

## UNIVERSITY OF WASHINGTON

SEATTLE 5, WASHINGTON

Department of Physiology and Biophysics

School of Medicine

December 3, 1948

Lt. Colonel Blount  
Air Surgeon's Office  
Director, Research Division  
Hdqts, Air Force  
Pentagon Building  
Washington, D. C.

RCC8.960517.003

Dear Colonel Blount:

We have just returned from a two day visit with Col. Bollerud at Fairbanks, and are very pleased with the prospects of the laboratory there and the possible work with the men in the laboratory. At the present time it looks as if we will have our equipment and men ready to go about the 15th of January. We have had a strenuous time ordering equipment and making certain that it would be delivered in time. We have in some cases ordered two of an item to be certain that we have it in time. This, however, is not extravagance, since we hope to leave one set of equipment at Fairbanks if there are people there interested in carrying on the work. We have been successful in getting a small nucleus of personnel, and are rapidly developing the prospects of other personnel to enlarge our group.

I am enclosing an outline of the project, as we hope to accomplish it during this winter. We are perhaps optimistic in trying to accomplish all this, but I feel that we will be able to do at least part of it.

In the future we will send you a news release for the local papers, who have been quite anxious to carry some information on this contract. I hope that this can be written in such a manner as to be good publicity for the Air Force and for the Air Surgeon, so if you have any comments or changes you would like to make in it, feel free to do so.

We found Col. Bollerud enthusiastic, and a man with whom I am sure we would enjoy working. I think he has done a grand job at the Arctic Aero Medical center.

I certainly hope that you will feel free to write to us at any time with any comments you have on our contract. We have received a very excellent letter from Col. Gage which we appreciated very much. If there are any meetings in Washington or elsewhere that you think we should attend, I think we can arrange to do so.

Yours very truly,



Loren D. Carlson  
Assistant Professor

LDC:ngt  
enc.

National Archives, College Park, MD  
Review of 4 April 1996 and 8 May 1996

Record Group 341  
Entry 44  
Box 96

Folder: AAK Contract (U of Washington)

Department of Physiology and Biophysics  
University of Washington

Winter Program at Arctic Aero Medical Laboratory  
Ladd Field, Alaska

This proposal for the study to be made at the University of Washington and at Ladd Field is best approached by quoting a general statement made by Dr. W. O. Fenn:

$$\Sigma \text{Stress} = f_{1s} + f_{2y} + f_{3z} + \dots + f_{nN}$$

$$\Sigma \text{Stress} = \Sigma \text{compensations} + \Sigma \text{strains}$$

In this study we propose to evaluate the additional stress involved in operations in the cold. The investigation will proceed in three sections: mammalian physiology, comparative physiology, and psychology. Each will be carried out in two phases; a preparatory and exploratory phase the first year, and a final phase the second year.

Work in comparative physiology and in psychology will be supervised and carried out separately. It is the purpose of this proposal to outline the part of the work in mammalian and human physiology.

The response to stress or strain is measurable through the activities of the respiratory and circulatory system. Under normal conditions, the response of these systems is known for varying degrees of work. This serves as a basis of comparison for the additional stress imposed by cold. For example, a man working at 0 or 100 Kg. M./min. may require additional oxygen for maintenance of heat balance. At higher work levels this may change. His reactions may change with time due to acclimitization.

To investigate these adequately, one set of measurements will provide data on the heat output and input. The measurements we propose to make are:

- 1) Body temperature, internal and surface.
- 2) Rate of heat loss from body surface by use of clothing of known thermal conductivity.
- 3) O<sub>2</sub> consumption and CO<sub>2</sub> output by alveolar air sampling.
- 4) Inspired and expired air temperatures.
- 5) Heart rate.
- 6) Weight loss during experiment.
- 7) Moisture losses.
- 8) Respiratory air flow.
- 9) Determination of an empirical thermal conductivity coefficient of the body.

The equipment for these measurements will be mounted in the mobile test trailer available at the Arctic Aero Medical Laboratory. Subjects will be adjacent to the truck, but protected from radiation. Test can be made at rest and during walking at given rates. Measurements will be made on ourselves, Ladd Field personnel, and if time permits, on natives. This

equipment is schematically shown in the appended figure.

An entirely new set of data may be introduced in the measurements of rate of heat loss, and this will lead to the investigation of blood flow in the skin and appendages. This and the following studies will be carried on concurrently at our laboratory. It is proposed to attack this problem using radioactive isotopes. With the proper experimental set-up and proper instrumentation, the amount of blood at certain distances below the skin may be calculated. Changes due to exposure to cold will be determined. This will be done on animals first then, if feasible, on humans.

All these investigations lead one to analyze the control mechanisms. Just as the  $\xi$  stress is a function of a number of variables, so the pulmonary ventilation and circulation are regulated by a number of factors which may be interrelated. It is hoped that work may be carried out in the study of some of the neural mechanisms involved in control. Specific work is being done to determine the influence of a limb reflex in the control of respiration. Work is planned to record electrical activity from the temperature regulating center at ordinary environmental temperatures and with exposure to cold, changes in the temperature of the regulating center will be sought; these are hypothetical, but not demonstrated experimentally. Experiments are underway to determine whether neural impulses, as apposed to metabolites, control respiratory activity.