HISTORICAL CONTEXT, ANTHROPOMETRIC AND CARDIOVASCULAR DATA

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Thank you, Dr. White. This is a rare opportunity to exhibit our study of aging and we appreciate this opportunity that you gentlemen are affording us. Parenthetically, I would like to add something which Dr. White did not mention, and would not emphasize - that one of the advantages of working at the Lovelace Foundation is the fact that you can do research without having it directed "from on high". His gracious "hands off" attitude has been one of the things that I personally have appreciated and I suspect that, in his wisdom, he gets more work out of us this way.

We are particularly happy to have you here because we would much rather tell you what we are doing ourselves than have you read about it in some lay publication. I do believe that we have to tell you what we are doing here directly, first-hand, not second or third hand, and this is our purpose today. We are going to present our data to you in the various disciplines that we cover in our Study of Physiologic and Psychologic Aging in Aviators. These are anthropometric, cardiovascular, psychologic and pulmonary function. The investigators primarily interested in these areas will present their own data to you.

The project that we are going to discuss originally grew from what has been called an arbitrary decision by the former Federal Aviation Agency administrator, General Quesada. It was an administrative decision to stop airline pilots from flying scheduled airline flights at the age of 60. General Quesada consulted with the experts in a variety of fields. He

consulted with Dr. Mohler, who at that time was a gerontologist working at the National Institutes of Health. The F. A. A. administrator had worked with General Schwichtenberg, as a representative of the Lovelace Foundation. He had consulted with other experts but got no unanimity of opinion, so Dr. Schwichtenberg tells me, and he finally decided it was going to be age 60. He knew that he was "damned if he did" and "damned if he didn't" but he had to establish some sort of policy. Dr. Randy Lovelace and Dr. A. H. Schwichtenberg suggested that rather than use a chronologic age as a cut-off for flying, that a physiologic age might be determined. The Federal Aviation Agency at this time awarded money for a feasibility study to the Department of Aerospace Medicine, in particular to Dr. Schwichtenberg, to see whether he could determine physiologic age. This was 1959-1960. Dr. Schwichtenberg has had a peculiar talent for finding effective people. At that particular juncture he had Dr.Hillard Estes, and he asked him if he would participate in this feasibility study. Don Estes, as you all know, later became the acting Civil Air Surgeon. Dr. Estes went to a variety of labs in this country and in Europe. About half-way through the study the Federal Aviation Agency decided that, since he was working form them through the Lovelace Foundation, they would rather have him work for them directly. Dr. Estes left the Lovelace Foundation to work for the Federal Aviation Agency, and I believe that he was instrumental in setting up the Civil Aeromedical Research Institute in Norman, Oklahoma. At any rate the feasibility study was completed at the Lovelace Foundation by myself. I was on loan from the Lovelace Clinic where I worked as an internist since 1957. On the basis of this feasibility study the F. A. A. believed that it would start its own study of physiologic aging

in cooperation with Georgetown University and under the leadership of Dr. Arthur Wentz.

In 1961 the National Institutes of Health awarded us a substantial grant for a three year period. This grant was awarded on the basis of the feasibility study made for the F. A. A., as well as on the excellence of research already done by Dr. Ulrich Luft in this study of physiologic aging, pulmonary function, exercise tolerance, and fat-free weight. In 1964 this grant was renewed for a five year period. To date the Institute of Child Health and Human Development has generously awarded us some 1.2 million dollars. These funds have enabled us to develop our cross-sectional study into a longitudinal study of physiologic and psychologic aging.

Although aviation medicine provided the initial motivation for this research, the orientation of this study is gerontologic. We are studying aging. We do this by measuring the loss of function in an unusually healthy, normal population. Our particular reason for studying professional aviators is not to determine how well they might fly a Boeing 707 or 747. We study them because we believe them to be a physically and mentally effective group of people.

Historically, professional pilots are unusually free of disease. If they had had rheumatic fever, they would not be flying. If they had tuberculosis, they would not be flying. Their present health records are equally clean. They get regular yearly physical examinations. If they develop any serious illness such as hypertension, diabetes mellitus, or rheumatoid arthritis, this would be noted by the A. M. E., and F. A. A. regulations would ground this commercial pilot.

In addition to this past and present history of basic good health, these professionals must be both intelligent and well-coordinated. Dr. Szafran noted a mean IQ of around 120. In order to land 100 tons of loaded 707 repeatedly on a piece of concrete, they must be well coordinated. This latter aspect of consistently good function is a biologically selective, self-screening system. If they don't function well, they don't survive!

In summary, we have here a group of active, well-motivated volunteer subjects with past and present histories of good, normal health, who consistently perform well and who have continued to perform well. Such a group provides us with an unusually fine opportunity to study the losses of function that we integrate into a definition of "aging".

As an historical aside, it is of interest to note why such longitudinal studies of aging have become feasible only in the past 20 years. Until that time, infectious disease was the major threat to human survival. Since 1950, this significant variable has been practically eliminated. Public health measures instituted at the turn of the century in this country have all but wiped out typhoid fever and endemic malaria. Tuberculous patients were segregated from the general population. The sulfa drugs developed in Germany in the late 1930's were the first chemicals to limit the ravages of meningococcol epidemics. The mass production of penicillin during World War II easily replaced arsenicals in the treatment of syphilis and minimally efficacious anti-serum in the treatment of pneumococcal pneumonia. Fatal tococcal diseases such as erysipelis and scarlet fever became rarities. Waxman's discovery of streptomycin in the late 1940's and the development of nicotinic acid derivatives have eliminated tuberculosis as the "white plague" in the United States.

The arrival of a host of "broad spectrum" antibiotics in the 1950's finally provided a health base on which a longitudinal study of aging could be built. For the first time in the history of man, a selected population could be studied without the fear of losing a substantial number of these subjects to incapacity or death from infectious disease.

The largest variable to remain for our population of aviators was trauma and accident. We hoped that the consistently good professional performance of these subjects reflected a lack of degenerative disease. This assumption was, at best, an educated guess in 1959. In 1966, data on the incidence of myocardial infarction in airline pilots and in three equivalent "normal" populations was published in the Journal of Aerospace Medicine. These data tended to confirm our presumptive intuition that there would be a low incidence of coronary artery disease in this professional group. If we could see our first slide please.

INCIDENCE OF MYOCARDIAL INFARCTION (Cases/Year/1000)

Age	Airline Pilots	U.S.A.F. Pilots	Framingham	Industrial
30-34	0.44	0.18	1.29	0.37
35-39	0.66	0.88	2.06	1.65
40-44	1.44	1.34	3.11	2.00
45-49	1.25	1.68	5.40	6.07
50-54	2.87	4.19	4.80	8.27
55-59	6.12	13.13	10.65	11.16
60-64	-	-	-	7.82

These data on myocardial infarction in airline pilots are in essence after the fact.* News releases about our study have stated that our pilots have a lower incidence of coronary artery disease. I have not yet answered your letter, Dr. Carter, and I apologize for my tardiness. However, I will take this opportunity to answer your question about the source of my information on myocardial infarction in aviators. The data in this slide includes populations of airline pilots, United States Air Force pilots, males in Framingham,

*Otis B. Schreuder, M. D. and the Medical Committee of the Air Transport Association of America, Washington D. C. in Aerospace Medicine v. 37, No. 4, Sect. II, April, 1966, pp. 33-34. Slide compiled from Tables vii-x. Airline pilot incidence of CHD and myocardial infarction is from the Medical Committee, Air Transport Association of America.

Massachusetts, and working males in industry. We note an incidence of 6.12 myocardial infarctions per year per 1,000 airline pilots age 55-59 years. The incidence for an equivalent population of U. S. Air Force pilots is more than double that. The male population of Framingham has an infarction rate that is 1.74 times that of airline pilots, while the rate for male industrial workers is reported to be 1.82 times that of private, professional aviators. In addition, it becomes apparent from these data that airline pilots appear to be 10 years younger, in terms of clinical evidence of coronary occlusive disease, than apparently equivalent groups of males in the Air Force, in Framingham, and in other industries. These latter groups of males have, at ages 45-49, an incidence of myocardial infarction that is achieved ten years later by the group of actively flying, airline pilots. This trend is apparent by the fourth decade.

Question: What is the source of these statistics?

Answer: It was prepared by the Medical Committee of the Air Transport Association of America, or something of the sort, it appeared in Aerospace Medicine in 1966 and I will get the reference for you.

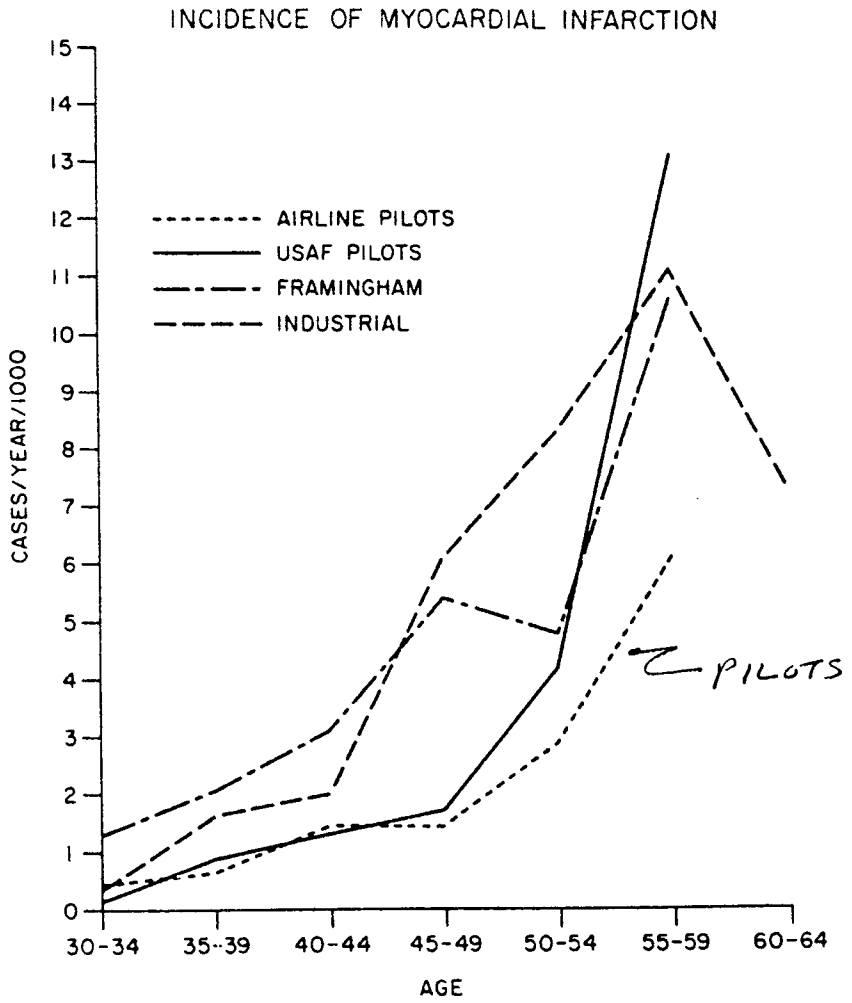
Question: I believe that this data was included in something Dr. Bremeir published, I am really not sure about that.

Question: I believe that there is some literature in the A. P. A.

Dr. Siegel: I would like to comment now that I don't think we know what the incidence of myocardial infarction is among airline pilots.

Dr. Proper: I believe that in the same context we could say that we really don't know what it is in Air Force pilots or industrial workers either, actually. But I think this depends on various techniques. The biostatisticians may want

to challenge us. At any rate, these are the published statistics that we have which suggest, as statistics suggest, that the incidence of myocardial infarction is less in our population group than in three other population groups. I am not prepared to defend any of these studies myself. They are published data, but they are not our data and only a reference point essentially. The next slide, please.



This slide shows the same thing in a more linear fashion. We see that our airline pilots from 50 - 59 seem to be having a lower incidence of myocardial infarction than in the other three groups which are presented.