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Prevalence of Spectacle Wear Among U.S. Army Aviators

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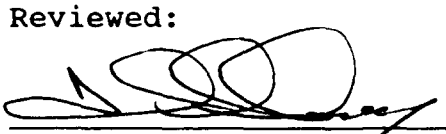

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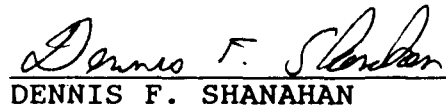

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BSTRACT (Continue on reverse if necessary and identify by block number)

The advanced avionic and electro-optical systems installed within Army rotary wing craft are becoming increasingly incompatible with spectacle wear. Therefore, the alence of spectacle wear among Army aviators is an important factor to take into account the development of future systems. A review of spectacle prevalence data within the ation Epidemiology Data Register (AEDR) for the years 1986, 1987, 1988, and 1989 was formed. Data were consistent across all four years, with mean prevalence of spectacle being 22.25 percent for active component forces. Over the same four-year period, erve and National Guard forces displayed mean specta e-wear prevalences of 27 percent 32 percent, respectively. These prevalence rates are higher than those previously ained in 1985 by a similar but slightly different paradigm. The prevalence of presbyopic

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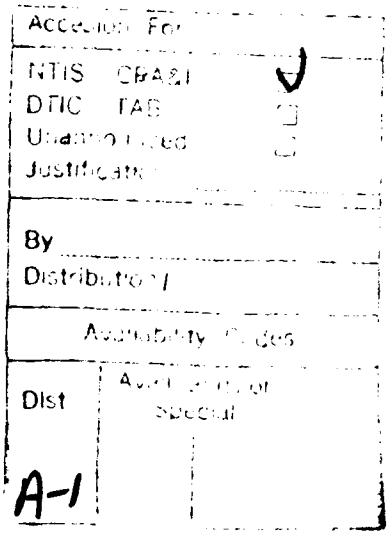
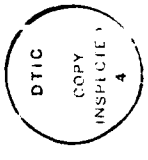
aviators by this query is also higher than previous appraisals. In conclusion, spectacle-wearing aviators exist in greater numbers than previously documented, and represent a segment of the aviation population that will have increasing compatibility problems with advanced flight systems. Therefore, system planners will need to address these incompatibilities in future hardware developments.





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Introduction

Recent technological advances have had a major impact on military aviation. While modern methods of providing visual information via electro-optics/visionic systems have extended the aviator's operational envelope, these devices are becoming increasingly incompatible with spectacle wear. Currently, the U.S. Army Aeromedical Research Laboratory (USAARL) is conducting a research project concerning the feasibility of routine use of extended wear contact lenses by Army aviators on a world wide basis (Lattimore and Cornum, 1989). However, the long-term use of contact lenses may not be practical for all aviators. As a result, organizational planning for possible alternatives to contact lens wear is necessary. In order to ensure the development of viable planning options, it is important that accurate spectacle wear prevalence data are routinely available.

Information regarding numbers of aviators who wear spectacles within the Department of Defense (DoD) is limited. Only until recently have any approximations and estimates been published. Bachman (1989) quoted an unpublished presentation (Price, 1985) stating that approximately 18 percent of all Army aviators wear corrective lenses. A recent U.S. Air Force sample survey (Miller et al., 1990) estimated that 27 percent of the Air Force pilots wear spectacles. About 19 percent of the Navy's pilots require some type of correction (National Research Council, 1990). According to discussions with Navy Aerospace Medical Institute (NAMI) personnel, a survey now is being formulated to update spectacle usage among naval aviators.

Currently, contact lenses are prohibited from being worn by Army aviators and aircrew while performing flight duties. However, specific waivers have been granted to certain air crewmembers participating in The Army Surgeon General approved, controlled research studies (Bachman, 1985; Lattimore, 1988; Lattimore and Cornum, 1989). The current policy (Implementation plan, 89-73) within the Air Force is that pilots may wear contact lenses while performing flight duties. The Tactical Air Command (TAC) pilots may obtain lenses at Air Force expense, while Military Airlift Command (MAC) and Strategic Air Command (SAC) pilots may obtain contact lenses at their own expense.

Beginning in 1983, the U.S. Army Aviation Epidemiology Data Register (AEDR) was developed as a joint effort of USAARL and the U.S. Army Aeromedical Activity (USAAMA) at Fort Rucker, Alabama. The AEDR is a permanent, computer-accessible repository of medical information on the entire Army aviation population. This automated database system provides information pertinent to:

1. The development and evaluation of aviation medical selection and retention standards;

2. The conduction of epidemiologic studies on health risk factors;

3. And the provision of a model for the natural history of disease in the aviation environment.

The AEDR also allows for the assessment of health hazards in the aviation environment and for the provision of human factors input to engineers developing aircraft, weapons, and life support equipment. The purpose of this study, therefore, was to determine the actual prevalence of spectacle wear within the entire Army-rated aviation population for the years 1986-1989 as a baseline for future discussions regarding avionics/spectacle incompatibilities.

Methods

As of 2d Quarter FY 90, the AEDR contained approximately 160,000 records from over 61,000 individuals. The medical information is taken from Flying Duty Medical Examinations (FDME) which are recorded on Standard Form (SF) 88 (Report of Physical Examination), SF 93 (Report of Medical History), SF 520 (Electrocardiographic Record), and an auxiliary form relating risk factors, family history, and flight experience. Medical transcribers enter the data from these forms into the AEDR database; each record is entered twice to minimize transcription errors. A record is composed of 178 fields containing administrative data, patient medical history with physician's comments, screened test results, physical findings, health risk factors, anthropometric measurements, vision data, diagnoses, and dispositions. It should be noted that each medical Standard Form mentioned above is not always submitted with every FDME. Therefore, some data are not available on every medical examination.

The data for this study were gathered from the AEDR by class of physical examinations and divided into four separate calendar years: 1986, 1987, 1988, and 1989. The data reflects information for each of these years for each major Army component (that is, active duty, reserve, and national guard), age distribution, classes of physical examinations and some ICD9 codes (International Classification of Diseases, Clinical Modification, 9th Revision) pertaining to vision.

Data from the classes of physical examinations were from two primary types: Class 1 and class 2. Class 1 physicals consist of two subcategories: Class 1 and 1A FDMEs. Class 1 FDMEs are used for entry into Army flight training for enlisted and

civilian personnel, and class 1As are for officer personnel entering flight training. Class 2 physicals are aviators' annual FDMEs after becoming rated pilots. These annual or periodic physicals also have two subcategories: Class 2 and 2A FDMEs. The class 2 is a standard annual FDME, while the 2A is an abbreviated or shorter version. Hence, some data entries were gathered on an alternate year basis. The class 2A is required for the aviator on even age years up to 34. After age 34, aviators receive a full class 2 FDME every year.

The principal AEDR variable (or computer search "flag") for determining if a person wore spectacles was titled 'Glasses.' If a physical (either the class 2 SF 88, or an abbreviated class 2A DA Form 4497-R) had any visual information in the 'corr. to 20/___' field for either far or near vision, it was interpreted by the medical transcribers entering the data into the AEDR that the individual wore spectacles. Therefore, a '2' was assigned to the AEDR glasses variable, meaning spectacles were worn. A '1' was assigned if no visual information was in the 'corr. to 20/___' block. Since the variable was obtained from both class 2 and 2A FDMEs, it is unlikely that any spectacle wearers were overlooked by this flag system. However, it is possible that an aviator might have had more than one class 2 physical within a year, causing an error of overestimation. If present, this error was likely very small because of the large population (approximately 12,000 to 14,000) compared to the small number of possible duplications (less than 1 percent, or 120). The vision data were taken from the AEDR database using a utility computer program which reads the database into a SPSS-X* control language structure.

ICD9 coding has been used in the database only since October 1988. This coding immensely expands the utility of the AEDR because records can now be coded for diagnoses, diseases, corrective procedures, and medications. This also means that visual abnormalities are coded. As a result, selected ICD9 codes were extracted for calendar year 1989 only, as a means of documenting prevalence of presbyopia within the Army aviator population.

Results and discussion

The results from the AEDR extract regarding wearing of spectacles are presented in a series of figures and tables. The first series of figures presents the three major Army components (active duty, reserve, and national guard) by year (1986-89) and depicts the percent of those individuals who wore spectacles.

Active component

Figure 1 illustrates percentages of active duty aviators wearing spectacles for the years indicated. The percentages

remain fairly constant over the 4 years. The total number of active duty aviators within the AEDR for the 4 years also remained somewhat constant. The totals were 13,410 (1986), 14,237 (1987), 12,038 (1988), and 14,352 (1989). A crosscheck of the 1989 result (22 percent) was performed by comparing it with the AEDR refraction fields of the SF 88 (block 60). The percentages were very similar.

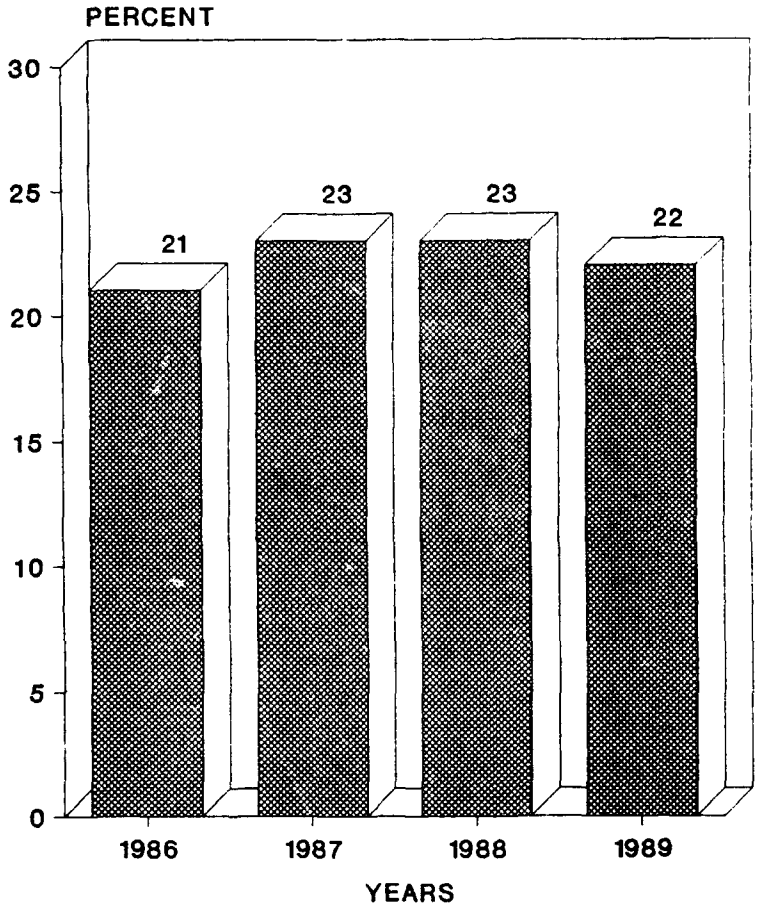

Figure 1. Percent of active duty aviators wearing spectacles for years 1986-1989

The mean age for active duty aviators in 1989 was 33 years (see Appendix B). The mean age for those aviators <u>without</u> glasses was 31 (see Appendix D). The mean age for aviators <u>with</u> glasses was 38 (see Appendix C). Mean ages for 1988, both with and without glasses were similar. An interesting observation resulted from reviewing the age distribution for the active duty aviators: it is largely bimodal. The first modal peak occurs at the 27-30 age group, and the second peak occurs at the 39-41 age group.

Comparison to earlier data

From the AFDR data shown in Figure 1, the major conclusion is that, over the last 4 years, almost a quarter of Army active duty aviators have worn spectacles at their annual FDMEs. The 18 percent spectacle wear prevalence figure, quoted by Bachman (1989) likely was based on information extracted from both class 1 (flight entry applicants) physicals and class 2 (rated aviators) physicals, thereby underdocumenting the actual prevalence. Data in Figure 1 denotes only class 2 aviators (i.e., rated pilots only).

Table 1 depicts the percentages of flight applicants (class 1 or 1A physicals) by component and year who wore spectacles when they applied for flight training. Caution should be exercised toward interpreting Table 1. The percentages indicated are for those who applied, not merely for those who were admitted into flight training. In addition, as a manner of medical policy, applicants' class 1/1A flight physicals are repeated at Fort Rucker when they begin flight training. Consequently, most applicants who were accepted into flight training would have had two class 1/1A physicals. The low spectacle wear percentage indicated by the class 1 and 1A FDMEs likely had a major effect on earlier attempts at quantifying the aviation population's spectacle wear prevalence (Price, 1985).

Table 1.

Percentages of flight applicants wearing spectacles by component from 1986-1989.

	1986	1987	1988	1989
Active duty	5% N=2956	7% N=7312	3% N=4076	2% N=4423
Reserve	7% N=268	7% N=775	5% N=348	6% N=263
National guard	6% N=686	7% N=1696	5% N=1033	5% N=949

Army reserve

Figure 2 represents the percentage of reserve personnel who wore glasses for the years 1986-1989. The total number of reserve aviators' class 2/2A FDMEs by year was: 1986 (1,949),

1987 (2,578), 1988 (2,211), and 1989 (2,237). The mean age for Army reserve aviators in 1989 was about 35 years (Appendix E). The mean age for those reserve aviators without glasses was 33. The mean age for reserve aviators with glasses was 41. Mean ages for 1988, both with and without glasses were similar. The age distribution for reserve aviators also is bimodal, with the first modal peak at the 26-30 group and the second at the 39-43 group. From the data presented, it appears about a quarter or more reserve aviators have worn spectacles at their annual FDME.

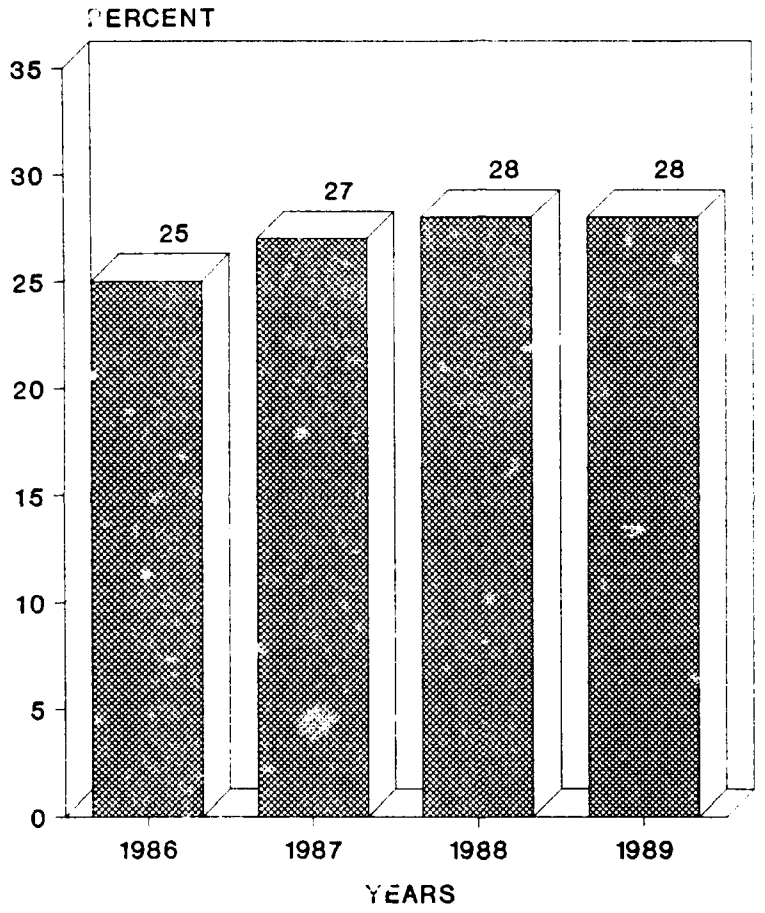

Figure 2. Percent of reserve aviators wearing spectacles for the years 1986-1989

National guard

The last component to be discussed regarding annual FDMEs is the national guard. The total number of class 2/2A FDMEs for national guard aviators within the AEDR for the 4 years was relatively consistent: 5,137 (1986), 5,726 (1987), 5,562 (1988),

and 6,759 (1989). Unlike the active duty and reserve pilots, there appears to be a noticeable percentage increase of aviators wearing spectacles from 1986 through 1989 (Figure 3).

The mean age for national guard aviators was 37 years (Appendix H). The mean age for aviators without glasses was 35. The mean age for those aviators with glasses was 42. Mean ages for 1988, both with and without glasses were similar. The age distribution of national guard aviators also trends to be bimodal, with the first modal peak at about 28 and the second at about 42. The AEDR data portrays about one-third of the national guard aviators as wearing spectacles when taking the annual FDME. This percentage steadily increased over the 4 years analyzed.

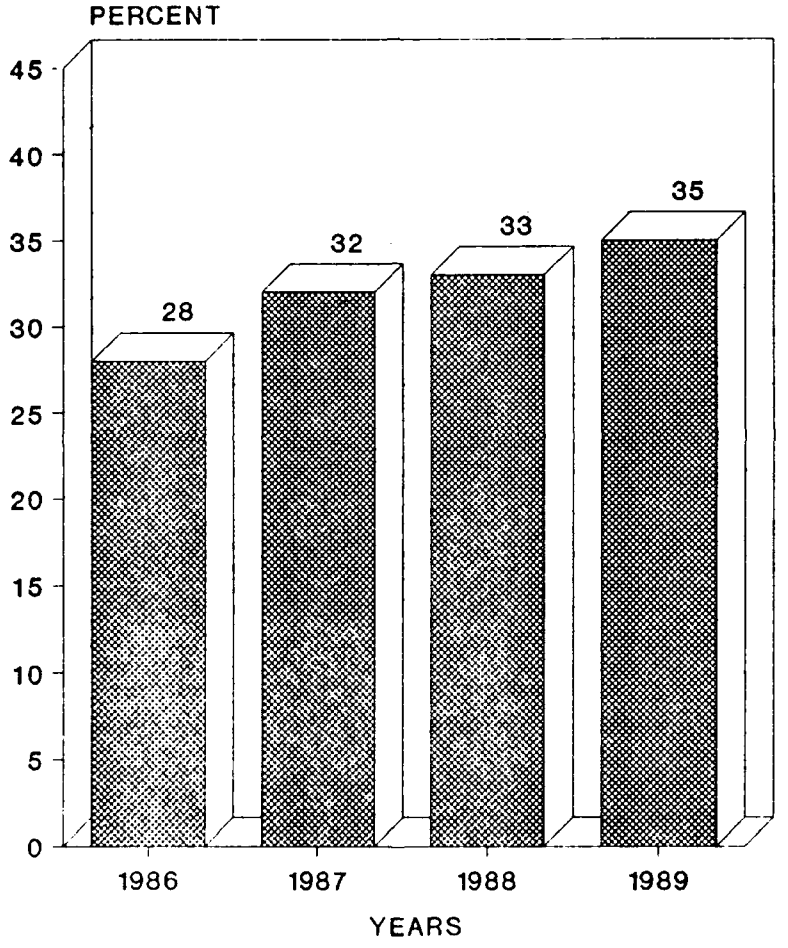

Figure 3. Percent of national guard aviators wearing spectacles from 1986-1989

Presbyopia prevalence

In addition to identifying the number of aviators who wore

spectacles, this study sought to determine the number of aviators for the calendar year 1989 who had a presbyopic condition (i.e., need to wear bifocals or reading glasses). Such information would be valuable to planners because the practical application of bifocal contact lenses is still on the frontier of applied research programs. Consequently, presbyopic aviators will necessarily be "married" to their spectacle correction in the future. Therefore, engineering and design solutions to spectacle incompatibility problems will have ultimate importance in keeping the older, experienced aviator in the cockpit.

The ICD9 code 3674 is assigned to individuals who have vision measurements worse than 20/20 in the 'near vision block' of the medical forms and who are over 40. Individuals less than age 40 are coded differently. Admittedly, this process is arbitrary and based on ophthalmological input during the developmental phase of the AEDR. Although the true number of presbyopes may be slightly different than indicated here, this system should provide a close estimate of the number of aviators dependent upon a near correction. The 3674 code is interpreted to mean that the individual is presbyopic. In 1989, there were over 14,000 active duty annual FDMEs. Of these, slightly over 1,100 had an ICD9 code of 3674. This means that approximately 8 percent of active duty aviators in 1989 probably had a near vision correction of some type. The personnel identified with the 3674 code normally had other vision related medical codes. For example, of the 1,100 coded 3674, almost half were also coded 3671 (myopia). Table 2 below depicts percentages of presbyopia for each component for 1989 only.

Table 2.

Percentages of components exhibiting presbyopia for 1989

Active duty N=14352	8%
Reserve N=2237	15%
National guard N=6759	20%

These data are functionally significant. If correct, then approximately 36 percent (8 percent divided by 22 percent) of active component aviators wearing spectacles were presbyopic and cannot be helped by current contact lens research programs. The reserve and national guard components are faced with even greater percentages (53 percent and 57 percent, respectively). Clearly, any type of routine contact lens program would not include a

liberal segment of the overall aviation population. System planners currently are faced with a significant problem. However, in light of age distribution data indicating a bimodal pattern, the percentage of presbyopic aviators will drop off in the next few years. But, with a second age peak moving forward, this same situation will resurface 10 to 12 years from now unless systems designers are prepared. The use of the AEDR in tracking such indicators will provide vital assistance to aviation system planners.

Summary

The overall purpose of this study was to identify spectacle usage of Army aviators within each of the three major components (active duty, reserve, and national guard) from 1986 through 1989. Prior to this year, information regarding aviator spectacle use within DoD was somewhat limited. Only recently have any numbers and percentages been published.

The AEDR is a computerized database of aviation flight physical examinations; it contains extensive information regarding vision, including ICD9 coding. From the analysis of the AEDR data, approximately 22 percent of active duty aviators wore spectacles. This percentage held constant from 1986 through 1989. The reserve aviator data were somewhat higher--slightly over 25 percent. For the national guard, the percentages were even higher--35 percent wore spectacles in 1989. The age distribution and mean age within each component for those wearing spectacles support the findings. Furthermore, the age distributions for each component are bimodal, indicating a changing manpower pattern over time.

Presbyopic data (1989 only) also were analyzed for each component utilizing ICD9 codes. Approximately 8 percent of the active duty aviators had presbyopia, compared to 15 percent for reserve aviators and 20 percent for national guard aviators. These figures translate to an even higher percentage of spectacle wearers being presbyopic and for a potentially major impact on design and engineering programs for the future.

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Appendix A

Manufacturers' List

SPSS Inc.
444 N. Michigan Avenue
Chicago, IL 60611

Appendix B

1989 age distribution for
all active duty pilots

Age	Frequency	Percent	Cum Percent
17	1	.0	.0
18	8	.1	.1
19	31	.2	.3
20	60	.4	.7
21	131	.9	1.6
22	211	1.5	3.1
23	417	2.9	6.0
24	615	4.3	10.3
25	724	5.0	15.4
26	780	5.4	20.8
27	809	5.6	26.5
28	838	5.8	32.3
29	826	5.8	38.1
30	760	5.3	43.4
31	701	4.9	48.3
32	577	4.0	52.3
33	566	3.9	56.3
34	521	3.6	59.9
35	519	3.6	63.5
36	530	3.7	67.2
37	510	3.6	70.8
38	571	4.0	74.8
39	654	4.6	79.3
40	611	4.3	83.6
41	595	4.1	87.8
42	496	3.5	91.2
43	300	2.1	93.3
44	255	1.8	95.1
45	220	1.5	96.6
46	145	1.0	97.6
47	103	.7	98.4
48	77	.5	98.9
49	50	.3	99.3
50	32	.2	99.5
51	26	.2	99.7
52	22	.2	99.8
53	9	.1	99.9
54-58	18	.2	99.9
.	33	.2	Missing
TOTAL	14352	100.0	100.0

MEAN 32.88 STD DEV 6.89

Appendix C

1989 age distribution for active duty pilots with glasses

Age	Frequency	Percent	Cum Percent
18	2	.1	.1
20	3	.1	.2
21	6	.2	.4
22	14	.4	.8
23	40	1.3	2.1
24	49	1.6	3.7
25	81	2.6	6.3
26	92	2.9	9.2
27	87	2.8	12.0
28	86	2.8	14.8
29	97	3.1	17.9
30	85	2.7	20.6
31	80	2.6	23.2
32	80	2.6	25.7
33	82	2.6	28.4
34	79	2.5	30.9
35	81	2.6	33.5
36	108	3.5	36.9
37	96	3.1	40.0
38	126	4.0	44.1
39	155	5.0	49.0
40	165	5.3	54.3
41	228	7.3	61.6
42	237	7.6	69.2
43	181	5.8	75.0
44	156	5.0	80.1
45	175	5.6	85.7
46	125	4.0	89.7
47	91	2.9	92.6
48	75	2.4	95.0
49	50	1.6	96.6
50	31	1.0	97.6
51	26	.8	98.4
52	22	.7	99.1
53	9	.3	99.4
54-58	18	.5	99.9
.	3	.1	Missing
TOTAL	3121	100.0	100.0

MEAN 38.07 STD DEV 7.41

Appendix D

1989 age distribution for active duty pilots without glasses

Age	Frequency	Percent	Cum Percent
17	1	.0	.0
18	6	.1	.1
19	31	.3	.3
20	57	.5	.9
21	125	1.1	2.0
22	197	1.8	3.7
23	377	3.4	7.1
24	566	5.0	12.2
25	642	5.7	17.9
26	688	6.1	24.0
27	721	6.4	30.5
28	752	6.7	37.2
29	728	6.5	43.7
30	674	6.0	49.7
31	621	5.5	55.3
32	497	4.4	59.7
33	484	4.3	64.1
34	442	3.9	68.0
35	438	3.9	71.9
36	422	3.8	75.7
37	413	3.7	79.4
38	444	4.0	83.3
39	499	4.4	87.8
40	444	4.0	91.8
41	367	3.3	95.0
42	259	2.3	97.4
43	118	1.1	98.4
44	98	.9	99.3
45	44	.4	99.7
46	20	.2	99.9
47	12	.1	100.0
48	2	.0	100.0
50	1	.0	100.0
.	29	.2	Missing
TOTAL	11219	100.0	100.0

MEAN 31.43 STD DEV 5.98

Appendix E

1989 age distribution for all reserve pilots

Age	Frequency	Percent	Cum Percent
19	3	.1	.1
20	16	.7	.9
21	8	.4	1.2
22	28	1.3	2.5
23	44	2.0	4.4
24	80	3.6	8.0
25	72	3.2	11.2
26	119	5.3	16.6
27	92	4.1	20.7
28	120	5.4	26.1
29	123	5.5	31.6
30	104	4.6	36.2
31	72	3.2	39.5
32	60	2.7	42.1
33	53	2.4	44.5
34	63	2.8	47.3
35	59	2.6	50.0
36	65	2.9	52.9
37	72	3.2	56.1
38	58	2.6	58.7
39	115	5.1	63.9
40	139	6.2	70.1
41	145	6.5	76.6
42	116	5.2	81.8
43	107	4.8	86.6
44	85	3.8	90.4
45	62	2.8	93.1
46	44	2.0	95.1
47	22	1.0	96.1
48	18	.8	96.9
49	12	.5	97.4
50	12	.5	98.0
51	7	.3	98.3
52	11	.5	98.8
53	10	.4	99.2
54-59	17	.7	99.9
.	4	.2	Missing
TOTAL	2237	100.0	100.0

MEAN 35.08 STD DEV 7.73

Appendix F

1989 age distribution for reserve pilots with glasses

Age	Frequency	Percent	Cum Percent
20	2	.3	.3
21	1	.2	.5
22	3	.5	.9
23	2	.3	1.3
24	10	1.6	2.8
25	7	1.1	4.0
26	9	1.4	5.4
27	10	1.6	7.0
28	9	1.4	8.4
29	10	1.6	10.0
30	14	2.2	12.2
31	11	1.7	13.9
32	6	.9	14.9
33	8	1.3	16.1
34	6	.9	17.1
35	9	1.4	18.5
36	12	1.9	20.4
37	17	2.7	23.1
38	10	1.6	24.7
39	34	5.4	30.1
40	45	7.1	37.2
41	66	10.4	47.6
42	45	7.1	54.7
43	47	7.4	62.2
44	52	8.2	70.4
45	47	7.4	77.8
46	34	5.4	83.2
47	20	3.2	86.4
48	18	2.8	89.2
49	12	1.9	91.1
50	12	1.9	93.0
51	7	1.1	94.1
52	11	1.7	95.9
53	10	1.6	97.5
54-59	16	2.6	100.0
TOTAL	632	100.0	100.0

MEAN 40.92 STD DEV 7.17

Appendix G

1989 age distribution for reserve pilots without glasses

Age	Frequency	Percent	Cum Percent
19	3	.2	.2
20	14	.9	1.1
21	7	.4	1.5
22	25	1.6	3.1
23	42	2.6	5.7
24	70	4.4	10.1
25	65	4.0	14.1
26	110	6.9	21.0
27	82	5.1	26.1
28	111	6.9	33.0
29	113	7.0	40.1
30	90	5.6	45.7
31	61	3.8	49.5
32	54	3.4	52.9
33	45	2.8	55.7
34	57	3.6	59.3
35	50	3.1	62.4
36	53	3.3	65.7
37	55	3.4	69.1
38	48	3.0	72.1
39	81	5.0	77.2
40	94	5.9	83.1
41	79	4.9	88.0
42	71	4.4	92.4
43	60	3.7	96.2
44	33	2.1	98.3
45	15	.9	99.2
46	10	.6	99.8
47	2	.1	99.9
56	1	.1	100.0
.	4	.2	Missing
TOTAL	1605	100.0	100.0

MEAN 32.78 STD DEV 6.65

Appendix H

1989 age distribution for all national guard pilots

Age	Frequency	Percent	Cum Percent
17	1	.0	.0
18	2	.0	.0
19	3	.0	.1
20	8	.1	.2
21	12	.2	.4
22	35	.5	.9
23	67	1.0	1.9
24	140	2.1	4.0
25	181	2.7	6.7
26	204	3.0	9.7
27	253	3.7	13.4
28	271	4.0	17.5
29	288	4.3	21.7
30	235	3.5	25.2
31	201	3.0	28.2
32	180	2.7	30.9
33	155	2.3	33.2
34	152	2.2	35.4
35	160	2.4	37.8
36	150	2.2	40.0
37	201	3.0	43.0
38	256	3.8	46.8
39	375	5.5	52.3
40	446	6.6	59.0
41	596	8.8	67.8
42	500	7.4	75.2
43	380	5.6	80.8
44	312	4.6	85.5
45	229	3.4	88.9
46	168	2.5	91.4
47	111	1.6	93.0
48	87	1.3	94.3
49	71	1.1	95.3
50	53	.8	96.1
51	61	.9	97.0
52	45	.7	97.7
53	31	.5	98.2
54	32	.5	98.6

Appendix H (continued)

Age	Frequency	Percent	Cum Percent
55	24	.4	99.0
56	25	.4	99.4
57	18	.3	99.6
58	15	.2	99.9
59	6	.1	99.9
60	1	.0	100.0
62	1	.0	100.0
63	1	.0	100.0
67	1	.0	100.0
.	15	.2	Missing
TOTAL	6759	100.0	100.0

MEAN 37.34 STD DEV 7.67

Appendix I

1989 age distribution for national guard pilots with glasses

Age	Frequency	Percent	Cum Percent
21	2	.1	.1
22	1	.0	.1
23	5	.2	.3
24	13	.6	.9
25	20	.8	1.7
26	23	1.0	2.7
27	34	1.4	4.2
28	33	1.4	5.6
29	28	1.2	6.8
30	44	1.9	8.6
31	36	1.5	10.2
32	33	1.4	11.6
33	19	.8	12.4
34	30	1.3	13.7
35	32	1.4	15.0
36	38	1.6	16.6
37	48	2.0	18.7
38	51	2.2	20.8
39	84	3.6	24.4
40	128	5.4	29.9
41	192	8.2	38.0
42	206	8.7	46.8
43	186	7.9	54.7
44	217	9.2	63.9
45	169	7.2	71.1
46	140	5.9	77.1
47	96	4.1	81.2
48	76	3.2	84.4
49	64	2.7	87.1
50	48	2.0	89.2
51	60	2.5	91.7
52	45	1.9	93.6
53	29	1.2	94.9
54	29	1.2	96.1
55	24	1.0	97.1
56	25	1.1	98.2
57	18	.8	98.9
58	15	.6	99.6
59	6	.3	99.8
60-67	4	.2	99.9
.	4	.2	Missing
TOTAL	2355	100.0	100.0

MEAN 42.32 STD DEV 6.99

Appendix J

1989 age distribution for national guard pilots without glasses

Age	Frequency	Percent	Cum Percent
17	1	.0	.0
18	2	.0	.1
19	3	.1	.1
20	8	.2	.3
21	10	.2	.5
22	34	.8	1.3
23	62	1.4	2.7
24	127	2.9	5.6
25	161	3.7	9.3
26	181	4.1	13.4
27	219	5.0	18.4
28	238	5.4	23.8
29	260	5.9	29.7
30	191	4.3	34.1
31	165	3.7	37.9
32	147	3.3	41.2
33	136	3.1	44.3
34	122	2.8	47.1
35	128	2.9	50.0
36	112	2.5	52.6
37	151	3.4	56.0
38	205	4.7	60.7
39	291	6.6	67.3
40	318	7.2	74.5
41	403	9.2	83.7
42	294	6.7	90.4
43	194	4.4	94.8
44	95	2.2	97.0
45	60	1.4	98.4
46	28	.6	99.0
47	15	.3	99.3
48	11	.2	99.6
49	7	.2	99.7
50	5	.1	99.9
51	1	.0	99.9
53	2	.0	99.9
54	3	.1	100.0
.	11	.2	Missing
TOTAL	4401	100.0	100.0

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