

USAARL Report No. 95-16



**U.S. Army Aviation Epidemiology Data Register:
Descriptive Analysis of Medical Disqualifications
Among Female Army Aviator Training Applicants**

By

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February 1995

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**United States Army Aeromedical Research Laboratory
Fort Rucker, Alabama 36362-0577**

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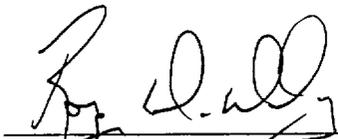
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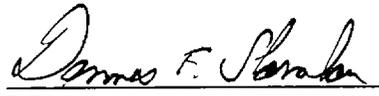


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REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified		1b. RESTRICTIVE MARKINGS	
2a. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release, distribution unlimited	
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE			
4. PERFORMING ORGANIZATION REPORT NUMBER(S) USAARL Report No. 95-16		5. MONITORING ORGANIZATION REPORT NUMBER(S)	
6a. NAME OF PERFORMING ORGANIZATION U.S. Army Aeromedical Research Laboratory	6b. OFFICE SYMBOL (if applicable) MCMR-UAD	7a. NAME OF MONITORING ORGANIZATION U.S. Army Medical Research and Materiel Command	
6c. ADDRESS (City, State, and ZIP Code) P.O. Box 620577 Fort Rucker, AL 36362-0577		7b. ADDRESS (City, State, and ZIP Code) Fort Detrick Frederick, MD 21702-5012	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION	8b. OFFICE SYMBOL (if applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
8c. ADDRESS (City, State, and ZIP Code)		10. SOURCE OF FUNDING NUMBERS	
		PROGRAM ELEMENT NO. 62787A	PROJECT NO. 30162787A878
		TASK NO. HC	WORK UNIT ACCESSION NO. 144
11. TITLE (Include Security Classification) U.S. Army Aviation Epidemiology Data Register: Descriptive analysis of medical disqualification among female Army aviator training applicants			
12. PERSONAL AUTHOR(S) Kevin T. Mason			
13a. TYPE OF REPORT Final	13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day) 1995 February	15. PAGE COUNT 12
16. SUPPLEMENTARY NOTATION			
17. COSATI CODES		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	aeromedical standards, female aviators	
06	03		
05	09		
19. ABSTRACT (Continue on reverse if necessary and identify by block number) Congress has directed studies of women in the military. The frequency and causes of medical disqualification for female applicants to Army aviator training are unknown. The U.S. Army Aviation Epidemiology Data Register was queried to provide a descriptive analysis of a cohort of female applicants to Army aviator training for calendar years 1987 to 1990. There was a total of 774 female Class 1 and Class 1A applicants to U.S. Army aviator training during calendar years 1987 to 1990. Among the applicants, 41.2 percent were Class 1 (Warrant officer candidates) and 58.8 percent were Class 1A (Commissioned officers). Commissioned officer applicants were significantly younger than Warrant officer applicants (p<0.001, 2-sided, Kolmogorov-Smirnov statistic). Among Class 1 applicants, 38.9 percent were medically disqualified compared to 36.7 percent for Class 1A. There was no difference in the risk for medical disqualification between Class 1 and 1A (Relative risk=1.059, CI _{95%} =0.882, 1.272).			
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS		21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL Chief, Science Support Center		22b. TELEPHONE (Include Area Code) (205) 255-6907	22c. OFFICE SYMBOL MCMR-UAX-SI

(Continued on next page)

19. Abstract (continued).

The six most prevalent disqualifying diagnoses were a failure to meet anthropometric standards (16.8 percent of applicants), myopia (9.3 percent), allergic rhinitis (4.1 percent), failure to meet weight standards (1.3 percent), anemia (1.3 percent), and hyperopia (1.2 percent). There was no significant difference in the risk for disqualification for any category of diagnosis between Class 1 and Class 1A.

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Background

Military relevance

Congress directed studies related to women in the military. A family of databases, collectively named the U.S. Army Aviation Epidemiology Data Register (AEDR), contains information concerning the health of female applicants to Army aviator training and female Army aviators. The U.S. Army Aeromedical Research Laboratory (USAARL) is using the AEDR to study the health of female Army aircrew. Currently, the frequency and causes of medical disqualification for female applicants to U.S. Army aviator training are unknown. This paper provides a descriptive analysis of a cohort of women applying to Army aviator training for calendar years 1987 to 1990.

Classes of flying duty medical examination for aviator training applicants

Class 1 applicants are warrant officer candidates. They come from the enlisted ranks of all U.S. military services or directly from civilian acquisition programs. Class 1A applicants are commissioned officers or cadets. They come from the Reserve Officer Training Corps (ROTC) or U.S. military academies. Most Class 1A applicants apply to Army aviator training in the beginning of their senior year of military academy, college, or university education.

Literature review

The Canadian Forces reported their experiences with the medical selection of female applicants to aviator training for calendar years 1977 to 1988. Among a total of 477 applicants, the medical disqualification rate was 31.2 percent. Failure to meet anthropometric standards (40.9 percent of disqualifications), vision standards (36.9 percent), neurologic standards (10.7 percent), and orthopedic standards (8.1 percent) accounted for a majority of the medical disqualifications. The article did not provide the frequency of medical disqualification by diagnosis, but lumped disqualifications into broad categories, such as "pulmonary" (Hicks, 1990).

The Belgian Armed Forces reported their experiences with the medical selection of female applicants to aviator training for the period 1 January 1983 to 31 July 1989. The medical disqualification rate was 93.2 percent among a total of 74 flight training applicants. Failure to meet neuropsychiatric standards (42.0 percent of disqualifications), vision standards (33.3 percent), and anthropometric standards (20.3 percent) accounted for a majority of medical disqualifications. The article listed the medical disqualifications by diagnosis. Unsatisfactory psychometric testing was the cause of medical disqualification in 25 of 29 cases of failure to meet neuropsychiatric standards. Refractive error accounted for 20 of the 23 ophthalmologic disqualifications. Inadequate leg length was the only cause for failure to meet anthropometric standards (Vancutsem and Vandebosch, 1990).

U.S. Army Aviation Epidemiology Data Register

Data were obtained from the U.S. Army Aviation Epidemiology Data Register. The AEDR is a family of databases storing medical history and physical parameters of U.S. Army student and trained aviators. One component is a flying duty medical examination (FDME) database. All U.S. Army flight training applicants and trained aviators are required to submit a FDME upon application, and then annually within 90 days of the end of their next birth month (Department of the Army, 1995). Another component is the waiver and suspension file (WSF), a mortality and morbidity index of flight physical disqualifications, casualty reports, and aeromedical board outcomes. The WSF references a medical document archive, containing the details of WSF cases.

Method

The AEDR was queried to identify all female Class 1 and Class 1A applicants to U.S. Army aviator training for the period 1 January 1987 to 31 December 1990, a total of 4 calendar years. Since some women had multiple Class 1 and Class 1A flying duty medical examinations (FDMEs) during the period of observation, the last Class 1 or 1A FDME was used for this analysis. The subject's age and class of FDME were extracted from the AEDR FDME database. The final medical disposition of the FDME and cause of medical disqualification were extracted from the WSF.

Goodness-of-fit testing by the Kolmogorov-Smirnov statistic was used for the analysis of cumulative frequency distributions (Daniel, 1983). The method of Katz was used for the analysis of relative risk with 95 percent confidence intervals (Kahn and Sempos, 1989). In some cases, an applicant had multiple disqualifications, such as a failure to meet both the anthropometric standards and vision standards. The percent disqualified was defined as:

$$\text{Percent disqualified} = 100 \left(\frac{\text{Number with the disqualifying diagnosis or in the diagnosis category}}{\text{Number of applicants in the FDME Class}} \right)$$

Results

Table 1 shows the number of applicants stratified by class of FDME and the calendar year of their last Class 1 and Class 1A FDME. There was a total of 774 applicants during the study period. There was an average of 193 applicants per year. Among the applicants, 58.8 percent were Class 1A and 41.2 percent were Class 1.

Table 1.
Number of female aviator training applicants for calendar years 1987 to 1990.

Class of FDME	Calendar year				N	Percent
	1987	1988	1989	1990		
Class 1A	102	114	126	113	455	58.8
Class 1	92	70	89	68	319	41.2
N	194	184	215	181	774	

Figure 1 shows the age distribution of female aviator training applicants stratified by class of FDME. The mean age of Class 1A applicants was 23.3, and the mean age of Class 1 applicants was 24.7. Class 1A applicants were significantly younger than Class 1 applicants ($p < 0.001$, 2-sided, Kolmogorov-Smirnov statistic). Table A-1, Appendix A, shows the number and cumulative frequency distribution by age and class of FDME for Figure 1.

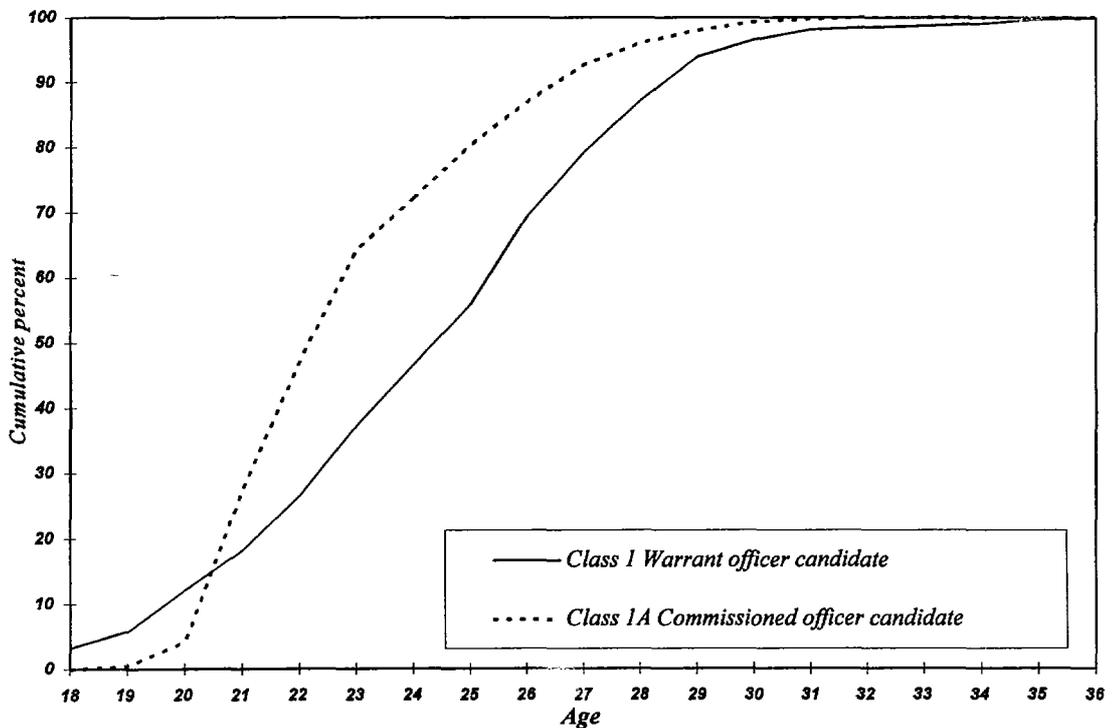


Figure 1. Age distribution of female aviator training applicants stratified by class of FDME.

Table 2 shows the number of medically disqualified female aviator training applicants stratified by class of FDME. Among Class 1 applicants, 38.9 percent were medically disqualified compared to 36.7 percent for Class 1A. There was no difference in the risk for medical disqualification between Class 1 and Class 1A (Relative risk=1.059, CI_{0.95}=0.882,1.272).

Table 2.
Number of medical disqualifications stratified by class of FDME.

Class of FDME	Medically disqualified	Qualified	N	Percent disqualified
Class 1A	167	288	455	36.7
Class 1	124	195	319	38.9
N	291	483	774	

Table 3.
Cause for medical disqualification stratified by category of diagnosis and class of FDME.

Category of diagnosis	Class 1A disqualified	Percent disqualified	Class 1 disqualified	Percent disqualified	Both classes	Percent disqualified
Anthropometry	73	16.04	57	17.87	130	16.80
Ophthalmology	52	11.43	35	10.97	87	11.24
Allergy	15	3.30	18	5.64	33	4.26
Orthopedics	11	2.42	7	2.19	18	2.33
Neurology	7	1.54	9	2.82	16	2.07
Cardiology	10	2.20	4	1.25	14	1.81
Otolaryngology	8	1.76	5	1.57	13	1.68
Psychiatry	8	1.76	5	1.57	13	1.68
Endocrinology	7	1.54	5	1.57	12	1.55
Hematology	4	0.88	6	1.88	10	1.29
Genitourinary	5	1.10	4	1.25	9	1.16
Pulmonary	0	0.00	2	0.63	2	0.26
N disqualified	200		157		357	

Table 3 shows the cause for medical disqualification stratified by category of diagnosis and class of FDME. There was no significant difference in the risk for disqualification for any category of diagnosis between Class 1 and Class 1A by calculating the relative risk with 95 percent confidence intervals (not shown). Table A-2 shows the cause for disqualification stratified by specific medical diagnoses and class of FDME.

The six most prevalent disqualifying diagnoses included a failure to meet anthropometric standards (16.8 percent of applicants), myopia (9.3 percent), allergic rhinitis (4.1 percent), failure to meet weight standards (1.3 percent), anemia (1.3 percent), and hyperopia (1.2 percent).

Discussion

When comparing our population of female applicants to other cohorts, the method of examination and medical standards affect the comparison. In this study, we have data to compare our population to the Canadian Forces and the Belgian Armed Forces, but the methods of examination are not the same. For example, the U.S. Army aviator training applicant FDME does not include routinely psychometric testing. This testing is performed on all applicants in the Belgian Armed Forces. Failure to meet psychometric standards was the most common cause of medical disqualification in the Belgian Armed Forces, while none of our subjects were disqualified for abnormal psychometrics. What you do not look for, you are not likely to find.

One factor confounding this analysis is that U.S. military flight surgeons do not report all discovered medical disqualifications for aviator training applicants. Many applicants who suspect they are disqualified come to military flight surgeon offices for a screening examination directed at the cause of disqualification. For example, an applicant knows or suspects that they are color vision deficient. The local flight surgeon might examine the applicant's color vision and finds a significant color vision deficiency. The applicant might not pursue the application process further after learning they are disqualified. Some flight surgeons do not send incomplete, disqualified Class 1 and 1A FDMEs to the reviewing authorities for these quick visits by applicants; despite being required to do so by regulation (Department of the Army, 1995). The aviation medicine clinic contact with the applicant might be even more casual, such as the applicant asking a medic to "check me out."

Summary and conclusions

There was a total of 774 female Class 1 and Class 1A applicants to U.S. Army aviator training during calendar years 1987 to 1990. Among the applicants, 41.2 percent were Class 1 (warrant officer candidates) and 58.8 percent were Class 1A (commissioned officers). Commissioned officer applicants were significantly younger than warrant officer applicants ($p < 0.001$, 2-sided, Kolmogorov-Smirnov statistic). Among Class 1 applicants, 38.9 percent were medically disqualified compared to 36.7 percent for Class 1A. There was no difference in the risk for medical disqualification between Class 1 and 1A (Relative risk=1.059, $CI_{0.95}=0.882, 1.272$).

The six most prevalent disqualifying diagnoses were a failure to meet anthropometric standards (16.8 percent of applicants), myopia (9.3 percent), allergic rhinitis (4.1 percent), failure to meet weight standards (1.3 percent), anemia (1.3 percent), and hyperopia (1.2 percent). There was no significant difference in the risk for disqualification for any category of diagnosis between Class 1 and Class 1A.

Further studies are required to determine if there are gender-specific differences for the risk of medical disqualification among applicants. It is likely female applicants are at higher risk for a failure to meet anthropometric standards than men. The distribution of anthropometric measurements among female applicants and male applicants has not been analyzed.

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Appendix A.
Data tables.

Table A-1.
Number of female aviator applicants stratified by age and class of FDME.

Age	Class 1A	Class 1	N	Cumulative percent Class 1A	Cumulative percent Class 1
18	0	10	10	0.00	3.19
19	2	8	10	0.44	5.75
20	17	20	37	4.19	12.14
21	106	19	125	27.59	18.21
22	89	26	115	47.24	26.52
23	77	34	111	64.24	37.38
24	36	29	65	72.19	46.65
25	37	29	66	80.35	55.91
26	30	42	72	86.98	69.33
27	26	31	57	92.72	79.23
28	15	25	40	96.03	87.22
29	9	21	30	98.01	93.93
30	6	8	14	99.34	96.49
31	2	5	7	99.78	98.08
32	1	1	2	100.00	98.40
33	0	1	1	100.00	98.72
34	0	1	1	100.00	99.04
35	0	2	2	100.00	99.68
36	0	1	1	100.00	100.00
N	453	313	766		
Age unknown	2	6	8	Birth date missing	
N	455	319	774		

Table A-2.
Cause for medical disqualification stratified by diagnosis and class of FDME.

Category	Class FDME		N	Disqualifying medical diagnosis	Class FDME		N
	1A	1			1A	1	
Allergy	15	18	33	Allergic rhinitis	15	17	32
				Anaphylaxis - bee sting	0	1	1
Anthropometrics	73	57	130	Leg length only	2	1	3
				Total arm span only	60	40	100
				Total arm span and leg length	11	16	27
Cardiology	10	4	14	Hypertension	1	1	2
				Left axis deviation	2	0	2
				Mitral valve prolapse	2	0	2
				Short PR interval	3	3	6
				Supraventricular tachycardia	1	0	1
				Wolff-Parkinson-White syndrome	1	0	1
Endocrinology	7	5	12	Hypothyroidism	0	2	2
				Overweight	7	3	10
Genitourinary	5	4	9	Cervical dysplasia	3	1	4
				Dysmenorrhea	1	0	1
				Endometriosis	1	1	2
				Renal calculus	0	2	2
Hematology	4	6	10	Anemia	4	6	10
Neurology	7	9	16	Chronic headaches	1	1	2
				Concussion	0	1	1
				Migraine headaches	0	3	3
				Motion sickness	1	1	2
				Post concussion syndrome	0	1	1
				Seizure disorder	1	1	2
				Skull fracture	1	0	1
Syncope, recurrent	3	1	4				

Table A-2 (Continued).
Cause for medical disqualification stratified by diagnosis and class of FDME.

Category	Class FDME		N	Disqualifying medical diagnosis	Class FDME		N
	1A	1			1A	1	
Ophthalmology	52	35	87	Depth perception deficit	0	1	1
				Hyperopia	4	5	9
				Myopia	44	28	72
				Ocular motility disorder	3	1	4
				Retinal detachment	1	0	1
Orthopedics	11	7	18	Arthropathy, multiple joints	0	1	1
				Arthropathy of shoulder	1	0	1
				Arthropathy of wrist	1	0	1
				Chondromalacia	0	1	1
				Chronic low back pain	1	0	1
				Compression fracture of spine	0	1	1
				Derangement of knee	4	0	4
				Pes planus	0	1	1
				Scoliosis	4	3	7
Otolaryngology	8	5	13	Hearing loss	6	1	7
				Nasal polyps	0	1	1
				Sinusitis	2	3	5
Psychiatry	8	5	13	Adjustment disorder	1	0	1
				Depression	3	3	6
				Dissociative reaction	1	0	1
				Psychosomatic disorder	1	0	1
				Sleepwalking	1	0	1
				Unsatisfactory ARMA	1	2	3
Pulmonary	0	2	2	Asthma	0	2	2
N	200	157	357	N	200	157	357