

PREVIOUS AND CURRENT RESEARCH

1965 - Present -- Aerospace Medical Division, San Antonio, Texas

Performed an extensive investigation of the problems of determination of mass under zero gravity, especially as related to physiological balance studies of man. In particular, I have studied the use of a spring/mass oscillator theoretically and experimentally. As a result of this work, it has been possible to design a series of flight instruments with accuracies on the order of .01% - .02% for rigid masses to .1% or better for non-rigid masses, including humans, over the range of 50 grams to 100+ kilograms. I have taken the smaller instrument through successful flight testing on zero G aircraft profiles. Hardware is currently being designed and flight qualified under my direction for proposed NASA and MOL programs. These are the first mass scales ready for flight use and at least one design is tentatively scheduled for use in a NASA Apollo Applications experiment.

Collaborators - Dr. E. ~~D.~~ Palmatier, South Building, University of North Carolina, Chapel Hill, North Carolina, and

Mr. William Oakey, Southwest Research Institute, San Antonio, Texas

1966 - Present -- Aerospace Medical Division, San Antonio, Texas

Analysis of physical aspects of the problems of ergometry and crew conditioning in space flight which includes mathematical analysis of conventional movements and is planned to include measurement of efforts of muscle groups and total energy cost of various tasks under zero G trajectory. Effectiveness of various programs for conditioning is to be investigated. Design of prototype ergometer, ~~which~~ ^{it} will allow accurate measurement of energy and work under variations in type and ~~from~~ amount of loading for a variety of motions ^{was} an important portion of the program and has been accomplished.

Collaborators - Lt Colonel J. W. Ord, Aerospace Medical Division, San Antonio, Texas

1965 - Present -- Aerospace Medical Division, San Antonio, Texas

Experimental investigation of feasibility of on-line automatic sleep staging (Dement-Kleitman criteria) by EEG is underway and is

1965 - Present

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Aerospace Medical Division

An extensive experimental and theoretical investigation has been performed to determine the feasibility of obtaining arterial oxygen saturation, cardiac output and blood volume under conditions of orbital flight with peripheral dye injection and a three wavelength earpiece densitometer. I have designed prototype earpiece densitometers including a flight prototype in test.

Collaborators - ^{1st} Col J.W. Ord Aerospace Medical Division

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planned to include design of flight-qualifiable analyzer and associated gear such as personal telemetry link and electrodes.

Collaborators - None

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1965 -- Aerospace Medical Division, San Antonio, Texas

Theoretical and experimental analysis of personal telemetry problems in orbiting laboratory performed with design of practical miniature transmitter with battery life of 30+ days demonstrated.

Collaborators - None

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1962 - 1963 -- University of North Carolina, Chapel Hill, North Carolina

Collaborators - Drs. D. A. Davis, K. Sugioke, and D. Grosskreutz.
The use of conditioned G.S.R. response for audiometric threshold testing in children and/or uncooperative subjects was investigated and a system designed which yields results comparable to standard direct procedures and at great reduction in complexity over previous indirect procedures.

Collaborators - Dr. Newton Fischer and Dr. Grady Thomas, Department of Otolaryngology, University of North Carolina, Chapel Hill, North Carolina

1962 - 1963 -- University of North Carolina, Chapel Hill, North Carolina

Study of muscle action in unrestrained motion of the lower extremities in normal subjects and subjects suffering muscular atrophy from various causes were made with multichannel, telemetered E.M.G.'s, integrators and continuous goniometry. Design of the apparatus was a significant portion of this program.

Begin Here
Collaborator - Miss ~~Margaret Moore~~ *Sally Farrand*, Department of Physical Therapy, University of North Carolina, Chapel Hill, North Carolina

1955 - 1963 -- University of North Carolina, Chapel Hill, North Carolina

Study of improved methods of clinical monitoring of patients during and post surgery/anesthesia. Improved devices for respiratory studies,

Collaborator - Dr. Gordon Ira, Duke University, Durham, North Carolina

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blood pressure, blood flow, temperature and electrophysiological signals were designed and constructed and/or investigated. These devices included rheographs, optical and displacement plethysmographs, EEG and EKG systems, gas flow transducers and samplers, blood flow meters, blood pressure transducers, analog operators for signal processing and improved display and recording devices. Literally thousands of cases were followed with various combinations of monitors and results analyzed such that a definitive monitoring system was designed and telemetered with EKG digital pulse pressure routinely monitored on a 2-channel scope in every O.R. suite with telemetered EEG and respiratory studies available for special cases. System remains in continuous use to date.

Collaborators - Drs. D. A. Davis, K. Sugioka, and D. Grosskreutz,
North Carolina Memorial Hospital, Chapel Hill, North
Carolina

1959 - 1962 -- University of North Carolina

A study of improved methods of diagnosis of suspected heart disease was made using some of the above techniques. A radio telemetry system with magnetic tape recording and an on-line analyzer of selected EKG parameters was designed and constructed. This equipment allowed unrestricted study time and activity and demonstrated a marked increase in positive diagnoses of chronic, intermittent arrhythmias and transient myocardial ischemia. Effects of drugs and various activities were also documented with these techniques.

Collaborators - Dr. T. C. Gibson, University of Vermont Medical School,
Burlington, Vermont

Dr. Isadore Rosenfeld, Cornell University, New York,
New York

1961 - 1963 -- University of North Carolina, Chapel Hill, North Carolina

Effects of activity, especially normal activity, athletics, and abnormal metabolic states such as thyrotoxicosis and psychic stress on heart rates were investigated by means of unrestrained recording of heart rate with telemetry and cardiometers.

Collaborator - Dr. Gordon Ira, Duke University, Durham, North Carolina

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1959 - 1960 -- Del Mar Engineering Laboratories, Los Angeles, California

Investigation and development of UHF Doppler and simple electronic computation techniques were performed. This work was later incorporated in a successful missile scoring Navy tow target.

Collaborator - Mr. C. Sanctuary, Del Mar Engineering Laboratories

1956 - 1959 -- Del Mar Engineering Laboratories, Los Angeles, California

Development and tests of radar optical scorers were continued with production design and subsequent standardization by USAF (TDU 4B) and USN (Aero 39). Production items were procured in quantity by U.S., Canadian, and Allied Air Forces.

Collaborators - Del Mar Engineering Laboratories, Production Engineering Staff

1956 - 1959 -- Del Mar Engineering Laboratories, Los Angeles, California

An investigation of I.R. sources resulted in sources and controls suitable for use in small target vehicles which became standard with the military services.

Collaborators - Mssrs. Lolmaugh and Smith, Del Mar Engineering Laboratories

1958 -- Del Mar Engineering Laboratories, Los Angeles, California

The behavior of regenerative and super-regenerative R. F. detectors were analyzed and marked improvements made in bandwidth and detection efficiency. Practical designs based on this work were used in command receivers produced in quantity.

Collaborators - Del Mar Engineering Laboratories, Production Engineering Staff

1958 -- Del Mar Engineering Laboratories, Los Angeles, California

Investigation ^{+ development} of non-coherent, nano-second U.V. light sources, filters and detectors resulted in high resolution "optical radar" several years prior to similar application of lasers.

Collaborators - None

1952 - 1955 -- Eglin AFB, Florida

Extensive investigations were made in radio, optical, and radar methods of tracking small missiles which included work in improving camera lens, ultraspeed recording materials and high resolution pulsed radar. This work had practical application in several radar optical scoring systems which allowed the first operational evaluation of a variety of air-to-air missiles. Received USAF Legion of Merit for this work.

Associates were: Mr. J. J. Bauer, PGVED, Eglin AFB, Florida
Mr. J. Schauble, Physical Sciences Laboratory,
Eglin AFB, Florida