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SOUTHWEST RESEARCH INSTITUTE  
BIOMEDICAL APPLICATIONS TEAM

NASA CR-

147407

BIOMEDICAL APPLICATIONS  
TEAM TASKS

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NASA JOHNSON SPACE CENTER  
CONTRACT NO. NAS 9-13775

SwRI PROJECT NO. 13-3836

Southwest Research Institute  
P. O. Drawer 28510, 8500 Culebra Road  
San Antonio, Texas 78284

BIOMEDICAL APPLICATIONS TEAM TASKS

NASA Contract No. NAS 9 - 13775  
SwRI Project No. 13-3836

31 October 1975

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FINAL REPORT

November 1974 - October 1975

APPROVED:



W. Lyle Donaldson  
Sr. Vice President and  
Director, Department of Bioengineering

## PREFACE

This report covers the activities of the NASA Biomedical Applications Team at Southwest Research Institute between 12 November 1974 and 31 October 1975 in the performance of NASA Contract NAS 9-13775. The program was performed in the Department of Bioengineering at Southwest Research Institute under the direction of H. Haskell Ziperman, M.D. Other members of the team who participated in the program during the reporting period were as follows:

Jean M. Dreyer  
Charles J. Laenger, Sr.  
Samuel R. McFarland  
H. Herbert Peel  
John L. Sigmon  
Robert L. Wilbur

Technical consultants who contributed to the program were as follows:

James R. Allen, Rancho Los Amigos Hospital, Los Angeles, California  
J. H. U. Brown, Ph. D., Coordinator, Consortium of Southwest Research Institute, Southwest Research Foundation, The University of Texas at San Antonio and The University of Texas Health Science Center in San Antonio.  
Jack Johnson, Veterans Administration Hospital, San Antonio, Texas.  
Frances Price, Ph. D., School of Allied Health Sciences, The University of Texas Health Sciences Center at Dallas.  
F. Hermann Rudenberg, Ph. D., The University of Texas Medical Branch, Galveston, Texas.

## ABSTRACT

The NASA Biomedical Applications Team at Southwest Research Institute served as an information and technology interface between NASA Johnson Space Center (JSC) and the medical community. The role of our multi-disciplinary team was to solicit and prepare technology requests for consideration by NASA JSC, assist in identifying applicable NASA technology, and continue to interact with the technology requestor to complete the technology transfer process.

Biomedical Applications Team members interacted with researchers, clinicians, therapists, special educators and administrators in approximately 50 medical and medically-related facilities during the reporting period. We received and processed 42 formal technology requests and continued work on a number of technology requests accepted in the previous year. We made numerous presentations and participated in conferences and workshops in efforts to effectively transfer NASA technology to the medical community.

The Department of Bioengineering performed applications engineering work on Contract NAS 9-14321 during the reporting period. This work was performed to complete the technology transfer process through generation of functional hardware for use and evaluation by the technology requestor. A resume of this effort is presented herein.

Publicity for the NASA Biomedical Applications Program is effective in soliciting technology requests which is an indispensable part of the technology transfer process. The most cost-effective means for acquiring this publicity is participation in medically-related symposia by presenting papers and displaying tangible results of aerospace technology. Section 4 lists the SwRI BA Team activity for this purpose, including effort funded by Southwest Research Institute.

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## 1.0 INTRODUCTION

### 1.1 Biomedical Applications Teams

Four unique Biomedical Applications Teams functioned during the reporting period. The National Aeronautics and Space Administration developed this concept in an effort to transfer aerospace technology to the medical and medically-related community in a timely and cost-effective manner.

Each team was closely affiliated or operated by one of the NASA Centers as follows:

<u>BA Team</u>	<u>NASA Center</u>
Southwest Research Institute San Antonio, Texas	Johnson Space Center Houston, Texas
Research Triangle Institute Research Triangle Park North Carolina	Langley Research Center Hampton, Virginia
Stanford University School of Medicine Palo Alto, California	Ames Research Center Mountain View, California
The University of Wisconsin Madison, Wisconsin	Goddard Space Flight Center Greenbelt, Maryland

The SwRI BA Team addressed itself to a broad range of medical and medically-related problems as indicated by the list of technology requests in Section 2. In preceding contract periods, our team concentrated somewhat on the rehabilitation area and other BA Teams would, on occasion, refer rehabilitation technology inquiries to us. During the reporting year, emphasis was placed on systems and technology developed at Johnson Space Center, although all technology requests received were appropriately processed or transferred to other BA Teams. The SwRI BA Team was hardware oriented and was particularly alert to technology transfer applications requiring engineering applications.

Members of the RTI BA Team have a broad range of capability and interest and, therefore, receive a very broad range of technology requests. They operate primarily in states on the eastern seaboard. They promote engineering applications through the research centers.

The Stanford University School of Medicine BA Team works closely with the Life Sciences Division at Ames Research Center. Their primary means for transferring aerospace technology is through performance of research utilizing or centered about aerospace technology. They host special national and international meetings and concentrate on cardiology.

The University of Wisconsin BA Team functions primarily in the midwest and concentrates on problems related to family medicine. They have a broad range of interest and capability and solicit technology requests.

## 1.2 SwRI BA Team Methodology

One of the primary goals in the reporting period was to minimize the time from technology request submission to final disposition of the request. Within thirty days after the technology request was received, the SwRI BA Team would (1) initiate a NASA data bank search, (2) review current state of the art, (3) review NASA data bank search results, (4) forward screened search results to technology requestor, (5) discuss technology request with originator, and (6) prepare and submit a complete information package, including recommendations for disposition, to the JSC Life Sciences Directorate for disposition.

A panel of engineers and physicians at JSC would review the technology request to determine (1) identifiable NASA technology, (2) relationship of technology request to available NASA facilities, personnel and on-going effort, (3) present state of the art, and (4) potential impact and benefits derived from satisfactory solution of problem that prompted the technology request. This panel would recommend one of the following: (1) build, test, modify and make devices available to technology requestor, (2) additional information acquisition, (3) refer to another NASA Center or (4) no further action. The SwRI BA Team would take action in accordance with the decision of this panel.

In the event that hardware was indicated, the SwRI BA Team would prepare hardware test and evaluation plans in collaboration with the technology requestor. Our BA Team would continue to assist and interact with the technology requestor until the technology transfer process was complete, including documentation.



### 1.3 Level of Effort

The S I BA Team level of effort for technology request acquisition processing and disposition and related activities was approximately one-half that of the other NASA BA Teams. During the first half of the reporting year, our assignments and levels of effort were as follows:

<u>BA Team Role</u>	<u>Profession</u>	<u>% Commitment</u>
Director	Physician	2
Assistant Director	Sr. Biomedical Engineer	50
Biomedical Engineer	Sr. Biomedical Engineer	45
* Coordinator, Assist Technical Monitor, Program Participant	Biomedical Consultant (Biochemistry)	100
Information Specialist, Assistant	Technical Assistant	50
Secretary	Secretary	15

\* Based at JSC in Houston

During the second quarter, we provided our JSC-Houston based coordinator with a secretary and reduced our BA Team activity in San Antonio for budgetary purposes.

A contract extension was initiated in June 1975 with funding that permitted a level of effort of about 40% of that during the first half of the reporting period. We were directed not to actively solicit new technology requests and to refer new requests to the Technical Monitor at JSC.

## 2.0 PRESENT STATUS OF SWRI BAT PROGRAM

### 2.1 Active Technology Requests

Numbers, titles and status of all active technology requests are shown in List A which follows.

### 2.2 Technology Requests - Applications Engineering

Technology requests which have resulted in hardware programs or are candidates for engineering application are shown in List B.

### 2.3 Technology Requests Closed

Technology requests which have been transferred to other NASA Centers, closed as a result of DE5 Panel and Technical Monitor directives or withdrawn by the originator are shown in List C.

### 2.4 Relationships With User Institutions

During this contract and predecessor contract periods, the SwRI BATeam endeavored to establish and maintain continuity with user institutions and technology requestors. The purpose was to create self-generating publicity for the NASA Technology Utilization Program and to obtain information and technology requests via "spontaneous" action. The RTI BATeam has demonstrated excellent results with this approach.

The JSC Technical Monitor for the BATeam initiated methodology which reduced time between submission of technology requests and NASA responses to the requestor. This significantly improved efficiency and quality of the program and relations with user institutions.

However, primary mission requirements and other JSC operations made it necessary to delay action on technology requests which were presented by the SwRI team for decision and action. The SwRI BATeam was directed on 25 June not to actively solicit any new technology requests. As directed by the Technical Monitor, on 4 August 1975, we informed all technology requestors that NASA responses to their active requests would be delayed about two months. Action is currently pending on 28 active technology requests.

**ACTIVE TECHNOLOGY REQUESTS**  
**Southwest Research Institute - San Antonio**

<u>Number</u>	<u>Title (Abbreviated)</u>	<u>Status</u>	<u>Date Submitted</u>
SWR-117	Autoanalysis of Drugs in Body Fluids	Interaction JSC/TR	
SWR-118	Breath Analysis for Drugs	Interaction JSC/TR	
SWR-127	Data Retrieval - Chronic Out-Patients	Interaction JSC/TR	
SWR-131	Record Brainstem Potentials	JPL/TR	
SWR-134	Non-Invasive Cardiac Output	Interaction JSC/TR	
SWR-141	Improved Methods - Cultures	Interaction JSC/TR	
SWR-142	Miniature Multichannel Telemetry	Interaction SwRI/TR	
SWR-143	Cooling Probe for Neuro-Muscle Studies	DE5 Survey	
SWR-158	Energy Expenditures of Geriatric Patients	Submitted to DE5	3-10-75
SWR-159	Viability Alarm for Geriatric Patients	Submitted to DE5	3-10-75
SWR-160	Exerciser for Burned Hands	Submitted to DE5	3-17-75
SWR-161	Pressure Garment for Hypertrophic Scars	Submitted to DE5	3-17-75
SWR-162	Pressure Measurement by Tight Fitting Garment	Submitted to DE5	3-17-75
SWR-163	V. S. Telemetry for EMS Vehicles	Submitted to DE5	3-17-75
SWR-164	N. I. Method for B. P. Monitoring in Primates	Submitted to DE5	3-25-75
SWR-165	Measure & Track Interventricular Wall Distances	Submitted to DE5	4-1-75
SWR-166	Verbal Cognizance Assessment	Submitted to DE5	4-10-75
SWR-167	Foot Force Measurement	Submitted to DE5	4-10-75
SWR-168	Anxiety Level Monitoring	Submitted to DE5	4-10-75
SWR-169	Portable Auditory Discriminations Evaluation	Submitted to DE5	4-11-75
SWR-170	Visual Discrimination Assessment	Submitted to DE5	4-11-75
SWR-171	A High Calorie Nutritional Supplement	Submitted to DE5	4-29-75
SWR-172	Control of Exuded Body Fluids	In Review by Requestor	
SWR-173	Body Heat Balance in Burn Patients	In Review by Requestor	
SWR-175	Drug Delivery System	In Review by Requestor	
SWR-176	Data Control for Multiple Clinical Testing	Submitted to DE5	5-15-75
SWR-177	Word Quality Indicator for Speech Therapy	Submitted to DE5	7-29-75
SWR-178	Astronaut Air or Liquid Cooled Space Suit	Submitted to DE5	8/10/75

**ORIGINAL PAGE IS  
OF POOR QUALITY**

**Legend:** TR - Technology Requestor  
DE5 - Johnson Space Center review panel

LIST A

ACTIVE TECHNOLOGY REQUESTS

JSC/SwRI - Houston

<u>Number</u>	<u>Title (Abbreviated)</u>	<u>Status</u>
JSC-175	Implantable Cardiac Pressure Sensor	In Review
JSC-176	Cardiotachometer	In Review
JSC-192	Medics Applications	In Review
JSC-193	Improved Materials for Cryogenic Superconductors	In Review
JSC-195	Telecare-Infants During Transport	Interaction Ames/JSC
JSC-208	Clear Lake City Emergency Medical Service	In Review
JSC-210	Apollo PLSS Dual Diaphragm Pump	In Review
JSC-211	Ventilator Circuit Malfunction Alarm	In Review
JSC-216	Identification of Bacteria-Chromatography	In Review
JSC-217	Commercial X-Ray Enhancement	In Review
JSC-218	X-Ray Imaging	In Review
JSC-221	Blood Flowmeter	In Review

## LIST B

## TECHNOLOGY REQUESTS - APPLICATIONS ENGINEERING

<u>Number</u>	<u>Title</u>	<u>Status</u>
AEB-4	Aesthesiometer, Tactile Separation	Shipped to JSC
AEB-5	Rocking Motion Detector (Blind)	Contract, G. E.
CHS-10	Hearing Aid Malfunction Alarm	Contract, Martin-Marietta
CRH-7	Automobile Control (Lunar Rover)	Contract, SwRI
GLM-35	Beta Radiation Probe	Contract, SwRI
MSC-1	Scalp Cooling, Chemotherapy	Transferred, NASA ARC
JSC-101	Mobile Biological Isolation System	NASA JSC
JSC-123	Hyperbaric Cocoon	NASA JSC
OVA-2	Lung Compliance Measurement	Equipment Available
TTU-4	Nocturnal Activity Monitor	Contract, SwRI
RNV-40	Athetoid Assist Device	Contract, SwRI
SWR-116	Prepackaged Food for Elderly	Contract, Technology, Inc
JSC-172	Hydrojohn	RTOP Candidate
JSC-183	Cardiac Imaging, Ultrasonic 3-D	RTOP Candidate
TTU-3	Rate Monitor for Self-Injurious Behavior	Contract, SwRI

**LIST C**  
**TECHNOLOGY REQUESTS - CLOSED OR TRANSFERRED**

<u>Number</u>	<u>Title (Abbreviated)</u>	<u>Comments</u>
MSC-1	Scalp Cooling, Chemotherapy	Transferred, NASA Ames
IOU-2	Evaluation Respiration	Transferred, NASA Langley
CRH-5	Urine Bag Valve	Closed
SWC-2	Evoked Cortical Response System	Transferred, NASA MSFC
SWR-110	Universal Earplugs for Oscopes	Transferred, NASA Langley
SWR-111	Quantitative Pneumoscope	Transferred, NASA Langley
SWR-112	Meter Readout for Blind People	Closed
SWR-113	Complete Screening System, Child	Transferred, NASA Langley
SWR-125	Measure Area, Lipid Bilayer Membrane	Transferred, NASA JPL
SWR-126A	Analyze Scintiangiograms	Transferred, NASA JPL
SWR0128	Control-Thermoregulation, Bedridden	Withdrawn
SWR-135	Pressure Patterns-Decubiti	Sent to ARC
SWR-136	TV for Education/Monitor, Hospitals	Transferred, NASA GSFC
SWR-140	Inflatable Garment	Commercial Product
SWR-144	Micro Displacement Sensor for Cardiac Valve	Sent to ARC
SWR-145	Device for Measuring Hand-Finger Strength	Information only
SWR-146	Measurement of Microemboli in Blood	Information only
SWR-147	Bone Pin Cutter	Commercial solution
SWR-148	Adjustable Commode Seat	Commercial solution
SWR-149	Intracranial Pressure Monitoring	Information request
SWR-150	Monitor Neuromuscular Activity	Information request
SWR-151	Flexible Paddle Arm for Diathermy Machine	Information request
SWR-153	Blood Pressure Monitoring (TTU-5)	JSC/SwRI Interaction
SWR-154	Bedside Analyzer to Monitor Blood Gases	Information request
SWR-155	Infrared Erythema Detector	Closed
SWR-156	Cranial Flexure Measurement	Closed
SWR-157	Measure Degree of Torticollis	Closed
SWR-174	Rapid Index File for Dispatchers	Withdrawn
JSC-135	Improved Powered Hand Prosthesis	Transferred, NASA KSC
JSC-178	Biological Isolation Garment	Equipment loaned
JSC-185	Veterinary Applications of Skylab Slides Strainer & Microscope	To be closed
JSC-194	Biological Isolation Garment	Equipment loaned

## 2.5 Other Commitments

An SwRI BA Team member has served on the Aerospace Subcommittee of the AAMI for several years. The RTI BA Team has provided the chairman for this group, and we have supported him particularly where hardware and utilization of NASA technology for production of commercial devices were concerned.

We have no additional commitments, although user institutions with which we have established rapport will expect to be contacted periodically.

### 3.0 APPLICATIONS ENGINEERING

#### 3.1 SwRI Activity - Contract NAS 9-14321

Under this contract, aerospace-developed technology was utilized to generate (1) an Aesthesiometer device for measuring tactile spatial discrimination in blind people, (2) a Rate Monitor for self-injurious behavior and (3) a Nocturnal Activity Monitor. These items were delivered to JSC and technical support packages have been prepared and delivered for dissemination.\* In addition, two other developmental projects are still in progress.

A Be'a Radiation Catheter instrument is nearing completion. One improved unit has been completed and demonstrated in the laboratory. The design has been finalized and construction will be completed upon receipt of ordered components. NASA Ames contributed to the effort by applying a plasma coating on one beta detector in order to produce a more rugged and functional detector. A list of candidate user-evaluators has been provided to JSC.

A prototype Rigid Lightweight Damped Orthosis has been completed and is under preliminary evaluation by the San Antonio Cerebral Palsy Treatment Center in cooperation with Rancho Los Amigos Hospital in Downey, California. NASA-developed technology for fabrication of composite materials and technology used by NASA Ames in developing exoskeletal armor-type space suits were utilized in generating an orthosis for athetoid children. Completion of this project will enable testing an advanced concept of care and treatment of children with certain severe neurologic disorders.

#### 3.2 Consortium Activity - Contract NAS 9-14473, Task 1

SwRI was named as one of several contractors to participate in a task order agreement for further development of specific NASA technology. Under the first task call of the contract, a feasibility study, a preliminary design effort was aimed at adapting The Lunar Rover Vehicle Control System to an automobile. The intent of the proposed adaptation was to enable persons with severe paralysis of the arms and legs to drive a car. The study assembled all available knowledge and polled cognizant persons about handicapped drivers and adaptive equipment. A limited test phase surveyed the control force and reaction capabilities of a population of high-level paralytics.\*

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\* See References, Section 6



The survey results and design concept have been published in a separate contractor's report. The second phase of a proposed four-part developmental plan is currently progressing under sponsorship of the Veterans Administration. NASA continues to serve in an advisory capacity. .

### 3.3 JSC Activity

Johnson Space Center has contracted with other organizations to develop a Rocking Motion Detector for blind people and a Hearing Aid Malfunction Alarm for deaf children. This hardware activity was initiated as a result of SwRI generated technology requests from Arkansas Enterprises for the Blind and Callier Hearing and Speech Clinic in Dallas.

#### 4.0 SUMMARY OF SWRI BIOMEDICAL APPLICATIONS TEAM ACTIVITY

##### 4.1 Visits to User Institutions

Visits to user institutions enabled us to contact many clinicians and researchers who would never otherwise have contact with NASA. This activity serves as a means for acquiring and processing inquiries and for diplomatically and efficiently "screening" technology requests. Personal visits with potential technology requestors should have significant weighting in judging performance and effectiveness of BA Teams.

The following visits were made during this quarter.

<u>Date</u>	<u>User Institution</u>	<u>Department/Personnel</u>
<u>Dallas Area</u>		
Various	Southwestern Medical School	Physical Medicine and Rehabilitation Allied Health Sciences
2/3	Callier Hearing and Speech Clinic	Research, Audiology
2/3	Caruth Rehabilitation Center	Administrator
2/4	Denton State School	Administrator/Clinicians
2/4	Texas Woman's University	Physical Education
<u>San Antonio</u>		
Various	V.A. Hospital	Psychiatry, Bioengineering Other Staff
Various	The University of Texas Medical School	Staff - Numerous Department
Various	Cerebral Palsy Treatment Center	Physical Therapy, Education
<u>Oklahoma Area</u>		
2/25	Oklahoma City V.A. Hospital	Cardiology, Biochemistry
2/25	Children's Convalescent Hospital	Staff

<u>Date</u>	<u>User Institution</u>	<u>Department/Personnel</u>
2/25	Oklahoma Department of Education	Special Education
2/25	Oklahoma Department of Institutions	Administration, Field Program
2/26	Tulsa Rehabilitation Center	Staff
2/26	The University of Oklahoma Medical School	Biochemistry
<u>Dallas Area</u>		
2/25	Southwestern Medical School	PM&R
2/25	Corsicana Medical Arts Clinic	Staff
2/26	Caruth Rehabilitation Center	Staff
2/26	Texas Woman's University	Physical Education
2/27	Personnel Associates	Staff
2/27	Parkland Hospital	Burn Intensive Care
2/27	The University of Texas Allied Health Sciences	Physician's Assistants
2/27	Presbyterian Hospital	Physical Therapy
<u>Boston</u>		
3/18	U. S. Army Research Institute for Environmental Medicine	Instrumentation Branch
<u>Louisiana</u>		
4/7	LSU Medical School at Shreveport	Pediatrics (Representing Research Committee)
4/7	Shreveport V. A. Hospital	Staff
4/7	Northwest Louisiana State School	Staff

<u>Date</u>	<u>User Institution</u>	<u>Department/Personnel</u>
4/8	Pinecrest State School	Psychology
4/8	Louisiana State Commission, MHMR	Commissioner
4/8	Hammond State School	Superintendent
4/9	LSU Medical School at New Orleans	Obstetrics & Gynecology
<u>Missouri</u>		
11/74	Kirksville College of Osteopathic Medicine	Staff
11/74	Kirksville Osteopathic Hospital	Staff

#### 4.2 Meetings and Presentations

Members of the SwRI BA Team attended and participated in various civic and professional and NASA planning-review meetings. A list of these meetings and roles of the team members are listed by categories.

#### Professional Meetings

Association for the Advancement of Medical Instrumentation,  
10th Annual Meeting, Boston, March 1975\*

Aerospace Subcommittee Meeting - Bob Wilbur participated

"Medical Monitoring System for Sled Testing with Human Subjects," Wilbur, McFarland, Ziperman. Presented by Wilbur.

Biomedical Engineering Society, Annual Meeting, New Orleans,  
Louisiana, April 1975\*\*

"A Powered Artificial Hand for Communication with Deaf-Blind People," Laenger, McFarland, Carpenter, Peel. Presented by Laenger.

\* Expenses of SwRI participant shared - NASA/SwRI

\*\* Expenses of SwRI participant paid by SwRI

Rocky Mountain Bioengineering Symposium, 12th Annual Meeting,  
Denver, April 1975\*\*

"Smoking Inhalation Response Indicator and Conditioner"  
Wilbur, McGill, Stevens. Presented by McFarland.

"Modification of Self-Mutilative Behavior By Aversive  
Conditioning," Wilbur, Chandler, Carpenter.  
Presented by McFarland.

"Fiber Reinforced Composites For Orthotics, Prosthetics  
and Mobility Aids," McFarland, Laenger, Francis,  
Ziperman. Presented by McFarland.

American Association on Mental Deficiency, 99th Annual  
Meeting, Portland, Oregon, May 1975.\*\*

"Habilitation Engineering Applied to Problems in Mental  
Retardation," Laenger and Wilbur. Presented by Wilbur.

Aerospace Medical Association Convention, San Francisco,  
April 1975.

John Sigmon attended and helped man a NASA booth.

International Conference on Remote Emergency Medical  
Service, Lubbock, Texas, May 1975.

"Technology Utilization Programs at the Johnson Space  
Center." John Sigmon also helped man a NASA booth.

AAMI Conference on Medical Devices Legislation, Washington,  
D. C., June 1975.\*\*

Herb Peel attended the conference.

28th Annual Conference on Engineering in Medicine and Biology,  
New Orleans, Louisiana, September 1975.\*\*

"Quadriplegic Force Output and Reaction Times Using a Lunar  
Rover Controller Simulator." Presented by Sam McFarland.

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\*\* Expenses of SwRI participant paid by SwRI

**Program and NASA  
Sponsored Meetings**

The Biomedical Technology Application Panel meeting at TUO Headquarters and NASA Goddard was attended by Charles Laenger in December. The Veterans Administration Prosthetics Center/Rancho Los Amigos Hospital/NASA conference was attended by Sam McFarland. The semi-annual Technology Utilization Biomedical Applications conference at Stanford University and Ames Research Center was attended by Sam McFarland and John Sigmon in January.

A review of the SwRI BA Team was held in San Antonio in April. Program operating procedures, interaction with NASA centers, coordination with and responses to the Technical Monitor, visit schedules and visitation policies, reports and report distribution were discussed. Technology requests contained in the last quarterly report were reviewed in detail and suggestions and directions for changes and further action were acknowledged by SwRI. Engineering applications projects and our brochure and exhibit effort were also reviewed.

Dr. H. Haskell Ziperman and John Sigmon attended the Biomedical Applications Program Review at Langley Research Center in May. John Sigmon attended the meeting, "Cardiovascular Imaging and Image Processing: Ultrasound, Angiography and Isotopes," at Stanford University in July.

John Sigmon worked in the NASA Headquarters TU Office for several weeks during July and August.

**Other Activity**

**Voice of America Interview, Houston, Texas**

John Sigmon gave an interview on NASA's Biomedical Application Program on 15 April. This will be translated to Arabic for broadcast at a later date.

**National Easter Seal Society, National Convention, San Antonio, 1975.**

"The National Aeronautics and Space Administration and Mobility Aids for the Handicapped." Presented by John Sigmon.

Federation of Americans Supporting Science and Technology,  
San Antonio, April 1975

"Skylab Medical Experiments, Telecare System and  
Other Biomedical Applications." Presented by John Sigmon.

Meeting and Symposia

The SwRI Department of Bioengineering provided an invited exhibit at the Texas Rehabilitation Association Conference in San Antonio, July 13-16, 1975. The exhibit's theme was Rehabilitative Engineering and our artificial hand for communicating with deaf-blind people received most attention. We showed other apparatus for therapy and education of blind cerebral palsied and autistic children. These items were developed under sponsorship of private foundations and SwRI. We also showed hardware developed through the BAT program. Devices shown were the Paper Money Identifier, the Lunar Rover Control simulator for evaluation of handicapped drivers, and lightweight prosthetics and orthotics apparatus. There was extensive coverage by the news media, both newspapers and television. BATeam members H. Haskell Ziperman, M. D., Charles J. Laenger, Robert L. Wilbur, Sam R. McFarland and H. Herbert Peel manned the exhibit. All salaries and expenses were paid by SwRI.

4.3 New Technology Requests

Forty of the forty-two new technology requests acquired by SwRI were received during the period from 12 November 1974 through 30 May 1975. During the remainder of the year when there was no active solicitation, only two formal technology requests were received. These are attached.

Technology requests received during quarters from November 1974 through January 1975 and February 1975 through May 1975. were previously included in reports for those periods.

4.4 Previous Technology Requests

Interaction with technology requestors continued throughout the year. When requests were closed the requestor was promptly informed. Information pertinent to requests, even closed requests, was sent to the user institution.

SOUTHWEST RESEARCH INSTITUTE  
BIOMEDICAL APPLICATIONS TEAM

PRELIMINARY TECHNOLOGY REQUEST STATEMENT

Request Number: SWR -177 Date of Preparation: 26 June 1975

Request Title: Word Quality Indicator for Speech Therapy

Date of Acceptance: \_\_\_\_\_

Principal Investigator: Nancy Mosher, Speech & Hearing Specialist; Robert Hoover,  
Director SCHI, Southwest Center for the Hearing Impaired

6487 Whitby Rd., San Antonio, Texas 512/696-2410

BA Team Coordinator: Laenger

What is Needed: A device which will objectively judge the quality of spoken words.  
A means for controlling "acceptable quality" and immediate scoring or immediate  
tangible reward should be provided. A "go/no-go" indication would be adequate.

Background: Many hearing impaired people receive speech therapy for (1) remedial  
purposes and (2) to encourage them to continue to use their voices. This therapy  
is almost always accomplished in a "one-on-one" manner - that is, one speech path-  
ologist deals with one patient at a time. It is very difficult for a person who is  
speech impaired to "practice" alone because his judgment of quality is subjective,  
or if he is hearing impaired, his disability deprives him of proper or adequate  
feedback.

Other Comments: A suitable device would extend the capability and productivity of  
the speech pathologist. It would also provide an effective means whereby the patient  
could practice in private. The device could be time-shared in a speech laboratory.



SOUTHWEST RESEARCH INSTITUTE  
BIOMEDICAL APPLICATIONS TEAM

## PRELIMINARY TECHNOLOGY REQUEST STATEMENT

Request Number: SWR-178 Date of Preparation: 10 July 1975Request Title: Astronaut Air or Liquid-Cooled Space SuitDate of Acceptance: 15 June 1975Principal Investigator: David R. Hazlett, M. D., Col., MC;  
Chief, Pulmonary Function Laboratory  
Fitzsimons Army Medical Center, Denver, Colorado 80240BA Team Coordinator: Robert L. Wilbur

What is Needed: The technology requestor desires information on how to acquire or construct an air or liquid-cooled suit to maintain a constant temperature in a body plethysmograph and provide comfort to the test subjects.

Background: Body plethysmograph experiments are being undertaken at Fitzsimons Medical Center. Temperature fluctuations in the plethysmograph due to body heat are troublesome and must be ignored or compensated. The increase in temperature is also uncomfortable to the subject under test.

Other Comments:

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#### 4.5 Information Requests

Requests for information were logged and answered promptly. The log for the period from 1 July 1975 through 31 October 1975 is attached.

4.6 Inquiry Log

SwRI #	Source	Date Acquired	Title	Status
C252	MSP*	6-2	Temper Foam	Forwarded to Edmont-Wilson
C253	PSH	6-10	Cardiac Rate Meter	Sent circuit diagram
C254	LSN	6-11	Temper Foam	Sent info
C255	WSC	6-13	Tactile Communication	Sent info
C256	JSC	6-26	Surgical Instruments	To Sigmon
C257	WSC	6-30	EMS	In preparation
C258	SCH	6-30	Speech Analysis	SWR-176
C259	SRC	7-7	Medical Benefits From Space Brochure	Info sent
C300	A&M	7-8	Temper Foam	Info sent
C301	WSC	7-17	EMS	Info sent
C302	NRC	7-22	Temper Foam	Info sent
C304	IGC	7-28	Brochure and Technology Request Forms	In preparation
C309	USC	8-4	TR SAM-TR-66-55	Info sent
C313	H. C. B.	8-5	Field Hospital	Forwarded to JSC
C316	IND	8/6	Switches on eyeglass frame	Info sent
C324	IND	8/25	Temper Foam	Info sent
C332	IND	9/17	Paper Money Identifier	Info sent
C337	KSH	10/10	Medical Benefits From Space	Info sent

## 5.0 TERMINATION OF SWRI BATEAM

SwRI was notified on 22 August that its NASA BA Team would be terminated with expiration of the present contract extension. NASA Exhibit No. 1 and Exhibit No. 2 have been shipped to JSC. Pamphlets, catalogs and other material have also been shipped. Technology request records, original logs and other information generated during the course of the present and predecessor NASA BA Team contracts are the property of NASA and will be shipped to JSC on the closing date of the present contract extension.

## 6.0 REFERENCES

Quarterly Progress Report, November 1974 - January 1975.

"Biomedical Applications Team Tasks," Contract  
NAS 9-13775, 28 Feb. 1975.

Quarterly Progress Report, February - May 1975.

"Biomedical Applications Team Tasks," Contract  
NAS 9-13775, June 1975.

Final Report. "Application of Features of the NASA Lunar  
Rover to Vehicle Control for Paralyzed Drivers,"  
Contract NAS 9-14473, Task 1, August 1975.

Technical Support Package (Number to be Assigned).

"Nocturnal Activity Monitor," Contract NAS 9-14321,  
March 1975.

Technical Support Package (Number to be Assigned)

"Self-Injurious Behavior," Contract NAS 9-14321,  
December 1974.