DOT/FAA/AM-95/5

Office of Aviation Medicine
Washington, D.C. 20591

A Longevity and Survival Analysis for a Cohort of Retired Airline Pilots

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February 1995

Final Report

This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.

U.S. Department of Transportation

Federal Aviation Administration

NOTICE

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT/FAA/AM-95/5		

4. Title and Subtitle	5. Report Date
A Longevity and Survival Analysis for a Cohort of Retired Airline Pilots	February 1995
	6. Performing Organization Code
7. Author(s) R.O. Besco, Professional Performance Improvement, Inc., Dallas, TX; S.P. Sangal, Wright State University School of Aerospace Medicine, Dayton, OH; and T.E. Nesthus and S.J. H. Veronneau, Civil Aeromedical Institute	8. Performing Organization Report No.
9. Performing Organization Name and Address Civil Aeromedical Institute P.O. Box 25082 Oklahoma City, Oklahoma 73125	10. Work Unit No. (TRAIS) 11. Contract or Grant No.
12. Sponsoring Agency name and Address Office of Aviation Medicine Federal Aviation Administration 800 Independence Ave., S.W. Washington, DC 20591	13. Type of Report and Period Covered 14. Sponsoring Agency Code

15. Supplemental Notes

16. Abstract

There is a popular belief in the aviation industry that retired pilots die at a younger age than the general population. If this belief is in fact, correct, research into the factors or events precipitating an early mortality among retired airline crew members could be of interest to the FAA. Few studies have addressed the question "Do retired airline pilots die at a younger age than their 60 year-old counterparts in the U.S. population?" Airline pilots reach the mandatory retirement age of 60 after an entire career of active health monitoring and maintenance required by the Federal Aviation Administration (FAA). In this study, a preliminary survey was made to determine the mortality and survival profile of retired pilots from a major U.S. airline. An initial sample of 2209 retired pilots and flight engineers was surveyed. Early and late retirees were dropped from the sample, leaving us with 1494 pilots who retired at age 60 between the study dates of April 1968 to July 1993. The Life Table Method was identified as the most suitable approach to analyze the pattern of mortality for this data set. Life Table analysis provides estimates of probabilities of surviving a given number of years after retirement. This technique allows subjects to enter (i.e., retire at age 60) or leave the study (i.e., die) at different points in time and it utilizes all the data on partial exposure to the risk of dying. It is non-parametric and requires no assumptions about the distribution of the survival function. Due to the anonymity of our sampling and other resultant assumptions, comparisons were made with the 1980 census of the U.S. general population of 60 year-old white males. A difference in life expectancy of more than 5 years longer was found for our sample of retired airline cockpit crew members. Half of the pilots in this sample retiring at age 60 were expected to live past 83.8 years of age, compared to 77.4 years for the general population of 60 year-old white males in 1980. The authors concluded that the question of lowered life expectancy for airline cockpit crews was not supported by the results of this particular data set.

17. Key Words	18. Distribution Statement
Pilots Longevity Survival Probability Life Table Method Cohort Analysis	Document is available to the public through the National Technical Information Service, Springfield, Virginia, 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	15	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

ACKNOWLEDGMENTS

The authors wish to acknowledge the cooperation of the following individuals at American Airlines: The late Captain Bill James, Vice President of Flight; Dr. Jeff Davis, Corporate Medical Director; Gayla Coffelt, Manager, Life, Health and Disability Plan Administration; and Bobbie Rystad, Life and Disability Administrator.

We are also grateful for the contributions of the following individuals at the Allied Pilots Association: Captain Brian Mayhew, Special Projects Director; and Mike Knoerr, Benefits Manager.

We also give a special thanks to Captain Jack Webb (AAL, Ret.), Secretary of the Grey Eagles.

Much gratitude is felt for the support and guidance of the professional staff members of The Civil Aeromedical Institute of the Federal Aviation Administration and particularly, Dr. Robert E. Blanchard, Manager, Human Factors Research Laboratory.

A LONGEVITY AND SURVIVAL ANALYSIS FOR A COHORT OF RETIRED AIRLINE PILOTS

INTRODUCTION

A question that has been discussed, pondered, and argued for years in the cockpits, briefing rooms, negotiating tables, and watering holes of commercial aviation is "What is the life expectancy of the typical retired airline pilot?" The conventional, operational wisdom has pointed to those incidents where retired airline pilots were in excellent health and physical condition and yet, died in the first few years, and even a few months after retirement. Every airline pilot can recount several personal anecdotes of colleagues who died very soon after the mandatory retirement age of 60. Some people believe that factors associated with this career may have precipitating effects on mortality.

Professional airline pilots should be in far better health at all ages than the general population. Every six months, airline pilots must pass a Class One Flight Physical, which is defined and required by the Federal Aviation Administration (FAA). Airline pilots reach age 60 (their mandatory-retirement date) after an entire career of active health monitoring and maintenance. Some people conclude that the life expectancy of a 60 year-old retired airline pilot should be considerably longer than the counterpart 60 year-old from the general population due to the continual medical scrutiny, early detection and treatment of disorders, and the selection out of those with serious pathology. However, the "flight line talk" of the aviation industry contends that pilots die at a younger age than the general population. Each time an airline pilot dies in the first few years after retirement, the hypothesis of the airline pilots' premature death is reborn and reinforced in the minds of the observers.

The underlying questions of a lowered life expectancy hypothesis are believed to be concerned with the effects of those factors to which airline pilots may have had excessive exposure. Several authors have pointed out physical and emotional stressors that may have a negative effect on the health and well-being of airline pilots (Besco and Smith, 1990; Mohler and Mohler, 1992; Mohler, 1993; Morgan, 1992; Reinhart, 1988). In no particular order, some of the most frequently discussed of these factors are:

1. Fatigue;
2. Cosmic radiation and electromagnetic field effects;
3. Circadian dysrhythmia;
4. Sound and vibration exposure;
5. Lowered humidity, ambient pressure and mild hypoxia;
6. Potential air quality contaminants;
7. Questionable nutrition;
8. Responsibility for passenger safety and survival;
9. Loss of career threat from corporate failure/ confrontational labor relations;
10. Anxiety of disqualification through professional errors;
11. Concerns of losing medical certification from occupational or other accidents, disease and aging.

If an early mortality trend is in fact, real, research into some or all of the factors listed above could be initiated to investigate their precipitating potential. Epidemiological investigation could also provide critical information concerning such trends as compared with a matching sample of the general population. Results of such analyses would be of interest to the FAA as indicators of possible health factors to be monitored in the pilot population. However, because of the requirement for complete anonymity in the present, preliminary study, that level of analysis could not be performed. This study is limited, therefore, to assessing the overall question of differential mortality for retired airline pilots. Future studies, should the results from this study indicate they are warranted, could explore the reasons for any differential effect noted.

PREVIOUS RESEARCH

The authors could find little research that would adequately address the question: "Do retired airline pilots die younger or live longer than the general population?" One article attempted to use statistical and actuarial data to address the retired pilot longevity question. In that report, Muhanna and Shakallis (1992) postulated that retired airline pilots have a lowered life expectancy when compared to the general population. The validity of their reported conclusions could not be determined due to incomplete descriptions of their research methodology, sampling techniques, and data analysis. We found that the authors assessed retired pilot mortality in a manner that does not account for the changing nature of the sample, i.e., taking into consideration all of the individuals who enter (i.e., retire) and leave (i.e., die or enter late in the study and leave at the close of the study, alive) during each year of the study period (i.e., designed as a cohort study). Also, their rates were expressed as percentages which presented the mortality data in an interesting manner, however, we felt it was an inappropriate method for analysis of realistic trends. In fact, all of their data were presented as percentages. No actual sample sizes were reported nor were any survival statistics.

Morgan (1992) assumed the Muhanna and Shakallis conclusions were valid. Their results prompted Morgan's discussion of recent changes in the professional aviators' environment that could explain some of the reputed shortened life expectancy. He pointed out many significant factors in the list cited above which might add life shortening stress to the professional airline pilot.

Kaji, Asukata, Tajima, Yamamoto and Hokari (1993) found that the mortality rate from natural causes was lower in active Japanese airline pilots than in the general Japanese population. Of their sample of 2327 pilots, 191 had retired. They found that only 16 of the 191 retired pilots had died. Kaji, et al., concluded that the improved health standard of the airline pilots explained their lower mortality and higher life expectancies. However, they did not have a large enough sample of retired pilots to determine reliable estimates of differences in post retirement life expectancy between pilots and the general population.

Irvine and Davies (1992) conducted a proportional mortality study of active and retired British Airways pilots. Irvine and Davies reported the conclusions of the actuaries to the British Airways Pension Schemes in an unpublished study for the period July 1986 to March 1989. Their emphasis primarily concerned causes of death, but they quoted the actuaries as reporting ***an increase in "life expectancy of about 5 years better than other reference pensioners."*** No sample size, sampling plan, or analytical methods were reported for the undocumented actuarial study. In their study, Irvine and Davies did not report any survival data for retired pilots in their conclusions.

Salisbury, Band, Threlfall, and Gallagher (1991) conducted an epidemiological study of deceased British Columbia pilots. They reported an elevated Proportional Cancer Mortality Ratio (PCMR) for airline pilots. Band, Spinelli, Ng, Math, Moody, and Gallagher (1990) conducted a study on causes of death in 891 Canadian Pacific Airlines pilots. They reported elevated PCMRs for the pilots in their sample. Hoiberg and Blood (1983) in a study of age-specific morbidity concluded that Navy pilots are in much better health than the normal population. The oldest pilots in their study were under 54 years of age. None of these authors studied survival patterns of retired pilots.

As part of the on-going research program on the question of mandatory retirement at age 60 for airline pilots, the FAA's Civil Aeromedical Institute has been investigating the relationship of age and performance in airline pilots. Hyland, Kay, Deimler, and Gurman (1992) conducted an extensive literature review on the subject. They did not specifically address the question of retired airline pilots longevity. Nor did they investigate the potential effects of a career-long exposure to the unique factors associated with a pilot's profession.

OBJECTIVES

This study was proposed as a preliminary investigation of the distribution of age at death of retired airline pilots and to investigate a large enough sample of retired pilots to provide reliable and valid estimates of post retirement survival. Survival patterns of retired airline pilots have a far-reaching impact on pilot's careers, life insurance and retirement benefits (Mayhew, 1992; Muhanna and Shakallis, 1992; and U. S. Congress, 1990). Survival patterns of retired air crew may also provide evidence that could lead to more research and epidemiological investigation of factors of unknown importance, associated with the conduct of a pilot's profession. The authors also felt that the question should be addressed specifically to provide the aviation community with scientific evidence, supporting or refuting the premature mortality hypothesis and hopefully to clear a way for the sharing of critical information contained in such data bases.

In our preliminary survey, no attempt was made to determine cause of death. This was agreed upon in order to preserve anonymity of our sample and secure the cooperation of the airline providing the data. Therefore, no attempt was made to conduct any epidemiological investigations of such variables as smoking, diet, exercise, family history, current health status, or cause of death. Dates in the corporate records were assumed to be accurate since the dates of hire, birth, retirement, and death are critical for salary, seniority level, and pension benefits for all air crew members.

METHODS

Cooperation from American Airlines (AAL), the Allied Pilots Association, and the Grey Eagles (retired AAL pilots) was received. The study was based on the receipt of data for 2209 pilots and flight engineers who had retired from active service with American Airlines during the 25 years between April 1968 and July 1993. The records of our sample were kept on a computerized data base. Each flight crew member was identified by birth date, date of hire, date of retirement, and date of death. No employee identification such as social security, employee, or FAA certificate numbers were provided for the study. The records of an estimated 250 additional pilots who had retired before April 1968 were recorded on a micro fiche data base, but the economics of retrieving these data prevented these pilots from being included in this survey.

Throughout the period in which the pilots in this sample were employed, American Airlines maintained stringent medical screening and high health standards, even at the initial hiring. American Airlines required an annual company flight physical **in addition to** the FAA flight physical. If there is any bias in the sample, it should be in the direction of better health and increased longevity of the entire population of AAL pilots compared to the general population.

Since both pilots and flight engineers have the same kind of exposure, in terms of working environment and flying hours, it could be argued that they should be treated as one population for the purposes of a study such as this one. However, since the flight engineers were not required to pass a Class I Flight Physical and they are not required to retire at age 60, it was decided to treat them as a separate population from the 60 year-old pilot retirees.

Some of the pilots and flight engineers retired as early as age 50. The information on the reasons for early retirements was not available. Since it was observed that many pilots retired early because of medical disqualification, the early retirees were not included in our sample of 60 year-old retirees. This group could potentially provide information concerning early incidence of the effects of career-related disability or mortality, but, for our purposes in this study, they were excluded from the sample. Hence, of the 2209 retirees, 360 had retired before age 60 and 355 stayed with the airline in another presumed capacity and retired after their 60th birthday. With the early and late retirees parsed out of the sample, 1494 pilots retiring at age 60 remained for analysis.

All the pilots in our sample retired at age 60 and in different calendar years. The survival status of each pilot was known at the close of the study in July 1993. The sample was still maturing at the cutoff date of the study, because 1298 pilots were still living. Thus, each pilot was in the study for a different length of time, starting at their date of retirement.

One popular and practical technique for describing survival experience over time is the actuarial or life table method. Described by some authors in detail (Griswold, Wilder, Cutler, and Pollack, 1955; Pearl, 1923), Cutler and Ederer (1958) described one very important advantage of the life table method, which is why we felt the technique was the most suitable approach to analyze the pattern of mortality for this data set. Specifically, this technique utilizes all survival information and data on partial exposure to the risk of dying to provide the best estimates of survival. It allows subjects to enter (i.e., retire) or leave the study (i.e., die or enter late and leave at the close of the study alive) at different points of time during the 25 years of the study. Also, the life table approach is non-parametric and requires no assumptions about the distribution of the survival function.

The Life Table analysis provides estimates of probabilities of surviving a given number of years after retirement and emphasizes the advantage gained by including survival information on individuals entering the series too late to have had the opportunity to survive the extent of the 25 year study. In addition, it estimates median residual lifetime or median remaining life expectancy for each year after retirement. This method indicates that, among those pilots who survive a given number of years past retirement, half of the survivors will die before the median life expectancy is reached and half will live beyond this median residual lifetime age.

RESULTS

Figure 1 contains the distribution of new retirees for each year in the 25-year study period. All 2209 retirees are represented in this figure. Early in the surveyed years, the annual number of retirees was much lower than in the later years of the study. This increase merely reflects the growth of the airline after World War II. Across the 25-year study period, 360 pilots and flight engineers took early retirement and 355 flight engineers stayed on past age 60. Of the 360 early retirees, 85% (306) had survived until the end of the study period. Of the 355 flight engineers who retired after age 60, 90% (321) survived until the conclusion of the study. Of the 1494 age 60 retirees, 1298 (87%) survived throughout the study period.

The survival probability curves for the three retiree groups (early, age 60, and late) are shown in Figure 2.

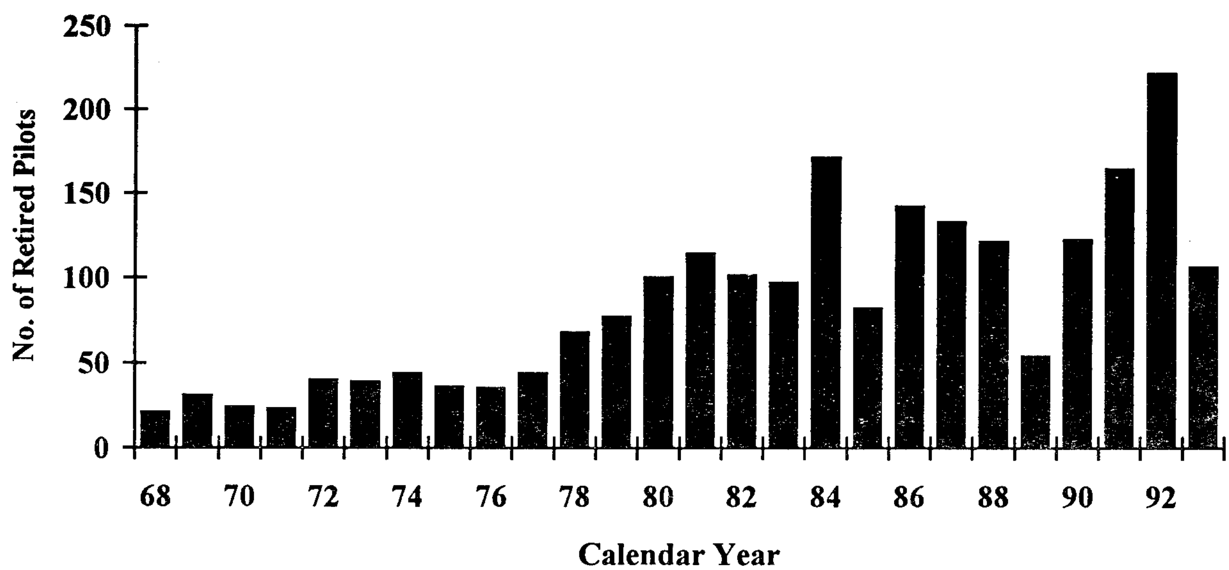

Figure 1: Distribution of pilots by retirement year.

There were no significant differences in the survival probability for the three groups. However, to maximize the generalizability of this sample, as stated in the methods section, it was decided to focus further comparisons on the pilots who retired at age 60. The analysis, Figures and Table that follow, involve only the sample of 1494 retired pilots.

Initially, the retired pilots were divided into two groups: those who retired through December 31, 1979, and those retiring from January 1980 to July 1993. This was done to determine if there were different mortality experiences among pilots who retired in the early years of the study period, versus those who retired in the later years. These two groups were established to examine the issue that longer exposure to high-altitude flying by pilots retiring in the second half of the study period could be related to survival patterns after retirement.

Figure 3 compares the survival distributions of pilots who retired during the first half of the study period, April 1968 to the end of December 1979, with the survival times of those pilots who retired in the last half, January 1980 to July 1993. Using the log-rank and the Wilcoxson test (Kalbleisch and Prentice, 1980), the difference between the above two survival functions was not significant. Since no significant difference was found between the survival patterns of these two retired pilot groups, the two samples were combined and analyzed as a single group (n=1494) of retired pilots.

Because our sample was anonymous, we could not verify the gender nor race of each retired pilot. It was also not possible to determine other factors, such as, socio-economic status, health consciousness, previous health-related histories, etc. of our sample. In view of the high estimated percentage of white males in this pilot sample and our preliminary approach to analyzing the data, the authors were required to make certain assumptions for comparisons with a sample of 60 year-olds from the general population. Hence, the survival rates of the pilots in our sample were compared with those from the U.S. life tables of 1980, 1985 and 1989 for 60 year-old white males (U.S. Department of Health and Human Services, 1984, 1988, and 1991).

The survival rates of retired pilots and that of the U.S. white male population for the years 1980, 1985, and 1989 were plotted. As seen in Figure 4, all three survival curves in 1980, 1985, and 1989 for 60 year-old U.S. white males were very close. There were no significant differences among the three years. The

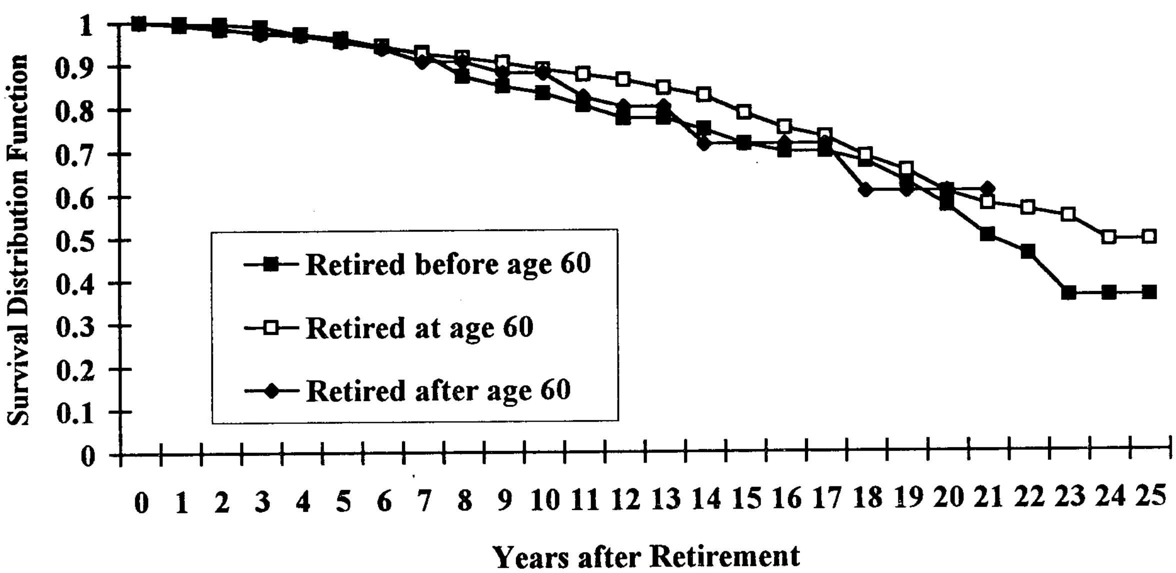

Figure 2: Comparison of survival distributions of three groups of pilots who retired at different ages.

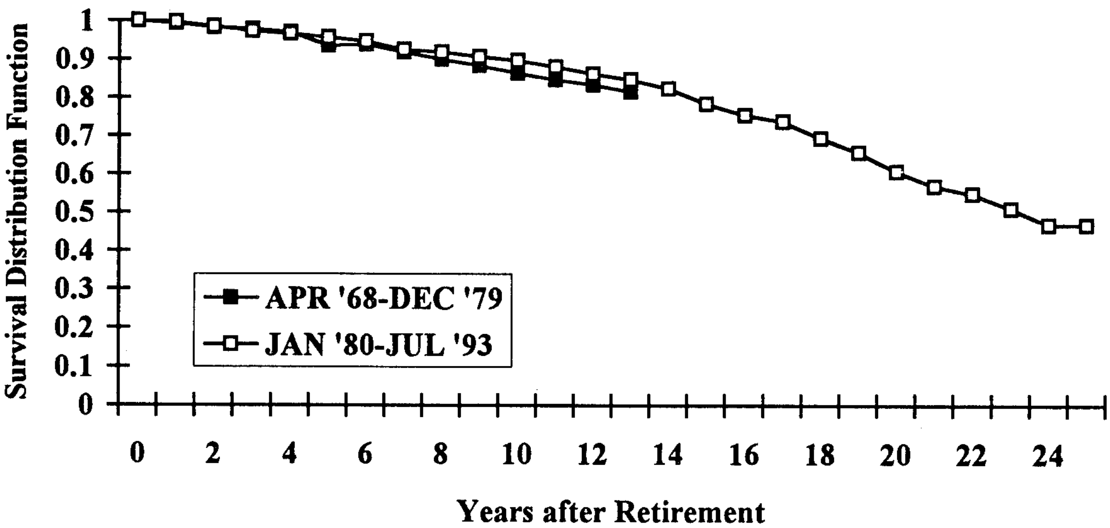

Figure 3: Survival distribution of pilots who retired during April 1968 - December 1979 and January 1980 - July 1993.

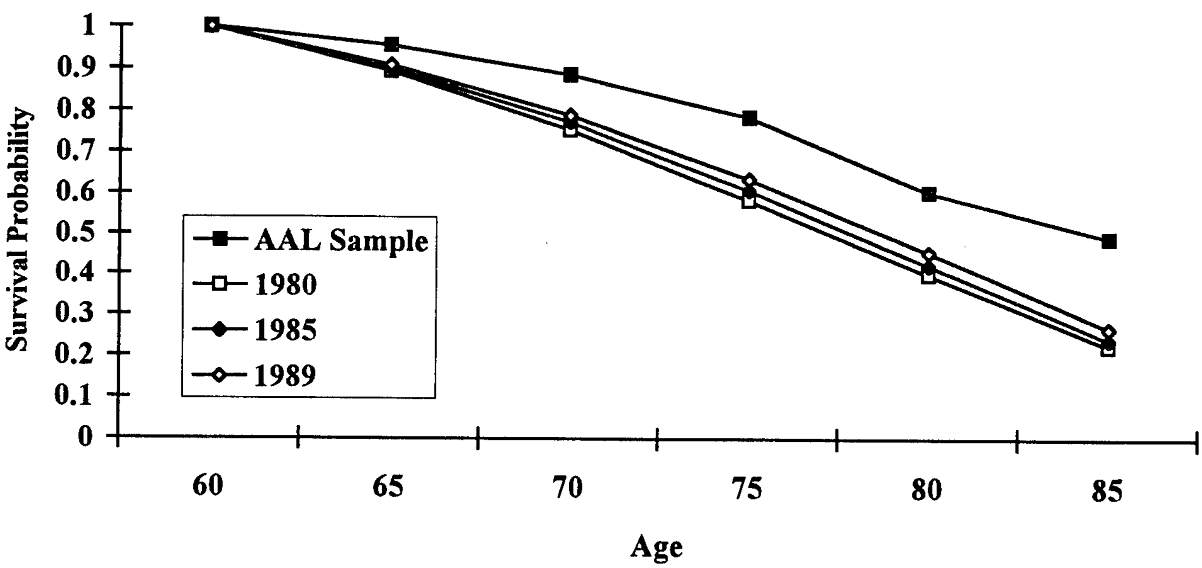

Figure 4: Comparison of survival probability of retired pilots (from April 1968 to July 1993) with 60-year-old U.S. white male population for 1980, 1985, and 1989.

Table 1. Combined Life Table and Survival Estimates of Pilots Retiring at Age 60 From April 1968 to July 1993

Years After Retirement Interval (1) x to x+1	Alive at Beginning of Interval (2) l_x	Died During Interval (3) d_x	Withdrawn Alive During Interval* (4) w_x	Effective Number Exposed to Risk of Dying (5) l_x	Proportion Dying (Col. 3÷ Col. 5) (6) q_x	Proportion Surviving (1-Col. 6) (7) p_x	Cumulative Proportion Surviving Interval (8) P_x	Survival Standard Error (9)	Median Residual Lifetime (MRL) (10)	MRL Standard Error (11)
0 – 1	1494	10	172	1408.0	0.0071	0.9929	0.9929	0.0022	23.812	0.25
1 – 2	1312	14	147	1238.5	0.0113	0.9887	0.9817	0.0037	22.979	0.28
2 – 3	1151	7	114	1094.0	0.0064	0.9936	0.9754	0.0043	21.986	0.28
3 – 4	1030	7	69	995.5	0.0070	0.9930	0.9685	0.0050	NA‡	NA
4 – 5	954	13	42	933.0	0.0139	0.9861	0.9550	0.0062	.	.
5 – 6	899	11	31	883.5	0.0125	0.9875	0.9431	0.0071	.	.
6 – 7	857	17	44	835.0	0.0204	0.9796	0.9239	0.0084	.	.
7 – 8	796	8	31	780.5	0.0102	0.9898	0.9145	0.0089	.	.
8 – 9	757	9	60	727.0	0.0124	0.9876	0.9032	0.0095	.	.
9 – 10	688	12	68	654.0	0.0183	0.9817	0.8866	0.0105	.	.
10 – 11	608	7	61	577.5	0.0121	0.9879	0.8758	0.0111	.	.
11 – 12	540	8	79	500.5	0.0160	0.9840	0.8618	0.0120	.	.
12 – 13	453	9	77	414.5	0.0217	0.9783	0.8431	0.0133	.	.
13 – 14	367	7	57	338.5	0.0207	0.9793	0.8257	0.0145	.	.
14 – 15	303	14	53	276.5	0.0506	0.9494	0.7839	0.0176	.	.
15 – 16	236	9	41	215.5	0.0418	0.9582	0.7511	0.0200	.	.
16 – 17	186	5	23	174.5	0.0287	0.9713	0.7296	0.0216	.	.
17 – 18	158	9	19	148.5	0.0606	0.9394	0.6854	0.0248	.	.
18 – 19	130	6	21	119.5	0.0502	0.9498	0.6510	0.0272	.	.
19 – 20	103	7	21	92.5	0.0757	0.9243	0.6017	0.0309	.	.
20 – 21	75	3	23	63.5	0.0472	0.9528	0.5733	0.0335	.	.
21 – 22	49	1	10	44.0	0.0227	0.9773	0.5603	0.0352	.	.
22 – 23	38	1	11	32.5	0.0308	0.9692	0.5430	0.0381	.	.
23 – 24	26	2	11	20.5	0.0976	0.9024	0.4901	0.0495	.	.
24 – 25	13	0	11	7.5	0.0000	1.0000	0.4901	0.0495	.	.
25 – 26	2	0	2	1.0	0.0000	1.0000	0.4901	0.0495	.	.

Notes: * Those individuals who were alive at the conclusion of the 25-year study, in July 1993.
‡ NA denotes data are not available.

year 1980 was chosen for subsequent comparisons with retired pilots because it occurred almost in the middle of the 25-year span during which this sample of pilots had retired.

Also shown in Figure 4 is the survival probability curve for the retired pilots in our sample compared to the three curves for the general population. The retired pilot group shows a much higher survival probability curve than does any of the other three curves displayed. It can also be seen in Figure 4, that by age 85, the probability of survival would be more than 49% for the retired pilot sample.

Table 1 contains the results of the Life Table Analysis for the 1494 retirement aged pilots (i.e., those who retired at age 60). An explanation of some entries in Table 1 might clarify and help in understanding the table:

Years After Retirement Interval Column (1) (x to x+1) i.e., 0–1 refers to the first year after retirement at age 60; 1–2, the second year, etc. Each interval is a cohort for the survival function.

Alive at Beginning of Interval Column (2) (l_x) is the number of cases that have survived to the beginning of the current interval. All 1494 were alive during their first year after retirement. Successive entries in this column are obtained by this formula: $(l_x+1) = l_x - (d_x + w_x)$.

Number Died Column (3) (d_x) gives the number of pilots who died during the interval. For example, ten pilots died during their first year after retirement. Fourteen during the second year, etc.

Withdrawn Alive During Interval Column (4) (w_x) refers to the pilots who were known to be alive at the close of the study, but were in the study for the maximum duration denoted by the upper limit of the interval. At the conclusion of the 25-year study period in July 1993, 172 surviving pilots had been retired for less than 1 year during the first interval. Thus, each cohort (in each year of 25-year study) contributes some information to our knowledge of survival during the interval.

Effective Sample Size Column (5). It is assumed that pilots lost or withdrawn from observation during an interval were exposed to the risk of dying, on the average, for one-half the interval. Thus, $l_x' = l_x - (w_x \div 2)$.

Proportion Dying During Interval Column (6). An estimate of the probability of dying during the interval. It is obtained by dividing the number of deaths by the effective number exposed to risk: $q_x = d_x \div l_x'$.

Proportion Surviving the Interval Column (7) is referred to, alternately as the probability of surviving the interval, or the survival rate. It is obtained by subtracting the proportion dying during the interval from unity: $p_x = 1 - q_x$.

Cumulative Proportion Surviving the Interval Column (8) is generally referred to as the cumulative survival rate, and gives the probability of a pilot surviving to the end of the specified yearly interval after retirement. Calculated by cumulatively multiplying the proportion surviving each interval: $P_x = p_1 \bullet p_2 \bullet p_3 \bullet \ldots p_x$. Table 1 indicates that the probability of a pilot surviving for 2 years after retirement is 0.98. For 20 and 25 years after retirement, survival probability is 0.60 and 0.49,

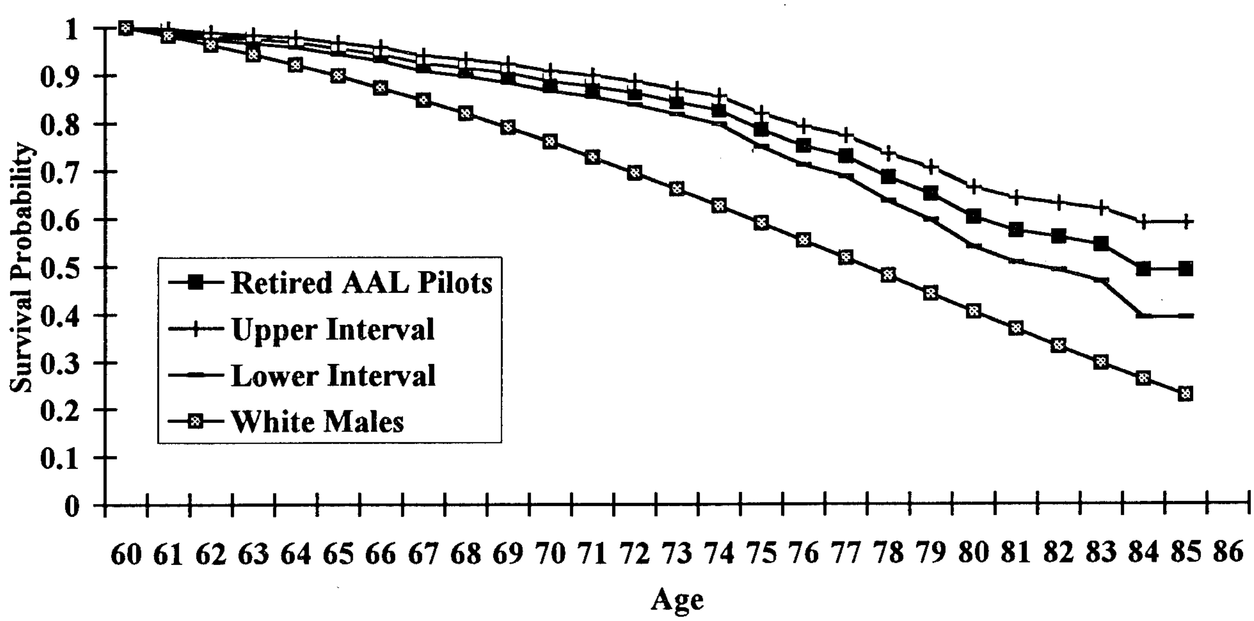

Figure 5: Survival probability curve of pilots retired during April 1968 to July 1993, and 95% confidence interval, compared to 60-year-old U.S. white males.

respectively. Figure 5 depicts this column with the 95% confidence interval derived from the standard error.

Survival Standard Error Column (9) provides a measure of confidence with which one may interpret the statistical results. Refer to Culter and Ederer, 1958 for the computational formula.

Median Residual Lifetime (MRL) Column (10) An estimate of the time point at which the value of the cumulative survival function is 0.50. That is, it is the time point by which half of the pilots retiring at age 60 are expected to have died. Table 1 shows that this point for our sample occurs during the 23-24 year interval. Linear interpolation is used to calculate the precise year value. So, half of our sample retiring at age 60 is expected to live 23.81 years beyond retirement age (after interpolation), i.e. to 83.81 years of age (60 + 23.81). For those surviving the first year after retirement a median life expectancy of 22.98 more years was shown, to an age of 83.98 years old. For those surviving two years after retirement, their median life expectancy was increased to 21.99 more years or to an age of 83.99 years old. MRLs for surviving beyond this point in our sample cannot be accurately estimated because an insufficient percentage of retirees had died to compute reliable estimates.

It can be seen in Figure 5 that in the 1980 U.S. white male population the survival probability curve is entirely below the lower 95% confidence limit for pilot survival. Therefore, the pilots in this sample live significantly longer than U.S. white males. The median survival age for the retired pilots in this sample is 83.8 years. For the 60 year-old U.S. white male, the median survival ages for the years 1980, 1985, and 1989 are 77.4, 78.1, and 79.0, respectively. In our sample, the retired pilots have more than a 5 year advantage of median life expectancy compared to the 60 year-old U.S. white male population.

DISCUSSION

The hypothesis of premature mortality among retired airline pilots compared to their counterparts in the general population was not supported by the data in this study. Retired pilots in this sample appeared to enjoy a life expectancy of more than 5 years longer than the 1980 U.S. general population of white males. However, before it can be concluded that this is true for ***all*** retired airline pilots, the adequacy of this sample to represent the population of retired airline pilots should be determined. This sample represents ***only one*** industry airline.

It could be argued that compared with other airline pilots, this sample may have been subjected to higher medical standards at the time of initial hiring and monitored more closely throughout their careers. It could be hypothesized that an even greater increase in life expectancy should have been realized, but was not because of the purported effects of the environmental and personal stress factors associated with this occupation. This would, however, require much more information than was provided in our sample of data.

A question concerning the adequacy of our general population sample could also be raised. Because our pilot sample was anonymous, we could not match personal characteristics (e.g., socio-economic status, education, health consciousness, family history or specific health attributes) that could be influential in promoting longevity, to the general population we sampled.

Questions such as these are recommended for investigation and that a follow-up or updated survey of AAL pilots be conducted on a regular basis to track changes in the median residual lifetime estimates of the surviving pilot population. As the age of this sample matures, more accurate life expectancies for each year following retirement will become available. If mortality dates in the survival distribution prove to be earlier than projected more precise epidemiological studies could be proposed to assess the relationships of the potential stress factors associated with this career.

A practical next step would be to conduct a more exhaustive survey of retired airline pilots with a sample that would be more representative of the entire population. World-wide, there is a very high number of pilots who have retired from major airlines. A follow-on study, which would obtain a larger sample of these pilots and contain data on causes of death and reasons for early retirement, would certainly yield information to verify and refine the results found in this study.

An anonymous and confidential program, which would utilize the data bases on air crew members in the current major U.S. airlines, should result in a sample of greater than 10,000 retired pilots. By calling on the data bases in all departments of the airlines (at least the flight, medical, personnel, and benefits departments) the data on health history, causes of death, and reasons for early retirements should be available. The data needed for this type of survey would not require personal identification or references, such as names, social security numbers, employee numbers, pilot's or drivers license numbers. A wealth of information from this type of survey could also yield a more definitive answer to the retired pilots' longevity question.

CONCLUSIONS

The hypothesis that retired airline pilots die at younger ages than their general population counterparts was not supported by this study. On the contrary, this study revealed a significantly longer life expectancy for this 25-year sample of retired pilots from American Airlines as compared to their 60 year-old counterparts in the 1980 U.S. general population census of 60 year-old white males. The airline pilots' median residual lifetime for this sample was greater than five years longer than their counterparts in the U.S. white male population. A more exhaustive survey of airline pilots including all of the major U.S. airlines and international airlines is recommended.

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☆U.S. GOVERNMENT PRINTING OFFICE: 1995 - 660-067/00080