEMPERATURE A64-26454

SANchez, J. C.

BONDED PIEZORESISTIVE STRAIN GAUGE AND CAPSULE OR DIAPHRAGM-TYPE TRANSUDERS FOR LOW PRESSURE MEASUREMENTS A64-16625

Sandborn, V. A.

MEASUREMENTS OF FLOW DURATION IN A LOW PRESSURE SHOCK TUBE NASA-TN-D-1218 N62-11666

HOT WIRE RESISTANCE TEMPERATURE TRANSUDER FOR MEASUREMENT OF TRANSIENT FLOW N62-12358

Schein, R. L.

INDUCTION TRANSUDER FOR DIELECTRIC FLUIDS N62-11541

Schein, T. R.

INDUCTION TRANSUDER FOR DIELECTRIC FLUIDS N62-11123

Schmid, A. P.

A SENSITIVE MAGNETIC TRANSUDER WESCON PAPER-3.2 N62-17796

Schwepp, J. L.

DYNAMIC CALIBRATION OF PRESSURE TRANSUDERS NBS-MONOGRAPH-67 N64-16236

TYPES AND CHARACTERISTICS OF PRESSURE TRANSUDERS AND CONCEPTS OF CALIBRATION AND ANALYSIS N64-16237

TYPES OF APERIODIC FUNCTION GENERATORS N64-16241

Sharanowitz, H.

OPTICAL AMPLIFICATION EMPLOYING ELECTRONIC SCANNING TECHNIQUES ARL-154 N62-12133

Shapery, M. R.

DISCUSSION OF THE PERFORMANCE OF TURBINE-TYPE OR PROPELLER TRANSDUCERS, OPERATING ON LIQUID HYDROCARBONS, IN THE RANGE 0.5 TO 250 GPM A63-11187

Sittig, E.

PIEZOELECTRIC SINGLE CRYSTALS, FERROELECTRIC ELECTROSTRICTIVE CERAMICS AND MAGNETOSTRICTIVE METALS FOR USE AS ULTRASONIC TRANSUDERS A63-20741

Slater, E.

MICROMINIATURIZATION OF ELECTRONIC MEASURING DEVICES FOR BIOMEDICAL PURPOSES A64-17295

Smotherman, W. E.

DEVELOPMENT OF PRESSURE TRANSUDER FOR PRESSURE MEASUREMENT IN HYPERVELOCITY WIND TUNNEL TESTING AEDC-TOR-63-135 N63-18749

Sperrazza, J.

PROPAGATION OF LARGE AMPLITUDE WAVES IN PURE LEAD BRL-115B N62-12998

Srinathkumhr, S.

PRESSURE TRANSUDER USING LINEAR DIFFERENTIAL TRANSFORMER TN-5E-3-63 N64-29389

Stapel, M.

DRAG-TYPE TRANSUDER FOR MEASURING IMPACT FORCE OF MOVING STREAM A63-10798

Star, J.

STUDY OF THE APPLICATION OF HALL EFFECT TRANSUDERS AND THE CHARACTERISTICS ASSOCIATED WITH THEM A63-16327

Stroas, E. J.

DESIGN AND CALIBRATION TECHNIQUES FOR ACCELEROMETERS AND TEMPERATURE PROBES AT CRYOGENIC TEMPERATURES A63-18304

Stucki, F.

SMALL SOLID STATE FERRIMAGNETIC TRANSUDER FOR MEASURING INTERNAL STRESS IN ELECTRONIC ENCAPSULATING RESINS A64-24919

Tegrand, C.

DISCUSSION OF WORKING PRINCIPLES OF VARIOUS TYPES OF PRESSURE TRANSUDERS USED IN TEST AND MONITORING INSTALLATIONS A63-15141

Thatcher, J. H.

SEMICONDUCTOR TRANSUDER FOR SHEAR STRAIN MEASUREMENT IN LOW MODULUS PROPELLANT-LIKE MATERIALS AIAA PAPER 64-506 A64-24105

Thomas, J. P.

TRANSIENT PRESSURE MEASURING METHODS APPLIED TO LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS NASA-CR-51515 N63-22047

Trall, G. C.

CALIBRATION OF PRESSURE TRANSUDER SYSTEM FOR UNSTEADY PRESSURE MEASUREMENTS AEDC-TOR-63-29 N63-13424

Van Lin, V. A. J.

TRANSIENT RADIATION EFFECTS IN PRESSURE TRANSUDERS AFSC-TDR-62-63 N62-16174

Voutas, A. M.

FREQUENCY SHIFTS IN VIBRATING M ODES OF BEAMS UNDER TWIST DETERMINED BY A MINIATURE ELECTROMECHANICAL DEVICE KNOWN AS A TWISTED BEAM TRANSUDER A63-15940

Wal, D.

COOLANT WATER TEMPERATURE MEASUREMENT IN ELECTRIC ARC AIR HEATER N62-12073

Walter, J. J.

DYNAMIC RESPONSE OF TRANSIENT PRESSURE TRANSUDERS FOR LIQUID PROPELLANT ROCKET COMBUSTION CHAMBERS NASA-CR-51516 N63-21974

Mezer, R. H.

PITOT PRESSURE MEASUREMENTS IN HYPERSONIC SHOCK TUNNEL NAVWEPS-7329 N62-12666

Weaver, R. D.

THERMAL ENERGY CONVERSION TO ELECTRICITY - ELECTROTHERMALLY REGenerative TRANSUDER DEVICE AD-403290 N64-30900

Whitman, J. G., Jr.

CAPACITIVE TRANSUDERS FOR NARROW BAND VIBRATORY DISPLACEMENT OUTPUT OF ANGULAR MOTION SENSORS - ENERGY DENSITY CALCULATION FOR PARALLEL PLATE TYPE ESL-R-153 N63-13604

Willis, J.

SENSITIVITY AND LINEARITY OF ACCELEROMETER USING PIEZOELECTRIC CRYSTALS A64-24737

Wolfe, R.

ABILITY OF A TRANSUDER TO RESOLVE SPATIAL DETAILS OF TURBULENT PRESSURE FIELDS IN SHEAR
Y

YAKOVLEV, V. F.
FLOWS AND IN SONAR RECEIVERS
A63-13194

Y

YAKOVLEV, V. F.
MEASUREMENT OF STRESS IN MACHINERY COMPONENTS
USING BASELESS WIRE PICKUP
FTD-TT-63-731/1&2
N64-24243

Z

ZAKHAROV, Yu. G.
MEMBRANE TRANSDUCERS TO MEASURE PRESSURE PULSE
IN AIR STREAM
FTD-TI-63-737/16264
N64-22860

ZIOMECKL, H.
HALL EFFECT IN SEMICONDUCTORS TO MEASURE
MECHANICAL DISPLACEMENTS AS A FUNCTION OF
ACCELERATION
A63-19670