REPORT

PROJECT FOR THE ANALYSIS OF TECHNOLOGY TRANSFER

Quarterly Evaluation Report #4

13 October 1968 - 12 December 1968

Contract NSR 06-004-063

DENVER RESEARCH INSTITUTE
UNIVERSITY OF DENVER

QUARTERLY EVALUATION REPORT #4

PROJECT FOR THE ANALYSIS OF TECHNOLOGY TRANSFER

13 October 1968 - 12 December 1968

Contract NSR 06-004-063

- Prepared for -

National Aeronautics and Space Administration

- Prepared by -

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DENVER RESEARCH INSTITUTE – UNIVERSITY OF DENVER

PURPOSE AND SCOPE

The purpose of this report is to present additional instances of information use investigated under Contract NSR 06-004-063. The following cases represent the final screening of questionnaires returned by Technical Support Package requestors during the first year of the Project for the Analysis of Technology Transfer (PATT).

The process of documenting instances of Technical Support Package use begins with a screening of the returned questionnaires which identifies potential cases for documentation. The screening process involves considerable personal judgement. A significant response to a particular question could provide the key to determining whether further follow-up is indicated. A more discriminating determination makes use of a combination of several responses.

Two professional staff members independently review all returned questionnaires. Each researcher prepares a list of questionnaires he considers suitable for further attention. The lists are then reconciled and allocated to the PATT staff members for telephone or field investigation.

More stringent screening criteria have been used during this and the prior reporting period than had been applied earlier. This approach has identified situations of information use of greater significance. Barriers and incentives to the transfer process are becoming more apparent as additional actual and potential cases of transfer are documented.

George E. Hayo, a graduate student with the University of Denver's College of Business Administration, provided considerable assistance in completing the first year documentation effort. The results of his documentation efforts during the report period follow. These cases should not be considered as being representative of the universe of Technical Support Package users because the screening process disregards statistical sampling techniques and tends to identify more favorable situations for documentation.

Case Number: 80301416

The Penn-Poly Corporation, a fabricator of polyurethane, is interested in developments in temperature resistant plastics. A NASA Support Package on thermosetting plastics was obtained by Penn-Poly and sent to the Thiokol Corporation for further investigation.

Subject	Technology Source
Penn-Poly Corporation Mt. Bethel, Pennsylvania 717-897-6187 Contact: Heinz Walter President	Lewis Research Center Tech Brief: 67-10197

H. Lubowitz, E. Burns, and B. Dubrow of TRW Systems, under contract to Lewis Research Center, have developed a new class of thermosetting plastics with improved strength as well as thermal and chemical stability.

The Penn-Poly Corporation, fabricator of polyurethane, has experienced material failure in plastics with increasing heat. This is a common occurrence and, generally, substitute materials are used. The development of high-strength, heat resistant plastic would have great potential in material handling, feed haulers, and business machinery sales for Penn-Poly.

Heinz Walter, President of Penn-Poly, said his organization has not had sufficient time to evaluate the NASA information. Since they are a fabricator of polyurethane and not researchers, they sent the NASA information onto the Thiokol Corporation for further investigation. According to Mr. Walter, there is not a commercially available plastic product that will not either flex or lose its high-strength at temperatures above 230 to 250 degrees F.

Mr. Walter obtained the NASA information through a notice in the Material Engineer. This was the only NASA Support Package he had ever received. He thought the NASA information was "very good."
Mr. Walter's background is in Chemical Engineering.

GEH:bp
11/14/68

Case Number: 80403887

The Westinghouse Electric Corporation, Aerospace Division, is investigating the use of Aluminum Alloy 7075 to replace Alloy 6061 in some of its aerospace applications. The NASA document on Aluminum Alloy 7075 provides information to improve development work techniques in welding and heat treating.

Subject	Technology Source
Westinghouse Electric Corp. Aerospace Division Defense and Space Center Friendship International Airport Baltimore, Maryland 21203 301-765-4701 Contact: Robert D. Feather Process Engineer	Marshall Space Flight Center Tech Brief: 67-10301

The Aerospace Division of Westinghouse Electric Corporation manufactures radar equipment, stabilizers and A-frames for holding radar frames and packaging for electronic equipment. Currently, Magnesium-Aluminum Alloy 6061 is used in its products.

Robert Feather, Process Engineer, stated that Process Engineering is investigating the substitution of Aluminum Alloy 7075 for Magnesium-Aluminum 6061. Alloy 7075 is harder, performs better in vibration testing, and is easier to work with in production. Mr. Feather said his particular interest is in heat treating and cleaning methods, fabrication, and welding techniques. He has not used Alloy 7075 in a product or component or a product because the investigation is not complete.

Mr. Feather received a Tech Brief describing the Materials Data Handbook for Aluminum Alloy 7075 from his supervisor. The NASA document has been reviewed by more than 40 people in Manufacturing and Process Engineering. Other information on the use of Aluminum Alloy 7075 is available from suppliers such as Reynolds Aluminum and Aluminum Company of America.

Mr. Feather said NASA documents he has reviewed are clear, well written, complete in detail, and thorough in considering results of alternative tests and conditions. The Materials Data Handbook is more

Case Number: 80403887 (Cont.)

than one-half inch thick, according to Mr. Feather, and covers Aluminum Alloy 7075 thoroughly. Mr. Feather viewed the availability of NASA documents without the accompanying expense of development is of great benefit to industry.

Aerospace Division of Westinghouse Electric Corporation personnel concerned with the use of Aluminum Alloy 7075 in new products are process and manufacturing engineers, mechanical design engineers, and materials engineers.

GEH:mc
11/6/68

Case Number: 80504850

The Convair Division of General Dynamics was considering the purchase of expensive devices for measuring production tube flares. At the time, a NASA invention to test tube flares quickly and accurately was discovered through personal contact with a NASA representative. On further inquiry, it was found that the gauge was only a concept. Neither a production nor prototype model had been developed.

Subject	Technology Source
Convair Division San Diego, California 92112 714-296-6611, Ext. 1230 Contact: R. E. Harper Senior Quality Control Engineer	Kennedy Space Center Tech Brief: 66-10537

Francis Griffin of the Kennedy Space Center invented a gauge to test tube flares quickly and accurately. This gauge incorporated a test cone that was precisely made with a tapering surface to complement the tube flare.

The Convair Division of General Dynamics Corporation was concerned with procuring a device for measuring tube flares in production. Convair was having problems at the time meeting specifications and was considering the purchase of measuring devices costing from $20,000 to $40,000. According to R. E. Harper, Senior Quality Control Engineer, Convair fabricated a measuring device in its shop.

Mr. Harper was acquainted with the availability of the NASA gauge by a NASA representative. Mr. Harper received the Tech Brief and was pleased to find that there was a simple method available for measuring tube flares. On further inquiry, he found the NASA invention was only a concept, although he thought the concept was good. Therefore, Convair wasn't able to procure a tool or gauge similar to the NASA gauge. Further, he noted the NASA gauge required very tight tolerances and an extremely accurate measuring device. Ultimately, the specifications for measuring were relaxed, and was no need for the NASA-type tube flare gauge. Over 100 hours were used in searching for a device to accurately measure production tube flares.

Mr. Harper thought the NASA device would substitute for the expensive instruments available. Similar devices of less accuracy were available

Case Number: 80504850 (Cont.)

commercially. Mr. Harper stated that if the NASA idea discussed in a Tech Brief was only a concept, or in the conceptual stage, it should be specifically stated in the Brief. He added it should also be stated if the invention was a prototype or product that was available, either commercially or through another source.

Mr. Harper usually receives NASA information through either personal contact or trade magazines.

GEH:bp
10/28/68

Case Number: 80505067

The Consumer and Technical Products Division of Owens-Illinois, is using Vis-A-Plan in new product development and for contractor performance in demolition work.

Subject	Technology Source
Owens-Illinois Technical Center Consumer and Technical Products Division 1700 North Westwood Avenue Toledo, Ohio 43607 419-242-6543 Contact: James Marsh Corporate Consulting Industrial Engineer	Kennedy Space Center Tech Brief: 67-10240

Nathan Ranck of Trans World Airlines, under contract to Kennedy Space Center devised a bar-charting technique for representing and evaluating project activities on a performance-time basis. Vis-A-Plan is a method of charting that is compatible with, and supplementary to PERT. This technique may be used independently in development planning without need for sophisticated machine programming.

Mr. James Marsh of Owens-Illinois Technical Center, has used this technique of charting for a new product in the Consumer and Technical Products Division. The technique performed quite satisfactorily, keeping the product on schedule. Some of the people in the division aren't pleased, since the technique pointed out clearly their responsibilities and, in some cases, shortcomings. Nevertheless, the technique will be used in the development of another new product in this division. The charting technique is also being used with a contractor on a demolition project by the Administrative Division.

Mr. Marsh thought that Vis-A-Plan is an excellent reporting tool to management and more clearly understood than PERT. Vis-A-Plan lets people know what they have to do and when; thus helping define their responsibilities. Progress reports are routed to individuals and their performance is reviewed at meetings.

Case Number: 80505067 (Cont.)

About 120 hours were used to establish the charting system. One man spends approximately 30 percent of his time keeping the system going.

Mr. Marsh's first contact with the Vis-A-Plan was through a Tech Brief. He regularly receives Briefs at his office and distributes them to others for their information. When the Vis-A-Plan system was encountered, it was thought to be the most fitting for the application. He thinks the quality of NASA publications generally fine, but sometimes it is difficult to obtain more specific information.

GEH:bp
10/28/68

Case Number: 80505299

Materials Research and Development personnel at the Lester Branch of Westinghouse Electric are investigating the use of several types of materials. A NASA handbook will serve as a reference source for particular alur 'num and stainless steel alloys.

Subject	Technology Source
Westinghouse Electric Corp. Lester Branch Philadelphia, Pennsylvania 19113 215-595-2893 Contact: Linden Boyer Materials Engineer	Marshall Space Flight Center Tech Brief: 67-10089

The Syracuse University Research Institute, under contract to Marshall Space Flight Center, has developed a set of Materials Data Handbooks for Aluminum Alloys 2014, 2219, and 5456, and Stainless Steel Alloy 301. The handbooks summarize known properties of these commercially available alloys.

Linden Boyer, Materials Engineer with Westinghouse Electric, said his group of research and development personnel are working on all types of materials applications. The handbooks for aluminum and stainless steel alloys are one of a number of reference sources used on a limited basis for materials information. It permits them to obtain the information from one source for these alloys. The handbooks are used infrequently and only when studying particular alloy types. The information in the handbooks is easily understood and well organized. However, even with the handbooks, Mr. Boyer reported they will still refer to other sources.

Mr. Boyer receives Tech Briefs through normal company distribution channels. The library retains the Tech Briefs in its files. Mr. Boyer would like to see the NASA packages give a more in-depth coverage of some subjects, but generally, the information is adequate.

GEH:mc
10/16/68

Case Number: 80505455

The Control Systems Division of Chandler Evans, Inc. will adapt an AEC-NASA computerized parts list system for use as part of its order control system. Currently, the Division is defining requirements for the new ordering system.

Subject	Technology Source
Chandler Evans, Inc. Control Systems Division Subsidiary of Colt Industries, Inc. Charter Oak Boulevard West Hartford, Connecticut 06101 203-236-0651 Contact: Allan Wright Reliability Manager	Space Nuclear Propulsion Office Tech Brief: 67-10348

William Horton and Marilyn Kinsey of Westinghouse Astronuclear Laboratory, under contract to AEC-NASA Space Nuclear Propulsion Office, developed a computerized parts list system designed to coordinate engineering releases, parts control, and manufacturing planning.

During the past four months, the Control Systems Division of Chandler Evans, Inc. has been developing requirements for an order control system. The system will be used in the development of all new products. The Control Systems Division builds preproduction and prototype fuel controls and high pressure fuel pumps for the aerospace industry.

Mr. Allan Wright, Reliability Manager, said they are still investigating requirements for the order control system. The parts list provided by NASA will have to be reprogrammed for the IBM 1130 computer. The NASA system will not be used as an order control system, but only as the parts list. Some adaptation will be required since this program is used only to convert the basic parts list to a numeric parts list.

The NASA computer program is very specific and does not consider exceptions. For instance, it considers only using one work order throughout the program while Chandler Evans, Inc. might have many work order numbers for the ordering of the same part. Mr. Wright reported they would like to work toward a current parts list that is developed during the design of new products instead of one that is put

Case Number: 80505455 (Cont.)

together after the product has been developed. When their order control system is established, they hope to avoid ordering or making wrong parts and to better coordinate part ordering and use.

Availability of the AEC-NASA information appeared in Product Engineering magazine. Mr. Wright wrote for the Tech Brief when he was considering developing an order control system. The computer program was received with the Tech Brief. In addition to receiving information through magazine referral, he receives a NASA monthly bulletin called "Reliability Abstracts and Technical Reviews." Mr. Wright thought NASA information is generally of good quality.

GEH:kcr
10/30/68

Case Number: 80505790

The Thermophysical Environmental Group at Aerojet General Corporation uses a NASA Fluid Properties Handbook in calculations for designing coolers and other low temperature systems.

Subject	Technology Source
Aerojet General Corporation Von Karman Center Azusa, California 91703 213-334-6211, Ext. 5978 Contact: Carl Fischer Senior Engineer	Marshall Space Flight Center Tech Brief: 67-10440

Alan Sherman and Robert Gershman, of the former Douglas Aircraft Company, compiled a Fluid Properties Handbook for Marshall Space Flight Center. It is a single source compilation of physical property data pertaining to helium, hydrogen, oxygen and nitrogen.

Mr. Carl Fischer, Senior Engineer in Thermophysical Design, said his group found this handbook very useful in calculations for cryogenic fluids, in the design of coolers, sensors and other low temperature systems. It covers a wider temperature range than other handbooks as well as being a single source for this type of information. It is in a very usable form and is used daily by design group personnel. New people coming into the design group are immediately acquainted with the handbook. This saves them considerable time in looking up information for calculations. Twenty to twenty-five hours a week are saved by having all the information in one handbook.

Mr. Fischer had a definite need for a single reference source, but when he sent for this handbook, he didn't think the book would be as good as it was. He was especially pleased with the entropy charts. However, some of the figures in the handbook are difficult to read because the lines are obscured.

Mr. Fischer receives Tech Briefs at his home. He would like to see a monthly index with prices for the materials described in the Tech Briefs. Otherwise, he is quite satisfied with the Tech Briefs and other NASA information.

GEH:kcr
10/15/68

Case Number: 80607188

The Center for Brain Research at the University of Rochester uses intracellular microelectrodes for measuring impulses from the brain. A NASA Technical Support Package for a miniature electrometer preamplifier will be used in a system at a considerable savings over preamplifiers available commercially.

Subject	Technology Source
Center for Brain Research The University of Rochester River Campus Station Rochester, New York 14627 716-275-4022 Contact: Lawrence Ota Electrical Engineer	Ames Research Center Tech Brief: 66-10549

Gordon De Boo and Clifford Burrous of the Ames Research Center developed a negative capacitance preamplifier using a dual Metal Oxide Silicon (MOS) transistor in conjunction with bi-polar transistors. The Center for Brain Research at The University of Rochester has built a prototype of this preamplifier at a cost of about $100. The preamplifier will be used in a system to measure brain impulses. An attempt is being made to isolate one or two cells of the brain and to record the spikes or impulses transmitted from the brain.

Problems with the offset voltage, caused by the microelectrodes, have prevented use of the prototype preamplifier as a DC amplifier. Until the DC offset voltage problem is corrected, they will be using AC voltage, coupling the preamplifier to the final amplifier. When the problem is corrected, the Center for Brain Research and, specifically Mr. Lawrence Ota, will build eight more of these preamplifiers. Total cost for the prototype and eight additional amplifiers is anticipated to be less than $900. Two commercial versions are available which are similar, or at least will do the job, at a price of about $500 each. Mr. Ota envisions a savings of $3, 500 by building the preamplifiers described in the NASA Support Package.

A Medical Electronics News technical abstract prompted Mr. Ota to build the prototype miniature electrometer preamplifier. At that time, there was not a particular need for the preamplifier, but continued

Case Number: 80607188 (Cont.)

developments in brain research are such that many preamplifiers are being evaluated. Only the NASA version was built as a prototype although others were commercially available and could have been fabricated.

NASA publications are not usually received by Mr. Ota. The appearance of the technical abstract in the Medical Electronics News enabled Mr. Ota to use the NASA invention.

GEH:mc
10/15/68

Case Number: 80607316

Douglas Astropower, a division of McDonnell Douglas Corporation, is obtaining electroencephalograms of epileptics in laboratory experiments aimed at prevention and identification of epileptic seizures. Helmets, such as developed by NASA's Ames Research Center and its own design, are uncomfortable to the epileptic wearer. If future work with pilots or other subjects is considered, helmets incorporating some of the NASA ideas might be used.

Subject	Technology Source
McDonnell Douglas Corporation Douglas Astropower 2121 Campus Drive Newport Beach, California 92660 714-833-1311, Ext. 384 Contact: Dr. Vladimir Ordon Senior Research Scientist	Ames Research Center Tech Brief: 66-10536

Douglas Astropower, a division of McDonnell Douglas Corporation, is conducting tests of epileptics. This research will aid in the prevention and identification of epileptic seizures. According to Dr. Ordon, Astropower has tried using a helmet, incorporating measurement instrumentation, to obtain electroencephalograms (EEG's). The helmets were uncomfortable for the subjects and their use was discontinued. Electrodes are now applied directly to the scalp.

Test personnel believe that helmets are unsuitable for the measurement of epileptics due to their discomfort. No future use on testing of epileptics is planned.

However, Dr. Ordon and Frank Rich of the Veteran's Administration Hospital visited Ames Research Center and examined the instrumented helmet developed there. Ordon thinks this helmet represents a definite improvement in packaging although other improvements are still required. If helmets are needed in the future for the measurement of healthy personnel (such as pilots being tested in the centrifuge), Dr. Ordon will probably design an improved helmet based on the NASA design and incorporating his improvements.

Case Number: 80607316 (Cont.)

About 150 hours were used to evaluate helmets and related information before helmets were tried on the epileptic subjects. Additional use is not planned for either the NASA or the McDonnell Douglas helmet.

Dr. Ordon regularly receives NASA publications. He likes them and thinks they are both clear and informative.

GEH:mc
10/3/68

Case Number: 80607373

The Armed Forces Radiobiology Research Institute is using a pressure measuring system, based on a NASA invention, to measure radiation effects on animals.

Subject	Technology Source
Armed Forces Radiobiology Research Institute Bethesda, Maryland 20014 202-295-1000, Ext. 50090 Contact: Dr. C. L. Turbyfill Principal Investigator Radiobiology Department	Ames Research Center Tech Brief: 66-10624

Dr. Turbyfill of the Armed Forces Radiobiology Research Institute is making biopressure measurements on beagle dogs and rhesus monkeys using a pressure measuring system based on work accomplished at NASA's Ames Research Center. Measurements such as blood pressure and intercranial pressure are made to determine the effects of radiation.

Four transducers and transmitters were purchased from Bio-Optical. The cost of the standard transducer and transmitter from Bio-Optical was about $600. Dr. Turbyfill said that if the devices were developed under contract, it could cost as much as $50,000. Bio-Optical produces a pressure measuring system that meets the Research Institute's requirements with minor modifications.

A technician, working for Dr. Turbyfill, obtained information on the NASA developed pressure measuring system through a NASA representative. On further inquiry, Dr. Turbyfill discovered that Bio-Optical was building the transducer and transmitter described in the NASA Support Package. The Research Institute purchased the transmitters and transducers from Bio-Optical. The devices were then modified to fit the needs of the Research Institute. Electronic News later described a pressure measuring system similar to the NASA system.

Dr. Turbyfill regularly reads NASA publications. He said NASA is concerned with physiological applications though not with radiation effects.

Case Number: 80607373 (Cont.)

He finds NASA publications to be quite adequate and they save a lot of development time eliminating a portion of the Research Institute's need for developing technology.

GEH:kcr
10/25/68

Case Number: 80607617

The Detroit Research Laboratory of M&T Chemicals uses a NASA set of handbooks describing eddy current techniques as a reference source for nondestructive testing.

Subject	Technology Source
M&T Chemicals Incorporated Subsidiary, American Can Corporation Detroit Research Laboratory 1700 East Nine Mile Road Detroit, Michigan 48220 313-504-5740 Contact: Edgar Seyb Research Director	Marshall Space Flight Center Tech Brief: 67-10374

The Detroit Research Laboratory of M&T Chemicals Incorporated uses a series of handbooks on eddy current techniques in nondestructive testing. The document was prepared by General Dynamics Convair Division for Marshall Space Flight Center. The Research Laboratory is concerned with electroplating of metals and nondestructive testing. They use a commercially available machine for eddy current testing. The handbooks were ordered to supplement the information available on eddy current testing principles

Mr. Edgar Seyb, Research Director at the Detroit Research Laboratory, said he ordered the handbooks because he did not have the information provided in the handbooks. After review by research personnel the handbooks were filed as a reference source to be used periodically when problems arise on eddy current testing. Mr. Seyb has found the handbooks to be satisfactory for his purposes.

Mr. Seyb noted the availability of the handbooks in The Plating Journal of the American Plating Society. Although he does not regularly receive NASA publications, he sometimes obtains them after notices of their availability appears in professional journals.

GEH:emt
10/28/68

Case Number: 80607625

The AIRCO/BOC Cryogenic Plants Corporation, uses a single source fluid properties handbook developed for Marshall Space Flight Center as a reference for cryogenic calculations.

Subject	Technology Source
AIRCO/BOC Cryogenic Plants Corporation 575 Mountain Avenue Murray Hill, New Jersey 07974 201-464-6800 Contact: Joseph Kleinhaut Process Engineer	Marshall Space Flight Center Tech Brief: 67-10440

Alan Sherman and Robert Gershman, of the former Douglas Aircraft Company compiled a fluid properties handbook which is a single source compilation of physical property data pertaining to helium, hydrogen, oxygen and nitrogen.

The design and process departments of AIRCO/BOC Cryogenic Plants Corporation uses this handbook as reference material when building plants, production, and distribution systems, and low temperature systems.

Mr. Kleinhaut, of the Process Department, said his company found this handbook very useful in calculation of density, specific volumes, heats, viscosities, entropies, and pressures for low temperature processes. The handbook contains reliable data which aids in the correct design of equipment. It provides a single source of fluid properties for faster reference. Mr. Kleinhaut states that approximately 20 percent of the time used in performing calculations is spent looking up information such as that contained in the handbook.

The Process Department had an older edition of a similar handbook, published by the National Bureau of Standards and wanted to obtain an up-to-date edition. This prompted them to send for the NASA Fluid Properties Handbook.

Case Number: 80607625 (Cont.)

They are very pleased with the handbook except some charts are hard to read because of poor printing. Certain numbers are nearly illegible and curve lines run together. Mr. Kleinhaut cited the hydrogen T-S diagram as an illustration of the poor printing. He has found other NASA publications to be of generally very good quality.

NASA publications are received in the company library and are retained there.

GEH:ng
10/22/68

Case Number: 80607733

The Newport News Ship Building and Dry Dock Company intends to use a portable routing machine to cut stainless steel nuclear reactor pipe. The machine is similar in design to one in a magazine article and incorporates some of the ideas in a NASA invention.

Subject	Technology Source
Newport News Ship Building and Dry Dock Company Newport News, Virginia 703-247-1211, Ext. 3573 Contact: John P. DeBogary Asst. Superintendent Machine Shops Division	Marshall Space Flight Center Tech Brief: 67-10525

W. A. Pesch of Hays International Corporation, under contract to Marshall Space Flight Center, has developed a light weight portable router with a variable-speed driving mechanism. It is used on large, heavy metal subassemblies which are often impractical to move to a stationary machine. The portable router weighs approximately 40 pounds, powered by an electric motor and designed to follow a desired cutting path.

Newport News Ship Building and Dry Dock Company is developing a prototype portable router which meets the specifications of a design appearing in a Welding Engineering article. It incorporates some of the NASA design features. Mr. John DeBogary, Assistant Superintendent, said the prototype router will be used to cut in-service stainless steel nuclear reactor pipe. The pipe is currently cut by hand, but the inside of the pipe can be contaminated with shavings. The prototype will automatically do the cutting without leaving shavings in the pipe. Also, it will be faster and more efficient. A unique aspect of the NASA routing skate is its ability to make cuts while following more than one contour. This feature will be incorporated in the prototype.

Mr. DeBogary said the Newport News Ship Building and Dry Dock Company wanted to build its own prototype. NASA and other information will enable fabrication of the prototype in the machine shop. When completed, it will be used by skilled machinists.

Case Number: 80607733 (Cont.)

Mr. DeBogary received the Tech Brief from the design section and then sent away for the supporting information. Generally, he does not use much NASA information since he is working with standard metals and most of the welding information pertains to exotic metals. This was the only Support Package he has ever received and he thought it both authoritative and informative.

GEH:kcr
10/25/68

Case Number: 80708024

U.S. Borax Research is concerned with all applications of borax. An AEC Tech Brief on dispersion of borax in plastic as a fire retardant heat insulator provided additional selling features for its product.

Subject	Technology Source
U.S. Borax 412 Crescent Way Anaheim, California 92803 714-774-2670 Contact: Dr. Robert J. Brotherton Research Supervisor	Argonne National Laboratory Tech Brief: 67-10016

U.S. Borax Corporation supplies borax and borax compounds in large quantities to customers as a product and for use as a component in other products. Dr. Robert Brotherton of U.S. Borax Research is concerned with research in the use of borates. Borax and borax compounds are by-products of borates.

An AEC idea for the dispersion of borax in plastic as a fire retardant heat insulator was of particular interest to U.S. Borax Research. A mixture of borax powder and a chlorinated anhydrous polyester resin resists decomposition and exhibits high thermal insulation properties. The borax is used in a quantity of between 30 and 70 parts by weight for 100 parts of resin with 60 parts of borax being the optimum quality.

Dr. Brotherton was not aware of applications using borax in such high concentration. He said that this information contributes to their knowledge and can be used as a sales tool in promoting the use of borax and borax compounds. He now uses the information in talks on the use of borax, borax compounds and borates.

As a result of receiving this Tech Brief from another firm, Dr. Brotherton visited Argonne National Laboratory to talk with the personnel doing the work on borax compounds.

Dr. Brotherton regularly receives Tech Briefs through the Company library. However, he missed this particular one on borax in plastic as a fire retardant heat insulator. Dr. Brotherton is interested in all applications of borax and draws from many available sources including the trade press, magazine articles, and newspapers.

Case Number: 80708024 (Cont.)

Chemists and personnel in the Market Development Group are primarily concerned with NASA-AEC information such as on the fire retardant heat insulator.

GEH:bp
10/31/68

Case Number: 80708131-3

The University of Montana Chemistry Department is using the information in three AEC Tech Briefs and a series of AEC booklets to supplement notes in an advanced inorganic chemistry class and for lecturing in Montana high school chemistry classes. The up-to-date information on the inert gases and how these gases combine with other elements provides unique information to supplement high school texts.

Subject	Technology Source
University of Montana Chemistry Department Missoula, Montana 59801 406-243-2692 Contact: Forrest D. Thomas Professor of Chemistry	Argonne National Laboratory Tech Briefs: 66-10467 67-10133 67-10185

H. H. Hyman, I. Sheft, L. A. Quarterman, T. C. Shieh, N. C. Yang, C. L. Chernick, Howard H. Claassen, Henry H. Selig, and John G. Malm, Chemistry Division, Argonne National Laboratory, have investigated the combining of Xenon and the other five members of the family of noble gases with other elements to form stable compounds. Xenon combines with fluorine to form a compound. However, fluorine doesn't combine with other gases such as helium, argon and krypton. On further investigation, Xenon fluories were found to be effective as potential fluorinating agents.

The Chemistry Department at the University of Montana is using the information in three AEC Tech Briefs and a series of booklets as supplemental notes in an advanced inorganic chemistry class called "Representative Elements". The supplemental notes are used to discuss the gases and compounds of this family of inert gases. Professor Forrest D. Thomas, Chemistry Department, is liaison professor between the University and high school chemistry departments throughout Montana. Professor Thomas lectures to high school chemistry classes on the inert gases. He has built his lectures around the information available in the Tech Briefs, references quoted in the Tech Briefs, and AEC booklets. His presentation is particularly up-to-date, since he discusses the combining of inert gases with other elements, specifically Xenon with fluorine. The material provided a good summary and economical reference material. There are books on the subject of inert gases, but they do not provide up-to-date information nor are they in such a readily usable and concise form.

Case Number: 80708131-3 (Cont.)

High school books generally have a full chapter devoted to inert gases and are very specific in stating that they will not combine with other elements into compounds. These lectures provide unique information that makes inert gases more interesting to the students.

Professor Thomas clipped out a coupon in the Chemical and Engineering News to obtain the Tech Briefs and AEC information. However, he doesn't regularly receive NASA publications.

GEH:kcr
10/25/68

Case Number: 80708958

Borg-Warner has been investigating nickel and copper electroplating on titanium pump bodies. The technique described in a NASA publication is one of those being considered for use.

Subject	Technology Source
Borg-Warner Corporation Roy C. Ingersoll Research Center Wolf and Algonquin Road Des Plaines, Illinois 60018 312-827-3131 Contact: Clarence Albertson Manager, Physical Chemistry	Marshall Space Flight Center Tech Brief: 67-10532

Everett E. Brown of the Boeing Company, under contract to Marshall Space Flight Center, has developed a process for electroplating copper and nickel on titanium alloy. The process consists of anodic treatment of the titanium alloy in a solution of hydrofluoric and acetic acids, followed by electroplating with the copper or nickel.

Clarence Albertson of Borg-Warner Corporation, noted in a Tech Brief that a NASA article had been written on electroplating titanium. He knew that one of the company's divisions was concerned with plating titanium pump bodies with copper or nickel. He forwarded the information to the division. The division will use whatever process is proven most effective in electroplating. Other processes will also be considered.

The company's division makes several hundred of these pump body units for aircraft and missile applications. The titanium body gives a considerable weight advantage while retaining the strength of steel; however, titanium is much harder to work with.

Mr. Albertson says that 48 hours were used to review the information available from various sources on electroplating titanium before the information was forwarded to the Borg-Warner Division. There are a number of articles, listed in Chemical Abstracts, about electroplating, including the NASA article.

Mr. Albertson receives Tech Briefs through regular distribution channels from the company library. NASA Technical Support Packages are requested in cases where the Tech Brief indicates the information could be useful.

Case Number: 80708958 (Cont.)

Division personnel concerned with electroplating of titanium includes engineers and metallurgists and other personnel in production.

GEH:bp
10/28/68

Case Number: 80709025

Scot, Inc., a manufacturer of electronic components, has used the results of a NASA laboratory investigation to confirm its findings on the benefits of using lubrication on miniature slip rings. Previously, miniature syncros were produced in large quantities with unlubricated slip rings. Scot is converting to lubrication of the slip rings to reduce noise level and increase product life.

Subject	Technology Source
Scot, Inc. 2525 Curtiss Downers Grove, Illinois 60515 312-969-0620 Contact: Albert Khant Electrical Design Engineer	Marshall Space Flight Center Tech Brief: 67-10210

Mr. J. L. Radnik of IIT Research Institute, under contract to Marshall Space Flight Center, conducted a laboratory investigation to study the long terrn operation of miniature slip ring assemblies in the high vacuum conditions of outer space. This study included the influence of ring, brush, and insulator materials on electrical noise and mechanical wear. Investigation results showed the advantages of lubricated over unlubricated slip rings.

Mr. Albert Khant, of Scot, Inc., intends to use lubricated slip rings in miniature syncros for commercial aviation instruments and automatic direction finders. In a direction finder, the syncro seeks a null where the signal is minimum. Unlubricated slip rings amplify the spurious noise level heard by the pilot as a result of brush and slip ring contact. Scot, Inc. was investigating the benefits of lubricated slip rings and the NASA information confirmed the results of its findings.

Two or three slip rings are used in each syncro unit. Scot, Inc. produces 300 to 400 syncro units each week at a price of $25 to $30 per unit. Production with the lubricated slip rings will begin in about a month. It is anticipated that lubricated slip rings will produce a longer lasting syncro unit of higher quality with a lower noise level.

Mr. Khant's request for the NASA information was prompted by a specific need to determine the effectiveness of lubrication on slip rings. He

Case Number: 80709025 (Cont.)

stated that research and development time is not as available in a small company like Scot, as it would be in a larger company. He viewed it as a great benefit having NASA performing this type of research.

Other literature available at the time of Mr. Khant's request included that from his supplier of brushes and slip rings, a book on slip rings, and seminars on electric contact phenomena. Mr. Khant noted the availability of the NASA information in Electrical Mechanical Design Magazine. This NASA information was the only ever received by him. Mr. Khant thought the NASA publications are generally well written, and the information on the experiment performed was complete. Personnel using the information at Scot are generally electrical and mechanical engineers.

GEH:emt
10/28/68

Case Number: 80709095-6

The Department of Engineering Mechanics at the University of Nebraska has acquired two NASA Technical Support Packages. The first, on loading cylinders, is being used in a course on elastic stability and in connection with research. The second, on tension loads applied to cylindrical specimens, will be used as a reference source in a materials testing program.

Subject	Technology Source
University of Nebraska Department of Engineering Mechanics Lincoln, Nebraska 68508 402-472-2385 Contact: Dr. Ralph E. Ekstrom Associate Professor Engineering Mechanics	Marshall Space Flight Center Tech Briefs: 67-10375 67-10380

R. L. Finley, L. S. Liu and P. B. Yang (Boeing Company) under contract to Marshall Space Flight Center, developed an analytical procedure for determining critical buckling loads of orthotropic cylinders subjected to axial compression loading.

Dr. Ralph Ekstrom, Associate Professor of Engineering Mechanics at the University of Nebraska, is using NASA information to supplement his graduate level course in elastic stability. The source material for the course is made up of recent papers and books. In this case, Professor Ekstrom will hand out a two page summary of the material in the NASA Technical Support Package. The material might also be used as a reference source for doctoral students.

R. L. Stafford and J. F. Flower of McDonnell Douglas, under contract to Marshall Space Flight Center, designed a machine using a single-source mechanical loading system for proportioning axial-to-hoop tension loads applied to cylindrical specimens. Dr. Ekstrom will use this Technical Support Package as reference material for future research projects and test programs. Two years ago, a student was working on a project involving the loading of specimens and the information in the NASA package would have been of great help.

Case Number: 80709095-6 (Cont.)

Dr. Ekstrom thought the information in both NASA Technical Support Packages are of great value in keeping him up to date on advances in the state-of-the-art. His interest in the loading of cylinders was specific. Interest in the mechanical loading system was more of a general nature.

Dr. Ekstrom receives all Tech Briefs in the mechanical category. After review, he files them for department use. The University library also receives Tech Briefs. Dr. Ekstrom considered the information in the Briefs and Support Packages usually current, generally quite good, but he thought concepts are sometimes published quickly in a Tech Brief before being experimentally verified.

GEH:kcr
11/1/68

Case Number: 80709302

The Bureau of Mines reviewed a NASA Technical Support Package concerning high-strength tungsten alloy for possible use in its experimental freeze-dry process. Although this NASA innovation contributed to state-of-the-art knowledge, it could not be used in the freeze-dry process since the alloy is not hydrogen reducible.

Subject	Technology Source
U.S. Bureau of Mines Albany, Oregon 98321 503-926-5811 Contact: Gabriel Robidart Chemical Engineer	Lewis Research Center Tech Brief: 67-10340

The U.S. Bureau of Mines reviewed a NASA development for an improved ductility high-strength tungsten alloy for possible use in a freeze-dry process. The tungsten alloy contained tantalum which is not hydrogen reducible. A requirement in the experimental freeze-dry process is hydrogen reducibility.

Mr. Gabriel Robidart, Chemical Engineer, stated the Bureau of Mines is doing field experimentation on temperature resistant high-strength materials. He thought the NASA information provided them with knowledge of what others were doing in one of their areas of interest. Between 20 and 40 hours were used to review the NASA information in the Bureau of Mines office. Other Government source materials pertaining to high-strength alloys were also studied.

Mr. Robidart filled out a form in a trade press publication and sent it in for the NASA information. He occasionally sees NASA Tech Briefs in his office when they are distributed to personnel who have interests in specific areas. He considers NASA publication of better quality than the average publication which he receives. Mr. Robidart stated that he often can spot flaws in the NASA investigation thru reading the Technical Support Package description, and that in many of these cases he was able to predict the poor results which were obtained as a result of the investigation. Personnel interested in NASA information pertaining to

Case Number: 80709302 (Cont.)

high-strength, high-temperature materials, at the Bureau of Mines Office, are chemical processing engineers and scientists in field experimentation.

GEH:bp
10/25/68

Case Number: 80309460

The Physical Electronics Laboratory at Hewlett Packard uses a Workmanship Standards Manual as a reference source.

Subject	Technology Source
Hewlett Packard Company Physical Electronics Laboratory 1501 Page Mill Road Palo Alto, California 94304 415-326-7000 Contact: George Borg Shop Foreman	Space Nuclear Propulsion Office Tech Brief: 67-10200

M. D. Phillips of Aerojet General, under contract to AEC/NASA Space Nuclear Propulsion Office, prepared a Workmanship Standards Manual for welding. This manual was designed as part of a standard operating procedure for fusion welding.

George Borg, Shop Foreman at Hewlett Packard, uses this welding manual as a reference source for both good and bad welds. Mr. Borg is in the Physical Electronics Laboratory, a research laboratory concerned primarily with vacuum systems. Contamination and leak problems are common in these systems; thus, weld quality is very critical. The laboratory does all types of welding on many materials, including stainless steel, aluminum, titanium, copper and nickel.

Mr. Borg saw a technical notice describing the welding manual in the Welding Design and Fabrication magazine. He sent for the manual because of a need for this type of information as well as general interest and curiosity. This was the first NASA-AEC publication Mr. Borg had ever seen or used. He considered it very well written. He noted that the pictures were especially good. As far as he was concerned, the real welds, both good and bad, were the most useful items in the manual. In his work, he is particularly interested in stainless steel and aluminum and the pictures in the manual of these types of welds are most helpful. Mr. Borg would like to see more information in the future on other metals including glass sealing metals, titanium alloys and nickel alloys.

GEH:mc
10/23/68

Case Number: 80709687

The Thermo Electron Corporation is developing a thermionic converter package, using a NASA idea of a coulometer to control the charge on nickel/cadmium batteries.

Subject	Technology Source
Thermo Electron Corporation 85 First Avenue Waltham, Massachusetts 02154 617-894-8700 Contact: Lazaros J. Lazaridis Manager, Hydrocarbon Thermionics	Goddard Space Flight Center Tech Brief: 67-10446

John Paulkovich of Goddard Space Flight Center, has designed a coulometer controlled battery charge regulator for use in nickel/cadmium batteries. The use of nickel/cadmium type primary cells is attractive since these cells are capable of accepting a relatively high rate of charge without degradation. To take advantage of the nickel/cadmium cells tolerance for high charging rate, it is desirable to have a charge control method that would permit the maximum charge rate right up to full charge level. A coulometer controlled battery charge regulator has been designed for this purpose.

The Thermo Electron Corporation is developing a thermionic converter package to generate DC voltage using a coulometer to control the charge on the batteries. This thermionic converter is designed for homes as well as military (over-the-road) vehicles. Thermo Electron Corporation has purchased two Sonotone coulometers for testing. They have devoted 120 hours of engineering and technician time and about $200 in materials to develop the coulometer controlled regulator. The coulometer controlled regulator has proven feasible with the thermionic converters, but the project has been suspended pending further advancement on the system's converters. If work proceeds on this project, patent rights will be investigated before using the NASA invention. The total system has not been evaluated sufficiently to determine whether or not use of the coulometer provides any savings.

Mr. Lazaridis has been working in the area of thermionic converters and reported his inquiry was the result of a specific need. There have been

Case Number: 80709687 (Cont.)

several articles published on coulometer regulators and two papers were presented at the Power Sources Conference Sponsored by the Army Electronics Command in 1966.

Mr. Lazaridis said his company subscribes to NASA publications and they are routed to interested parties. He added that they are fairly complete, clarity is good, and they are useful.

GEH:kcr
10/25/68

Case Number: 80709696

Frequency Electronics, Inc. has evaluated a NASA idea concerning a transistorized clamping circuit and found it to lack sufficient tolerance for its application.

Subject	Technology Source
Frequency Electronics, Inc. 3 Delaware Drive New Hyde Park, New York 11140 516-328-0100 Contact: Paul Gheorghiu Senior Staff Scientist	Goddard Space Flight Center Tech Brief: 65-10118

A transistorized clamping circuit that clamps either of two voltage levels, with less than 0.1 percent voltage offset, was developed by Radio Corporation of America under contract to Goddard Space Flight Center.

Frequency Electronics, which concentrates its efforts on high frequency and high stability oscillators requiring high tolerances, attempted to adapt the circuitry to a power supply problem.

Mr. Paul Gheorghiu, Senior Staff Scientist with Frequency Electronics, Inc., receives Tech Briefs and requests Technical Support Packages whenever appropriate. About 4 hours were used to evaluate this NASA invention upon receipt of the TSP. In this case, after evaluating the transistorized clamping circuit, they found that its specified 0.1 percent error was not within tolerance limits for its applications. The normal tolerances are .01 percent error.

NASA technical information is reviewed by packaging, electronic, and mechanical engineers for use in development of new products or improvement of present products. Mr. Gheorghiu considered NASA publications as generally good and very clear. However, he added sometimes they tell of a new idea but lack sufficient detail.

GEH:mc
10/23/68

Case Number: 80709728

The Magnavox Company is using a solid state phase detector in submarine detection equipment. Tests have been completed and Magnavox is now preparing for production of these sonobuoys.

Subject	Technology Source
The Magnavox Company Bueter Road Fort Wayne, Indiana 46803 810-743-9721 Contact: John Shayne Circuit Design Engineer	Manned Spacecraft Center Tech Brief: 67-10253

C. L. Moberly of Motorola, Inc., under contract to Manned Spacecraft Center designed a solid state phase detector to replace a bulky transformer circuit.

The solid state phase detector will be used by Magnavox Company as a balance modulator in sonobuoys. Sonobuoys are submarine detection devices that look like fence posts and are dropped from airplanes into the water. A transducer then submerges in the water for detection of submarines. The solid state phase detector will replace two transformers that would have been built into the sonobuoy. Use of this phase detector saves weight, has superior operating characteristics, and costs less. Mr. John Shayne of Magnavox said that as many as one-quarter million sonobuoys might be built within the next five years for the Navy.

The original inquiry by Mr. Shayne was due to an interest in devices that would eliminate transformers in the sonobuoys. At the time, the NASA information was published there was not a suitable replacement for the transformers. Since that time several replacements have been developed. Only about one day was used by Mr. Shayne in translating the NASA information into plans for the sonobuoys. His inquiry for information on the solid state phase detector resulted from an article in the March 1968 issue of Electronic Products.

Mr. Shayne has requested other NASA Support Packages. He finds them "terse but adequate."

GEH:mc
10/18/68

Case Number: 80709830

The Chicago Rawhide Manufacturing Company, a producer of metal bellows, conducts continuous fatigue tests to improve the quality of its products. The method described in a NASA invention is similar to its test method and contributes to state-of-the-art knowledge.

Subject	Technology Source
Chicago Rawhide Manufacturing Co. Elston Avenue Chicago, Illinois 312-278-2100 Contact: James Jackowski Development Engineer	Marshall Space Flight Center Tech Brief: 68-10026

C. M. Daniels of North American Aviation, Inc., under contract to Marshall Space Flight Center, has used the classical method of presenting fatigue data in graphical form to predict fatigue life of metal bellows. With these data, the expected life of a new bellows design can be determined with reasonable accuracy before the bellows are fabricated and tested.

The Chicago Rawhide Manufacturing Company, a producer of metal bellows, runs fatigue tests similar to those described in the NASA information. According to James Jackowski, Development Engineer, Chicago Rawhide Manufacturing Company makes thousands of metal bellows each year. The metal bellows are sold primarily to the aerospace industry.

Fatigue testing of metal bellows usually runs for several months since anywhere from two to ten million cycles are required. According to Mr. Jackowski, the NASA article contains the only information available, other than what the company has, on fatigue of metal bellows. He says the company is especially interested in fatigue metal bellows of Inco X and Inco 718.

Mr. Jackowski has a general interest in the fatigue of metals and particularly of metal bellows. He sent for the Support Package to confirm or deny information he currently had available. He thought the curves in the Support Package were somewhat blurry and details of tests were not sufficiently specific. However, the discussion of test results

Case Number: 80709830 (Cont.)

was very good. This is the only TSP Mr. Jackowski has seen or used. He thought it generally well written, informative, and of value to his work.

Personnel using information on fatigue testing are primarily designers and mechanical engineers. NASA Tech Briefs are circulated to all engineers in the Engineering Department, but only a few Briefs are of value. The librarian distributes all Briefs since she is not well acquainted with the projects of the engineers.

GEH:bp
10/25/68

Case Number: 80709925

Optical Electronics, Inc. will use information from a NASA Technical Support Package concerning a multiplexer. This idea allows development of a new product.

Subject	Technology Source
Optical Electronics, Inc. P. O. Box 11140 Tucson, Arizona 85706 602-624-3605 Contact: Richard Gerdes President	Marshall Space Flight Center Tech Brief: 67-10396

Mr. S. S. Gussow of the Boeing Company, under contract to the Marshall Space Flight Center, developed a multiplexer incorporating insulated gate-field effect transistors for all digital logic functions. Basically the multiplexer consists of 30 primary channels, each of which is sampled 120 times per second.

Mr. Richard Gerdes, President, Optical Electronics, Inc., is going to use some of the ideas in the NASA Support Package, but will modify the basic design. In the new product, 15 to 16 signal generators with one output will be handled like the multiplexer, but will incorporate a random scan instead of a sequential scan. The NASA information will allow this new product to be built with the random scan. Sales of the signal generators are anticipated at 20 to 30 units per year at a price of about $3,000 each.

Mr. Gerdes' request for the NASA information was in response to a multiplexer problem he was having in developing the signal generators. The NASA information was noted in a Tech Brief. The president of Optical Electronics regularly receives Tech Briefs, however, only 3 to 5 percent of them are of sufficient interest to warrant a request for the Support Package. Even so, Mr. Gerdes still prefers to review all the Tech Briefs. He considers the quality generally very good and would like to see the publications continue. He especially likes their clarity and conciseness. He has, however, found a few Support Packages that he would classify as mediocre.

Case Number: 80709925 (Cont.)

Personnel who use NASA technical information at Optical Electronics are usually design engineers.

GEH:ng
10/18/68

Case Number: 80710025

PRD Electronics Incorporated, under government contract, has built a computer-programmable transfer frequency oscillator for a AN/247 VAST System. A contract for preproduction system, was to have included some of the ideas of a NASA invention for a discriminator in the oscillator. However, the preproduction system will no longer include an oscillator.

Subject	Technology Source
PRD Electronics Incorporated Subsidiary of Harris-Intertype Corporation 1200 Prospect Avenue Westbury, Long Island, New York 11590 516-334-7810 Contact: Joseph Mefford Senior Engineer	Marshall Space Flight Center Tech Brief: 67-10151

W. J. Reid of Motorola Incorporated, under contract to Marshall Space Flight Center, has developed an electronic frequency discriminator that replaces the conventional discriminator with a digital frequency comparator. By using a very stable reference frequency, stability problems would be eliminated in the discriminator and allow discrimination to an accuracy of that of the reference frequency.

PRD Electronics Incorporated had designed a prototype computer-programmable transfer frequency oscillator. This was one of about 50 building blocks in a AN/247 VAST System. A second contract for a system on the A7E airplane will consist of about 35 of these building blocks but without the oscillator, excluding the need for a discrimination.

Joseph Mefford, Senior Engineer, developed the prototype oscillator. He has breadboarded the NASA designed frequency discriminator and found it to work quite well. About 72 hours were used to review, discuss, and breadboard the discriminator. He said it is useful in CW mode but not in pulse mode. A comparator in the frequency discriminator assists in phase locking to the CW signal. This type of electronic frequency discriminator would be useful in automatic checkout equipment and for testing automatic systems.

Case Number: 80710025 (Cont.)

The personnel at PRD Electronics concerned with inventions such as the discriminator are electronic designers.

The request for the NASA invention was made while Mr. Mefford was working on the prototype frequency oscillator. He said it was the cleverest idea he had seen for a digital type discriminator. There were two or three other discriminator ideas in magazines at the time. Notice of the NASA innovation appeared in an electronic design magazine in the form of a technical summary.

Mr. Mefford has made periodic use of NASA publications, and those he has used seem quite satisfactory, are very clear, and move right to the point. He is now considering subscribing to a transfer technology service at a cost of about six dollars a year.

In closing, Mr. Mefford cited an article in Frequency Magazine, pertaining to another NASA Tech Brief referencing in aid in phase locking to signals from satellites.

GEH:bp
10/28/68

Case Number: 80710065

The Puget Sound Naval Shipyard ultrasonically inspects welds that are subjected to high pressures. A previously built prototype water column probe is being modified to conform to specifications in a NASA Support Package. Use of this new probe could lead to substantial time savings and improved weld inspection.

Subject	Technology Source
Nondestructive Testing Branch Puget Sound Naval Shipyard Bremerton, Washington 98314 206-478-3320 Contact: Leo Elia, Physicist	Marshall Space Flight Center Tech Brief: 68-10004

Raymond Evans and J. A. MacDonald of the Marshall Space Flight Center developed a mechanized ultrasonic scanning system designed for inspecting flaws in welds. The most significant development was a column probe which eliminates the necessity of submerging a weld being tested in water or providing a water flush over the inspection surface. The probe would improve reliability in the detection of flaws and enable improved analysis of butt welds.

The Nondestructive Testing Branch of Puget Sound Naval Shipyard had constructed a prototype water column probe but set it aside a year ago when they found it wouldn't eliminate the problem of standing waves in a column.

When the NASA article on the mechanized ultrasonic scanning system appeared, Leo Elia of the Nondestructive Testing Branch realized that the material specified in the article would absorb sound in the column and could be used for making a diaphram over the end to hold fluid in the column. He retrieved the prototype and is presently modifying it to conform to specifications in the NASA article.

The Puget Sound Naval Shipyard is now using ultrasonic scanners on a production basis for water tight inspection. If the modified prototype works satsifactorily, it could provide substantial time savings over the plastic shoe type ultrasonic scanner. Also, water can be used as a couplant instead of grease. Although probes have been around for about ten years, this idea is an improvement in the state-of-the-art, and could eliminate standing waves which would improve reliability for

Case Number: 80710065 (Cont.)

detection of smaller flaws. This could result in thousands of man-hours saved if an automated system is used and elimination of hundreds of hours in cleaning time. Scanning time would be reduced over rough surfaces.

A new prototype could not be built directly from the NASA article since no dimensions were given for the housing. However, the Nondestructive Testing Branch would probably still have designed to its own dimensions for transducers and thicknesses.

The Tech Brief for this ultrasonic scanning system was passed on to Mr. Elia by his superior who had read the Brief. This was the only Tech Brief Mr. Elia had ever seen, and thought it was well presented except for the lack of dimensions. An engineering drawing would have helped in either modifying the prototype he already had or building a new one. NASA technical information is available at the Shipyard Technical Library.

GEH:mc
10/15/68

Case Number: 80710161

A large Midwestern machine tool manufacturer is evaluating an improved circuit for measuring capacitive and inductive reactances for use in its machines.

Subject	Technology Source
A large Midwestern machine tool manufacturer	Marshall Space Flight Center
Research and Development Department	Tech Brief: 67-10513
Contact: Project Engineer	

I. Dalins of Marshall Space Flight Center and V. McCarty of the University of Alabama Research Institute developed an amplifier circuit for measuring very small changes of capactive or inductive reactance.

The Research and Development Department of a large Midwestern machine tool manufacturer is evaluating the NASA circuit for possible use in some of its large machines. This manufacturer uses gauging systems to measure capacitance in its large machines. Although not a marketer of circuitry, the manufacturer might incorporate several hundred of these circuits in its machines if they prove of sufficient value. A device is presently used that performs satisfactorily, but no single measuring instrument is considered best for measuring small changes of capacitive or inductive reactance. Therefore, improved methods are being sought.

The Research and Development Department regularly receives Tech Briefs and the prototype will be built directly from the information in NASA Tech Brief 67-10513. If the circuit has merit for use in the manufacturer's machines, the patent status will be investigated.

The Project Engineer thought NASA information is valuable in his area of interest. However, many NASA documents are of limited value since they do not apply to the machine tool industry.

GEH:kcr
10/30/68

Case Number: 80710214

The Stresskin Products Co., a Division of Tool Research and Engineering Corporation, evaluated a ceramic composite thermo-insulation used in a competitive product. The competitive product's performance was considered inferior to the company's own product and several others.

Subject	Technology Source
Stresskin Products Co. Division of Tool Research and Engineering Corporation 3030 South Red Hill Avenue Santa Ana, California 92705 714-540-4121 Contact: W. R. Mason Senior Project Engineer	Marshall Space Flight Center Tech Brief: 67-10608

A ceramic composite thermal insulation comprised of alumina-silica fibers, pigmentary potassium titanate, and asbestos fibers bonded with a colloidal silica sol was invented by Vaughn Seitzinger of the Marshall Space Flight Center. This insulation has the capability to radiate heat beyond the maximum limits of previous insulations. A solution to the binder migration problem is also accomplished by gelation of the collodial silica sol.

W. R. (Robert) Mason, Senior Project Engineer, Stresskin Products Company, requested the NASA Support Package to evaluate a competitive product that incorporated this new insulation material. The product is used in the SIB Space Booster. The booster is obsolete and the product is no longer being used. According to Mr. Mason, new insulation material is one of several that have been used in boosters for launching space vehicles, but doesn't seem to be the best. A blanket of refresil in an inconel 718 envelope is one better alternate. Generally, a heat shield for missiles such as the Saturn requires a panel and 1/4 inch insulation material of a product similar to that in the NASA Technical Support Package. However, Stresskin has a welded panel that requires no insulation.

The initial inquiry for the NASA Support Package was prompted by personal contact of Mr. Mason with Chrysler Missile Division and NASA

Case Number: 80710214 (Cont.)

representatives. He receives Tech Briefs on a request basis at his company, and Tech Briefs are retained by the library. Mr. Mason thought that the quality of NASA material is generally good, but sometimes there is a lack of background information in particular Support Packages. Information such as that concerning this new insulation material is used by the design engineering group at Stresskin.

GEH:mc
10/18/68

Case Number: 80811604

Mr. J. T. Milek, Member of the Technical Staff at Hughes Aircraft and Instructor at Santa Monica City College, uses NASA, AEC, DOD and other sources of information on materials in his work. A NASA document about procedures for externally loading and corrosion testing materials specimens is one of his information sources.

Subject	Technology Source
Hughes Aircraft Company Electronic Properties Information Center Culver City, California 213-391-0711, Ext. 7489 Contact: J. T. Milek Member of Technical Staff	Marshall Space Flight Center Tech Brief: 67-10451

Mr. J. T. Milek, Member of the Technical Staff at Hughes Aircraft, Materials Engineering Instructor at Santa Monica City College, and consultant, uses many sources of information on materials in his three jobs. He has obtained numerous NASA Technical Support Packages on materials, including the one specified in Tech Brief 67-10451.

Mr. Milek stated that he has over 15 file cabinets containing information. In addition to his work in materials, he is going to teach a course in electronics. He will be obtaining information in this field from NASA, AEC, DOD, and other sources.

Mr. Milek said he makes inquiries all over the country for information through the Huges Aircraft Information Center. He has collected reference material sufficient to write three books and many articles. He teaches a course in Materials Engineering at Santa Monica City College which is unique since it is intended to cover the spectrum of materials engineering. Students are required to write term papers using the reference material Mr. Milek has collected.

Mr. Milek personally scans every issue of STAR from cover to cover plus many other indexes and abstracts in his position as Member of the Technical Staff at Hughes Aircraft.

Case Number: 80811604 (Cont.)

Mr. Milek thought NASA publications are generally good. The information is up-to-date and usually can not be found in textbooks. In a recent article, he referred one of the NASA Technical Support Packages.

GEH:mc
11/5/68

Case Number: 80811614

The Submarine Signal Division of Raytheon Company manufactures sonar equipment. A NASA document on corrosion testing of materials specimens will be used as a guide in a testing program. The NASA information has also been useful in developing guidelines for deterioration of materials in a marine environment.

Subject	Technology Source
Raytheon Company Submarine Signal Division Portsmouth, Rhode Island 02871 401-847-8000, Ext. 2688 Contact: Howard Geltz Group Leader, Materials and Process Laboratory	Marshall Space Flight Center Tech Brief: 67-10451

T. S. Humphries of the Marshall Space Flight Center made a study of procedures for externally loading and corrosion testing stress corrosion specimens. The corrosion testing technique was applicable to work being conducted at the Raytheon Submarine Signal Division.

The Engineering Department of the Submarine Signal Division designs the transducer for sonar equipment manufactured by Raytheon. The transducers are exposed to the effects of seawater. The marine environment is exceedingly corrosive to both materials and coatings.

Howard Geltz, Materials Engineer and Group Leader in the Materials and Process Laboratory, is concerned with materials evaluation and seeking new and better methods for testing materials. A NASA document about corrosion testing of specimens contained test methods that will be used in a planned test program for materials and coatings in a marine environment. Mr. Geltz said the objective is to arrive at standard methods of testing which are acceptable to the Navy. Once standards are acceptable, a better process for preservation of materials and coatings can be established. Some Support Package information is directly applicable, or can be adapted to problems in a marine environment. Mr. Geltz has also submitted a paper to the Marine Technology Society outlining guidelines for deterioration of materials in a marine environment.

Case Number: 80811614 (Cont.)

Mr. Geltz noted the availability of the NASA document in Machine Design. The magazine contains a section called "Engineer's Library" listing new publications. Mr. Geltz's inquiry was on the basis of a specific need for investigating procedures for corrosion testing materials and coatings. This NASA document was only the second he had come in contact with and thought it well written with clear pictures. His own tests can be set up from the equipment illustrated in the NASA document. The line drawings are clear. He added the format was good and presented in an orderly fashion. He received other research publications through the Defense Documentation Center Clearinghouse, but these are generally xeroxed copies with unclear pictures.

GEH:mc
11/6/68

Case Number: 80812389

The Medical Products Division of Litton Industries was very interested in marketing a cardiac catheter, but the inventor had given the rights to another manufacturer. If the inventor is not satisfied with his present commitment, Litton Medical Products would be interested in manufacturing this catheter.

Subject	Technology Source
Litton Industries Litton Medical Products 1606 Beverly Boulevard Los Angeles, California 90026 213-622-5434 Contact: Donald S. Hunter Manager, Medical Instrumentation	Ames Research Center Tech Brief: 67-10669

Mr. Grant Coon of Ames Research Center invented and patented an ultra-miniature manometer-tipped cardiac catheter. This catheter was developed for measurement of intravascular pressures. Units have been used to catheterize the left ventricle and carotid arteries in dogs. Also, the transducers are presently being evaluated for use in man. Novel features are extreme miniaturization and addition of miniature leads compatible with fluids in the circulatory system.

Donald Hunter of Litton Medical Products was very interested in this advanced development of a cardiac catheter. He wrote to Mr. Coon to inquire about the manufacturing rights for the catheter. Mr. Coon was already committed to another firm, but indicated if this relationship did not work out, he would contact Mr. Hunter.

According to Mr. Hunter, this ultra-miniature catheter is a major advancement in the state-of-the-art. The catheter can be used to measure the pressure of vessels and chambers of the heart, and pressure gradients across ventricles. There are similar devices available, but they are neither as advanced nor as small as Mr. Coon's catheter. Mr. Hunter contacted marketing representatives of his firm in Mexico, Germany, and Canada, to determine their interest in the catheter. Each of these representatives indicated they would like to have a sample immediately. At the time of his inquiry, Mr. Hunter found there were

Case Number: 80812389 (Cont.)

no catheters as advanced as this one anywhere in the world. With recent work in heart transplants and related heart research, this product could make a significant contribution. Principal customers for this type of catheter would be research and medical laboratories concerned with heart studies in men and animals.

Mr. Hunter first encountered the NASA invention through a Tech Brief. He regularly receives Tech Briefs in his office. Briefs in the medical area are first screened by Mr. Hunter, and if of interest, the Support Package is obtained. He thinks NASA publications are "great," a real contribution to the state-of-the-art, and very up-to-date.

Litton Medical Products personnel concerned with the ultra-miniature catheter are in medical marketing and biomedical engineering.

GEH:bp
11/4/68

Case Number: 80812448

Westinghouse Electric Corporation is investigating the feasibility of commercial introduction of a NASA-type cardiotachometer unit. The declining cost of circuitry might make this unique direct digital circuit, with built-in analog to digital conversion, a commercial development within a year.

Subject	Technology Source
Westinghouse Electric Corporation Research and Development Center Pittsburgh, Pennsylvania 15235 412-256-7000, Ext. 7765 Contact: Thomas Haas Manager of Engineering	Ames Research Center Tech Brief: 67-10598

J. M. Pope, G. J. Deboo, and D. B. Smith, Ames Research Center, have developed a cardiotachometer with linear beat-to-beat frequency response.

Westinghouse Electric Corporation is considering the development of a commercial product on the basis of the NASA cardiotachometer in the near future. However, the high degree of accuracy of the NASA cardiotachometer might be more than is necessary for commercial use. According to Thomas Haas, Manager of Engineering, there might be a linear relationship of complexity with the accuracy of the device. Accuracy requirement reduction could simplify the circuit. Mr. Haas considers this instrument unique as a monitoring system that does not require the usual intermediate digital conversion. The instrument could be used to monitor coronary patients in hospitals, in the operating room, in intensive care or in coronary diagnostic work. Present instruments cost from $500 to $1,000. With the declining cost of circuitry, it is conceivable that within about a year, the NASA developed cardiotachometer could be made commercially available at a competitive price.

Mr. Haas has not investigated the patent status, but would do so if Westinghouse moves ahead with the development of the device for commercial application.

Case Number: 80812448 (Cont.)

Tech Briefs are received and circulated in the Medical Electronics section where Mr. Haas works. Personnel send for the NASA Support Package if it appears interesting. In this case, Mr. Haas was interested in measuring heartbeats. During the week before the Tech Brief appeared, he had been discussing the possiblity of direct measurement of heartbeats with his staff.

Mr. Haas finds the Tech Briefs and Support Packages adequate. However, he thought the Tech Briefs should describe any special circuitry required in the application so the information could be evaluated more rapidly.

GEH:bp
11/12/68

Case Number: 80812457

The Convair Division of General Dynamics is using a NASA survey report presenting current methods of fracture toughness testing as a reference source for proposal preparation and in aircraft design.

Subject	Technology Source
General Dynamics Convair Division San Diego, California 92112 714-277-8900, Ext. 3737 Contact: Charles Kropp Senior Engineering Metallurgist	Lewis Research Center Tech Brief: 68-10046

J. E. Strawley and W. F. Brown, Jr., Lewis Research Center, present a comprehensive survey of current methods of fracture toughness testing based on linear elastic fracture mechanics in a NASA Technical Note.

Mr. Charles Kropp of the Convair Division, General Dynamics, is working with the linear elastic fracture mechanics approach to fracture toughness of metals. Data developed along these lines are applicable to production parts for internal work at the Convair Division. Also, it is used in the preparation of proposals for study contracts with the government, and in design of the VFX to replace the F-111 aircraft. Mr. Kropp thought the survey report of fracture toughness test methods was a unique information source. He uses it as a library reference and will use it to develop new procedures. He added the survey report probably will never become obsolete.

While working on a fracture toughness project, Mr. Kropp noted the availability of the NASA information in a Tech Brief. Although an American Society for Testing and Materials (ASTM) Committee has been working on the same problem, they have not published any type of survey information or standards.

Convair has a notification system through which Tech Briefs are routed to personnel in their areas of interest. Mr. Kropp has used a number of

Case Number: 80812457 (Cont.)

NASA publications, and "has a lot of faith in them." He thought that the top men in their field have written technical notes and reports, and these pioneers have now become specialists. In his experience, these people have "bent over backwards" to help him with his requests.

GEH:bp
10/28/68

Case Number: 80812458

Allis-Chalmers is writing specifications and quality assurance measures to be used in proposals for building fuel cells. The proposal will involve fracture toughness testing of fuel cell brackets used in aerospace modules. A NASA document increased knowledge and insight about fracture toughness testing methods.

Subject	Technology Source
Allis-Chalmers Fuel Cell Division P.O. Box 512 Milwaukee, Wisconsin 53201 414-774-3600, Ext. 62237 Contact: Joseph F. Potochnik Materials and Process Engineer	Lewis Research Center Tech Brief: 68-10046

The Fuel Cell Division, formerly a research division of Allis-Chalmers, is using a NASA document about fracture toughness testing as a guide in writing test specifications for government contract proposals.

According to Joseph Potochnik, Materials and Process Engineer, in building fuel cells for aerospace modules, the fuel cells are mounted on a bracket and vibration tested to 10 g's. Partial and full penetration fillet welds will be used and compared. However, the concept of starting with an initial crack, loading, and then measuring the crack with various loads has not yet been tried. Proposals will be written that will include specifications for this type of testing. Contractual requirements could make this a necessity in the near future. Fuel Cells Division personnel are now learning the details of this type of testing. The main objective of this type of testing is to be aware of product capability.

Personnel concerned with fracture toughness testing at Allis-Chalmers are in the Materials and Process Group as well as metallurgists and research personnel.

Mr. Potochnik's request for the NASA information was in response to a specific need to update his state-of-the-art knowledge. Other sources

Case Number: 80812458 (Cont.)

of information included the American Society for Testing and Materials (ASTM), Lockheed, Battelle Memorial Institute, and Lehigh University.

Mr. Potochnik receives the Materials Category of NASA Tech Briefs and files them in a binder for the Division's Engineering Department. He thinks they are very good but could contain more details. However, the references act as a substitute for more in-depth information.

GEH:kcr
11/4/68

Case Number: 80812475

The Lapp Insulator Company is concerned with the fracture toughness of porcelain. The general test methods described in a NASA Support Package are being used in investigations to improve the quality of production porcelain.

Subject	Technology Source
Lapp Insulator Company, Inc. Le Roy, New York 14482 716-967-6221 Contact: James Crocker Ceramic Engineer	Lewis Research Center Tech Brief: 68-10046

A NASA technical note on fracture toughness testing by J. E. Strawley and W. F. Brown, Jr. of the Lewis Research Center, is being used as a guide for general testing techniques by the Lapp Insulator Company.

James Crocker, Ceramic Engineer, reported the Lapp Insulator Company was beginning to do fracture toughness testing of porcelain. In the procedure, a crack is introduced into a cylindrical porcelain bar. The bar is then subjected to double cantilever loads. He said they begin with the crack, load it, and then measure the length of the crack as the load is increased. This particular method of testing was described in the NASA document. The investigation deals with regular body porcelain rather than high strength porcelain, since the former represents the bulk of Lapp Insulator's production. The intent is to improve the toughness of the material, i.e., resistance to cracking, and thereby improving quality.

Mr. Crocker thought they must first learn to do the test before they will have a good measure for testing. Ultimately, they will be able to improve the material toughness. Tests have already been conducted, but additional refinements are needed.

Mr. Crocker was considering fracture toughness testing and was reviewing magazine articles and other sources of material when he encountered the NASA information. The NASA information was provided Mr. Crocker by the Vice President of Engineering through a Tech Brief. Mr. Crocker does not normally receive NASA publications, but he thought this one generally good although more applicable to metals than porcelain.

Case Number: 80812475 (Cont.)

Between 20 and 30 hours were used by ceramic engineers at Lapp Insulator to review new developments in fracture toughness testing.

GEH:kcr
11/4/68