

The Advance of the Flight Surgeon Into Space Medicine

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IT IS a rare privilege to have been given the honor of presenting a paper at the first session of the new constituent group of the Aerospace Medical Association, "The Society of United States Air Force Flight Surgeons."

It is furthermore gratifying that the honor should be given to the second oldest living flight surgeon, in point of service, of those trained in the Regular Army following World War One, and who had, at the time of his retirement, the longest continuous service of any Regular Army flight surgeon.

The general title of the program presentation, this afternoon, is "Operational Aerospace Medicine." It, therefore, is a subject that, at the time of the completion of my military service, was only one dimly envisioned though definite steps had been taken by a hardy few, who permitted their imaginations to play and project the possibilities of the stresses and strains on the human economy in this newly developing area of space research.

This paper must necessarily deal with the history of flight surgery. It will be my purpose to lay the groundwork for the evolution of the flight surgeon from the status of a medical officer attached to the Aviation Section of the Signal Corps of the Army, in World War One, to a highly trained specialist of today, assigned to the staff of the commander of an Air Force command or to one of the highly specialized laboratories dealing with the most intricate aerospace problems.

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Those pioneers who had the early realization that there were definite medical problems in connection with extra-terrestrial operations were wiser than their generation. They envisioned problems that to the exhilarated neo-pilots, who flew "by the seat of their pants," were gloriously non-existent or a matter of total indifference. Nevertheless, the problems were there and many are the pilots who have paid with their lives for a flaunting of this early medical advice. It is sad to relate there are still those who pay this heavy penalty.

The early flight surgeon was principally an examiner taking into account primarily the physical aspects of the pilot or applicant for flying training. He was not consulted concerning the many other problems that beset flying personnel, nor was he trained in matters concerning the "care and treatment of the pilot." It is an unhappy reality that frequently much jealousy was engendered between non-aeromedically trained medical officers and the flight surgeon. By the same token the early flight surgeon had little contact with his commanding officer. These individuals, if they were pilots, did not feel the necessity for consulting medical opinion in matters in which they believed themselves masters. This, to those of you who are relative newcomers in the field of aerospace medicine, is hardly believable, and yet I have had many sad personal experiences, of this sort, in my long career as a flight surgeon.

The flight surgeon with his advanced ideas of what the hazards of flying were, and how they might be overcome, had a most difficult climb to his present pre-eminent position. It

was a slow and tedious process and, at times, almost an impossible one to indoctrinate flying men as to the medical and psychological aspects of flying. To many a commanding officer of a flying station or squadron the flight surgeon was anathema and many were the imprecations that were called down on his head. He was considered by many to be a "necessary evil" and a "thorn in the flesh" by reason of those things for which he stood. As late as 1939 the chief of the Army Air Force expressed doubts "as to the justifying of the existence of flight surgeons." Nevertheless, the flight surgeon proved himself and has made himself an indispensable member of each Air Force command.

Man is a terrestrial animal and nature never intended that he fly. Man, being an earth-bound creature and not designed for flying, flies only as an adaptive function, albeit successfully. His flying, however, having become a fact, made certain adaptations to environmental changes necessary.

This necessitated research that was of a widening and continuing nature. The flight surgeon, faced with a new problem of adaptation, set about to provide a solution that would either change the environment or develop an item of equipment so that the flyer might overcome the difficulty.

This experimental work had its beginning during World War I and in 1920 it was the privilege of the speaker to be tested in the first altitude chamber at the School for Flight Surgeons at Mitchell Field, Long Island. This instrument was the progenitor of the outstanding elaborate altitude chambers now in current use in the testing of all flying personnel and those who would venture into space.

The facilities to do comprehensive research even though much needed, were not at hand in the lean years of the Army Air Service in the 1930's. A laboratory that did much pioneering in the problems of relatively early aviation was developed at Wright Field, Dayton, Ohio. This laboratory laid the groundwork for the concept of aeromedical research. It had for its purpose the development of equipment that

would permit the flyer to surmount the vicissitudes with which he was faced in an inimical environment.

The School of Aerospace Medicine, on the other hand, studied the individual's physical and emotional make-up in an attempt to choose those most fitted for aeronautics. Together these two activities attempted to select those best suited by make-up and adaptation to fly the ever-developing and more intricately machined airplanes.

All of us who were designated as flight surgeons were commissioned in the Medical Corps of the Army under the jurisdiction of the Surgeon General of the Army. The activities were headed by a medical officer on the staff of the Chief of the Army Air Force called the Chief of the Medical Division (later it was called the Medical Section). It was not until the Air Surgeon's Office was established by General H. H. Arnold, following a War Department directive, and headed by the then Colonel David N. W. Grant on October 31, 1941, that aviation medicine began to come into its own.

There was no clear-cut policy concerning the role of the Medical Service until the spring of 1942 when the Air Surgeon became directly responsible to the Army Air Force Commanding General. In spite of this, great strides were immediately made, against many odds, as a result of the war clouds that were gathering.

The early return of ill or injured air crew members from hospital to duty at their proper stations was a serious problem due to mounting war casualties. A long drawn-out disagreement between the Surgeon General of the Army and the Air Surgeon concerning this matter resulted. It was not well understood by non-Air Force medical officers that there were special problems to be considered in the care and treatment of flying personnel. In the spring of 1943 Lt. General "Jimmy" Doolittle, in the North African Theatre, expressed to me that Air Force hospitalization of its own personnel was essential because of the intimate personal contact flight surgeons had with their air crews.

This contact was necessary to keep flyers in the air.

In 1944 the matter was finally resolved and a great step forward was made. Certain difficulties that had been subjects of controversy throughout the war period until that time were at least partially solved.

While the hospitalization problem consumed much time and energy of the Air Surgeon and his staff, he retained sufficient energy and fortitude to direct other activities in his office and in the field with untiring effort. Marked advances were made in many fields of endeavor. The type and complexity of the problems of air crews mounted steadily and the flight surgeon was put on his mettle.

To begin with, personnel were needed to examine and classify medically the ever-increasing number of cadet applicants. At first, these medical officers were procured through the Surgeon General of the Army. This did not prove entirely satisfactory. Later the Army Air Force instituted its own medical procurement program. This proved eminently successful and brought outstanding doctors of all categories to our service.

Since aviation medicine had long been classified as a specialized branch of medicine, it was necessary for those oncoming flight surgeons to be given the necessary indoctrination.

Great advances were made at the School of Aerospace Medicine, not only in its ability to handle and train vastly increasing numbers of applicants, but also in the scope of its didactic instruction. The School, since its inception, has dealt primarily with the "care and treatment of flying personnel" and throughout its existence has stressed these matters. In 1942, with the increase of altitudes at which airplanes flew, a course of aviation physiology was instituted. This course envisioned even greater altitudes than were then being flown, and in this respect anticipated heights bordering on the lower fringes of space.

At about the same time the School assumed the responsibility for a special course of instruction for unit oxygen officers, previously con-

ducted by the Aero Medical Research Laboratory at Wright Field. This, while not entirely adequate for various reasons, nevertheless indicated the necessity for such indoctrination of all who flew to altitude. This training was implemented at three large units of the Army Air Force and at seven flexible gunnery schools.

There were many other aspects of the care and treatment of the flyer that were carried out during the war period.

Since that time the development of the School of Aerospace Medicine has undergone a marked metamorphosis in keeping with developments in flying. It has assumed, in stride, all the physiological and psychological problems having to do with astronautics. This is indicated by the new school designation, the "United States Air Force Aerospace Medical Center (Air Training Command)."^{*} While higher levels of technical training were envisioned in the late war period, it was not possible to institute them because of the lack of trained personnel, a deficiency in knowledge of the full extent of the problems involved and inadequate equipment.

Such trained personnel and adequate equipment are now available, and the School, making use of the extensive and outstanding facilities of college and university physiological laboratories, is able to bring to the flight surgeon knowledge that will permit him to evaluate the problems with which he is faced in this advanced astronautical era.

Little has been said of the Aero Medical Laboratory; however, this is not to depreciate, in the least, the outstanding work done by this installation from its inception to the present. This laboratory was not a teaching unit *per se*, nevertheless the results of its magnificent work are embodied in the curricula to which a flight surgeon is subjected. The work of the Aero Medical Laboratory dealt mainly with the problems of materiel, problems arising from and related to aircraft, the solution of medical problems arising from and related to engineering and,

^{*}Since presentation of this paper the Aerospace Medical Center has become part of the Sixth Division of the Air Force Systems Command.

all importantly, the effect of flight on man. In all years of its existence the Aero Medical Laboratory has stood in the forefront of those attempting to adapt the environment of the flyer to his vicissitudes, especially in these latter years.

The laboratory's contributions in connection with oxygen masks, high altitude studies, pressure breathing, anthropometric studies, thermal studies, acceleration, pressure suit development and numerous other projects were and are outstanding and assist greatly in permitting the flight surgeon to understand the problems of present-day flying, even to the supersonic stage in speed, the edges of space in altitude, and beyond.

There are many other facets of aviation medicine, Naval and civilian, that have been developed through the years. In the training of

flight surgeons attempts were made to project the problems that are pressing for solution in this age of aerospace medicine.

In my presidential address to the Aero Medical Association in 1946, I said:

"We are at present on the the threshold of a new world. There is none of us who can envision the possibilities of aviation medicine in the future with the progress of aviation and the complete linkage of medicine with aviation. Aviation cannot progress without the medical man. He is absolutely necessary, and, as I have said time without number, aviation and medicine are wedded and can never be divorced. This is an intriguing, stimulating and challenging problem with which we are faced. Each one of you has a definite responsibility in these matters."

These words have proved to be prophetic and may, with added impetus, be applied to the flight surgeon in his operational approach to aerospace medicine.

Liver Damage Effect on Hypertension

Carbon tetrachloride (CCl_4) intoxication lowers blood pressure elevated by administration of deoxycorticosterone acetate (DCA) to rats. Liver damage need be only slight—moderate to intense fatty metamorphosis—to cause pressure reduction.

Hypertension was produced in 18 rats by subcutaneous implantation of wax pellets containing 20 mg. of DCA. Pellets were almost completely absorbed within three months. Provision of excess sodium was not required to maintain hypertension. Except for 2 animals left hypertensive for six months, rats were given 0.15 cc. per kilogram of body weight of CCl_4 by injection twice weekly after blood pressure of more than 170 mm. Hg had been maintained

for at least two months. The intoxicant was discontinued when blood pressure remained at 120 to 140 mm. Hg for one month, then re-instituted at weekly intervals when hypertension returned.

Blood pressure fell about 49 mm. Hg during the first, and 46 mm. Hg during the second, period of CCl_4 treatment. Injection of CCl_4 in animals hypertensive for six months had a similar normotensive effect. Most animals had increased serum globulin values during CCl_4 treatment.—H. F. LOYKE, M.D., and J. S. MACKRELL, M.D., St. Vincent Charity Hospital, Cleveland, J. *Lab. & Clin. Med.* 58:871-875, 1961. Abstracted in *Modern Medicine*, March 5, 1962.