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**Aviation Epidemiology Data Register:
Age-Specific Medical and Nonmedical Attrition Rates
Among Fort Rucker Civilian Aviators**

By

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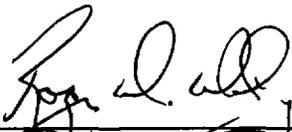
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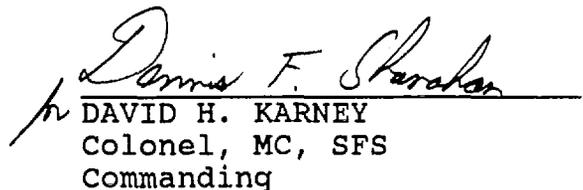


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<p>An epidemiological analysis of the coronary angiography outcomes of Fort Rucker civilian aviators could not be completed without first conducting an analysis of attrition from aviation service due to medical and nonmedical causes. Longitudinal data on flying duty medical examinations and aeromedical boards conducted on Fort Rucker area civilian aviators was reviewed using the U.S. Army Aviation Epidemiology Data Register (AEDR). The AEDR records of 847 Fort Rucker civilian aviators were reviewed over nine calendar years from 1985 to 1993. By the end of 1992, 528 (62.3 percent) remained in aviation service, 251 (29.6 percent) were lost to nonmedical attrition, and 68 (8.1 percent) were lost to medical attrition. Of the 847, 196 (23.14 percent) had operational military affiliation (dual-status service as civilians and reserve component aviators), while 651 (76.86 percent) did not. Controlling for age, there was a higher risk for nonmedical and medical attrition among those without operational military affiliation ($\chi^2_{[Mantel-Haenszel]}$, $p < 0.0001$). Medical attrition was uncommon up to 50 years of age. Cardiovascular disease accounted for three-fourths of the cases of medical attrition. Overall, there was a threefold higher rate of medical attrition among those without operational military affiliation.</p>			
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Introduction

In mid-1993, the Commander, U.S. Army Aeromedical Center, and the Chief of Staff, U.S. Army Aviation Center, Fort Rucker, Alabama, requested a review of the coronary angiography outcomes among Fort Rucker civilian aviators. During this review (Mason and Shannon, 1994), it was discovered there was a significant attrition of civilian aviators due to nonmedical causes, and this appeared to exceed the attrition due to medical causes. This finding was preliminary, and contradicted the belief that the Fort Rucker civilian aviator cohort was stable with attrition primarily due to medical reasons. This report analyzes their attrition from aviation service.

Method

The Aviation Epidemiology Data Register (AEDR) was queried for flying duty medical examinations (FDMEs) completed on all aviators with the rank and/or service component of "civilian" from 1 January 1985 through 1 March 1994. The first and last FDMEs completed while in civilian status in the Fort Rucker area were identified. They were stratified into age groups based on their age at the first Rucker civilian examination. An aviator was presumed to remain in aviation service through the end of calendar year 1992 if they had a FDME in 1993 or early 1994. Dual-status civilians, those also serving in the Individual Ready Reserve, Army Reserve or Army National Guard, were coded to have operational military affiliation. Retired military aviators and nonmilitary civilians were coded to have no operational military affiliation. The waiver and suspension file (morbidity and mortality diagnosis index) was reviewed to analyze diagnoses associated with a history of medical attrition. SAS® PROC FREQ was used for data analysis (SAS Institute, 1993).

Results

Records of 847 civilian aviators were reviewed. By the end of calendar year 1992, 528 (62.3 percent) remained in aviation service, 251 (29.6 percent) were lost to nonmedical attrition, and 68 (8.1 percent) were lost to medical attrition.

Of the 847, 196 (23.14 percent) had operational military affiliation, while 651 (76.86 percent) did not. The mean cohort entry age of those with operational military affiliation was 37.46 years (standard error=0.4462). The mean cohort entry age of those with no active military affiliation was 44.26 years (standard error=0.3298). This difference in age was significant (Student t-test, $p < 0.0001$). The analysis was stratified by age groups to control for age differences as shown in Table 1.

Table 1 shows the flying status of civilian aviators stratified by age at entry into the cohort and military affiliation. Among those less than 30 years old, there were no losses due to medical attrition. There was a threefold higher rate of nonmedical attrition among those with no operational military affiliation compared to those with operational military affiliation ($p < 0.0001$).

Table 1.
Distribution of attrition stratified by age and military affiliation.

Entry age	Military affiliation	N	Remaining in aviation service	All cases of attrition	Subtotals for attrition cases	
					Nonmedical attrition	Medical attrition
<30	No	36	19 (52.8%)	17 (47.2%)	17 (47.2%)	0 (0.0%)
	Yes	19	16 (84.2%)	3 (15.8%)	3 (15.8%)	0 (0.0%)
30-39	No	109	69 (63.3%)	40 (36.7%)	36 (33.0%)	4 (3.7%)
	Yes	108	85 (78.7%)	23 (21.3%)	21 (19.4%)	2 (1.9%)
40-49	No	346	215 (62.1%)	131 (37.9%)	112 (32.4%)	19 (5.5%)
	Yes	61	47 (77.0%)	14 (23.0%)	12 (19.7%)	2 (3.3%)
>=50	No	160	72 (45.0%)	88 (55.0%)	49 (30.6%)	39 (24.4%)
	Yes	8	5 (62.5%)	3 (37.5%)	1 (12.5%)	2 (25.0%)
All ages	No	651	375 (57.6%)	276 (42.4%)	214 (32.9%)	62 (9.5%)
	Yes	196	153 (78.0%)	43 (22.0%)	37 (18.9%)	6 (3.1%)
Total	All	847	528 (62.3%)	319 (37.7%)	251 (29.6%)	68 (8.0%)

Among aviators with an age ranging from 30 to 39 years, medical attrition was uncommon, accounting for 6 of 217 cases (2.8 percent). Nonmedical attrition remained significantly higher among those with no operational military affiliation (χ^2 , $p=0.015$).

Among those with an age from 40 to 49 years, medical attrition remained uncommon, accounting for 21 of 407 cases (5.2 percent). Nonmedical attrition remained significantly higher among those with no operational military affiliation (χ^2 , $p=0.036$).

Beginning at 50 years and older, medical attrition dramatically increased by fivefold compared with those 40 to 49 years old, accounting for 41 of 168 cases (24.4 percent). The risk of medical attrition was the same, whatever the military affiliation. Nonmedical attrition remained nearly threefold higher in those without operational military affiliation (significance could not be calculated due to the small size of some cells). The total risk for attrition in this age group was high, due to medical and nonmedical causes, accounting for 91 of 168 cases (54.2 percent).

Overall, there was a threefold higher rate of medical attrition among those without operational military affiliation (9.5 percent versus 3.1 percent). The excess in medical attrition occurred primarily between the ages of 30 and 49. Controlling for age, there was a higher risk for nonmedical and medical attrition among those without operational military affiliation ($\chi^2_{[Mantel-Haenszel]}$, $p<0.0001$).

Table 2 shows the mean number of years in civilian aviation service stratified by age on cohort entry and type of attrition. The total period of observation for Table 2 was from 1985 to 1992 (8 calendar years). Those with nonmedical attrition have less mean years of aviation service than those with medical attrition, until age 50, when the mean years of aviation service is the same for both groups.

Table 2.
Mean years of civilian service stratified by age and cause of attrition.

Age	Remaining in aviation service by end of 1992	Nonmedical attrition	Medical attrition
<30	5.35	2.35	N/A*
30-39	6.18	3.54	5.50
40-49	5.95	3.31	5.10
>=50	6.44	3.56	3.61

* No cases of medical attrition in this age group.

Table 3 shows the major causes of medical attrition. Cardiovascular disease accounted for 50 of the 68 cases (73.5 percent) of medical attrition. Since some civilians had multiple disqualifications, the most aeromedically significant diagnosis causing medical termination from aviation service was listed for each case. For example, a civilian aviator might have three disqualifications, such as a history of cerebrovascular accident, hypertension, and hearing loss. Hypertension and hearing loss are potentially waiverable, while cerebrovascular accident generally is nonwaiverable. Although hypertension may be a risk factor for cerebrovascular accident, hypertension is infrequently life-threatening and can be controlled by waiverable medications. Cerebrovascular disease may result in sudden death or permanent disability. In this example, cerebrovascular accident would be the most aeromedically significant diagnosis.

Table 3.
Major causes for medical attrition.

Most aeromedically significant disqualifying diagnosis	N
Asymptomatic, significant coronary artery disease	28
Cardiomyopathy	6
Recurrent ventricular tachycardia	5
Coronary angiography indicated, but declined by patient	5
Acute myocardial infarction	3
Profound hearing loss	3
Dementia	2
Diabetes mellitus on oral hypoglycemic medications	2
Hypertension on nonwaiverable medications	2
Chronic low back pain	2
Sudden death due to coronary artery disease	1
Aortic aneurysm	1
Recurrent supraventricular tachycardia	1
Intraocular cataract	1
Alcohol dependence	1
Major depression	1
Personality disorder	1
Pituitary adenoma	1
Ocular melanoma	1
Esophageal carcinoma	1

Discussion

The Fort Rucker civilian cohort is composed of several subgroups. The majority are retired or former military aviators flying Army aircraft while working for several flight instruction and maintenance contractors to the Department of the Army. Others are Department of the Army civilian aviators working in education and training, aircraft testing and evaluation, aviation standardization and safety, and research and development. Only a few are civilian-trained aviators with no history of military aviation training before working at Fort Rucker. A majority are eligible for military health care due to operational military affiliation or retired military status.

Many contract civilian and Department of the Army civilian aviators are dual-status, serving also as reserve component aviators in the Individual Ready Reserve, Army Reserve, or Army National Guard. Some are Department of the Army civilian technicians whose jobs are tied to operational military status as reserve component aviators. During weekdays, they operate Army Reserve and Army National Guard aviation support facilities in the Fort Rucker area. During reserve duty weekend drills or activation for military training, they become military aviators in the same facilities.

We have heard often in conversations among local aircrew members the belief that the Fort Rucker civilian aviator cohort is a stable population. Military aviators and flight surgeons end their tours at Fort Rucker and return years later to find a familiar cadre of civilian pilots still there. What they evidently miss among those familiar faces is the significant turnover in the civilian population. During the study period, nearly 40 percent of the civilian aviators left the cohort.

Another widely held notion is that medical termination from aviation service is the main cause of attrition in the Fort Rucker civilian cohort. This study found medical attrition accounted for only 21 percent of all cases of attrition (68 of 319). Most of the medical attrition cases were found in aviators between the ages of 50 and 72.

The finding that cardiovascular disease was the most common cause for medical attrition was not unexpected. In a study of U.S. airline pilots (Dark, 1983), cardiovascular disease was the leading cause of medical denial issuances for flying duties out of nine major disease categories, accounting for 42.6 percent of all flying duties medical denial actions.

The finding that medical attrition was related to aging was not unexpected. In a study of U.S. airline pilots (Dark, 1983), the annual rate for medical denial from airline pilot duties went from 1.0 per 1,000 per year for ages 25 to 39, to 5.8 per 1,000 per year for ages 45-49, to 14.4 per year per 1,000 for ages 55-59.

U.S. airline pilots are required to retire at age 60. Fort Rucker civilian pilots are allowed to continue flying as long as they remain medically and aeronautically qualified. During this study period, some Fort Rucker aviators remained in aviation service up to the age of 72.

The reasons for nonmedical attrition could not be determined by this study. Reasons may include involuntary workforce reductions, low employment seniority, low wages, irregular work hours, inability to develop secondary sources of income in the Fort Rucker area, dissatisfaction with the repetitive nature of training flights, or development of nonflying career interests. It is possible some cases of nonmedical attrition were due to unreported sudden death or permanent disability. When they leave, another aviator must be hired and trained. The Army must pay for this additional training cost that varies from 4 to 40 hours of flight training.

We noted a recurrent career pattern during data collection. This career pattern was that of the active duty military aviator who retired, transitioned to the Fort Rucker civilian aviator cohort, and then left the cohort in 1 to 3 years due to nonmedical reasons. This implies the recently retired military aviator may seek temporary employment in the Fort Rucker civilian workforce until they complete second career plans.

Conclusions

The Aviation Epidemiology Data Register records of 847 Fort Rucker civilian aviators were reviewed from 1985 to early 1994. Of these aviators by the end of 1992, 528 (62.3 percent) remained in aviation service, 251 (29.6 percent) were lost due to nonmedical attrition, and 68 (8.1 percent) were lost due to medical attrition.

Controlling for age, there was a higher risk for nonmedical and medical attrition among those without operational military affiliation ($\chi^2_{[\text{Mantel-Haenszel}]}$, $p < 0.0001$). Medical attrition was uncommon up to age 50. Cardiovascular disease accounted for three-fourths of the cases of medical attrition. Overall, there was a threefold higher rate of medical attrition among those without operational military affiliation.

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