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Improving our understanding of the psychological make-up of male and female pilots is the objective of "Assessment of Psychological Factors in Aviators". Of particular interest are the stressors of mixed-gender squadrons and psychological concerns related to combat and deployment. Judgment, cognitive abilities, personality traits, and crew resource management skills are gauged with the testing battery. The battery consists of four psychological tests and requires two hours to complete. The semi-structured clinical interview provides information about health, and career/deployment stressors and requires 30-45 minutes to complete.

Male and female pilot volunteers from AMC and AETC participated in the study. Volunteers came from Travis, Charleston, McConnell, Randolph, McChord, Dover, Fairchild, and McGuire AFB's, as well as the Air Force Academy. 64 male pilots and 50 female pilots volunteered at these bases; for a total of 114 volunteers.

The study was completely voluntary and anonymous. To maintain this anonymity we are unable to provide any individual's or unit's test results. All data generated will be reported as group data. IQ testing revealed no significant differences between men and women and personality testing showed greater Extraversion, Conscientiousness, and Agreeableness in women. The interview elicited 27 significantly different responses out of 323. These differences could be important for policy making and training.

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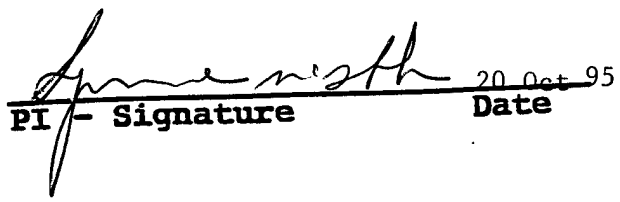

PI - Signature

20 Oct 95
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Final Report - "Assessment of Psychological Factors in Aviators" 20 Oct 95

Introduction:

Improving our understanding of the psychological make-up of male and female pilots is the objective of "Assessment of Psychological Factors in Aviators" (APFA). Of particular interest are the stressors of mixed-gender aircrew squadrons and the psychological concerns related to combat and deployment. An improved understanding of these two issues will improve safety and increase mission readiness. Little is known about the psychological characteristics of female pilots and pilots who fly crewed aircraft (2). Fighter, test, and light attack pilots, along with astronauts are most frequently studied at the expense of tanker/transport pilots, navigators, weapon systems operators, and flight surgeons (1). Due to the former combat exclusion rule, the majority of female pilots have been assigned to tankers and transports.

Very few studies describe the female aviator's psychological attributes. Novello and Youssef (4) studied 87 general aviation female pilots and found female pilots to be more similar to male pilots than to females in the general population. There is a paucity of data on women in all professions; often data from males is extrapolated to women. Perhaps such extrapolation is scientifically justified; only empirical study will determine if separate norms are required for female professionals.

Judgment, cognitive abilities, personality traits, and crew resource management skills are gauged with the APFA psychological testing battery. Computer administration allows confidentiality and anonymity, as well as standardization (3). The APFA testing battery consists of four well-accepted psychological tests and requires two hours to complete. Supervised by a licensed psychologist, the battery includes: the Multidimensional Aptitude Battery (MAB), an intelligence test; the NEO Five Factor Inventory (NEO-FFI), a personality test measuring neuroticism, extraversion, openness to experience, conscientiousness, agreeableness; the Personal Characteristics Inventory (PCI), a test of judgment; and the Cockpit Management Attitude Questionnaire (CMAQ), a crew coordination measure.

The semi-structured clinical interview provides information about personal and family health, and career/deployment stressors. The interview covers the impact of grounding greater than 30 days, health decrements due to aircraft design, teamwork difficulties, career goals, roadblocks to success, career demands, combat and POW concerns, stress coping styles, motivation to fly and flying goals. The interview is based on an aircrew survey developed by Voge that had a return rate of over 50% (Personal Communication, V. Voge, July 17, 1994). The interview requires approximately 30-45 minutes and is accomplished by a board-eligible, licensed psychiatrist.

Volunteers are male and female pilots from Air Mobility Command (AMC) and Air Education and Training Command (AETC). Volunteers from Travis AFB, California; Charleston AFB, South Carolina; McConnell AFB, Kansas; Randolph AFB, Texas; McChord AFB, Washington; Dover AFB, Delaware; McGuire AFB, New Jersey, Fairchild AFB, Washington, and the United States Air Force Academy in Colorado have participated. 64 male pilots and 50 female pilots volunteered at these bases. Thus, 114 pilots, total, volunteered to participate and completed the study.

Bases:	Women	Men
Travis AFB, CA	10	5
Charleston AFB, CA	6	5
McConnell AFB, KS	9	7
McChord AFB, WA	3	11
Dover AFB, DE	4	9
Randolph AFB, TX	2	*
McGuire AFB, NJ	6	12
Fairchild AFB, WA	6	15
USAFA, CO	4	*

* Due to the ratio of women to men collected and the varied backgrounds (some have previously flown fighter aircraft) of AETC male pilots, no male participants were solicited.

Text:

Maj Suzanne E. McGlohn, a board-eligible psychiatrist, and Maj. Raymond E. King, a licensed psychologist, traveled from the Armstrong Laboratory at Brooks AFB, Texas to each base noted above for a week-long stay. An enlisted member usually traveled along to provide technical and logistical support. Equipment included six IBM ThinkPad color notebook computers (486DX with 8 Meg RAM), 20 3.5" DSHD discs, consent forms, volunteer registry data forms, sign-up sheets, surge protectors, interviews, labels, and briefing slides. Prior to their departure, they coordinated their visit with a point of contact (POC) at each base. The POC was responsible for soliciting potential male and female pilot volunteers, arranging a place for a briefing on Monday morning for as many potential volunteers as possible, arranging two rooms to conduct the testing and interviewing, and arranging a place, to which the commander did not have ready access, for the sign-up sheets. The researchers received maximum assistance with the project from each base, due to the endorsement by AFCC, AFSG, and each MAJCOMs' CC.

Dr. McGohn provided a briefing on Monday morning for as many potential volunteers as possible explaining the nature of the project, how much time will be required, and what is contained in the consent form. Those who remained interested in participating were asked to carefully and critically read and sign a consent form. This form explained the content and purpose of the study and explained the procedures. The study was completely voluntary and anonymous; consent could be withdrawn by a participant at any time without consequence. All information provided on the consent form is protected by the Privacy Act of 1974, as directed by AFR 169-6. The data on the consent form cannot be linked to testing or interview data, further preserving anonymity. Participants were also asked to fill out a Volunteer Registry Data Sheet. Its purpose is to track participants in the unlikely event of any untoward effects. Again, this information cannot be linked to the data and thus anonymity is preserved. To maintain this strict anonymity we are unable to provide any individual's or unit's test results. All data generated will be reported as group data. After the briefing was given and consent forms were signed and witnessed, participants chose a

random number. Sets of random numbers were used to link the testing data to the interview data. Random numbers were not placed on the consent form or data registry sheet, thus preserving anonymity. Pilots could choose not to wear their nametags during the study. When participants had a number, they signed up for testing and the interview at a convenient time during the week.

Dr. King and the technician tested from one to six participants on the notebook computers at a time. General demographic information (number of military flying hours, commissioning source, etc.) was collected first, followed by the MAB, then the NEO-FFI, CMAQ, and finally the PCI. Volunteers could take breaks during the testing or even spread completion of the testing battery throughout the week. Dr. McGlohn conducted the semi-structured interviews individually, using a checklist and a tape recorder. Each volunteer was asked whether she or he verbally consented to recording; their response was documented on the interview sheet. Each volunteer was told the recording will be used to create a transcript of the interview, identified by number only, after which the cassette tape will be reused or destroyed. Identifying demographic information is not solicited during the interview.

Upon return to Brooks AFB after each data collection trip, testing and interview data was added to a secured database.

Results:

The demographic characteristics of the population studied are displayed in the table below.

	Women n = 49	Men n = 64
Mean age	30.25	29.33
Mean self-reported military flying hours	1,760	1,712.11
Mean self-reported combat-support flying hours	43.20	67.83
	(Expressed as	Percents)
Race*		
Asian	0	1.60
Black	2.04	6.25
Cauasian	97.96	90.63
Other/Wouldn't ID	0	0
Married		
Yes	53.1	67.19
No	46.9	32.81
Education		
Bachelors	44.90	53.13
Some Grad Work	22.45	34.38
Masters	32.65	9.65
More than 18 yrs.	0	3.13

Commissioning source		
OTS	12.24	15.63
ROTC	30.61	45.31
USAFA	55.10	39.06
MIMSO	2.04	0
Military Rank		
O-2	12.24	9.38
O-3	71.43	87.50
O-4	6.12	3.13
O-5	8.16	0
O-6	2.04	0
Crew position		
Co-pilot	40.82	31.25
Pilot	20.41	42.19
Aircraft Commander	16.33	9.38
Instructor Pilot	18.37	10.94
Stan Eval	4.08	6.25
Private Pilots' License		
Yes	67.35	65.63
No	32.65	34.38

* English first language for all participants

Female pilots achieved a Verbal IQ of 120 (5.4 sd), a Performance IQ of 121.6 (7.0 sd), and a Full Scale IQ of 122.3 (5.2 sd) while male pilots achieved IQs of 120.8 (5.6 sd), 122.7 (7.3 sd), and 123.4 (5.4 sd), respectively. There were no signficant IQ differences. At the subscale level, only Information and Picture Completion were significantly different, with males higher. NEO-FFI results show significantly higher female Extraversion, Conscientiousness, and Agreeableness.

Domain	Women (n=48)	Men (n=64)	t value
Neuroticism	43.88 (7.94)	42.61 (8.40)	.81
Extraversion	62.44 (10.11)	58.06 (11.04)	2.15*
Openness	51.60 (9.88)	51.86 (11.00)	-.12
Agreeableness	54.29 (9.86)	47.44 (11.15)	3.38**
Conscientiousness	55.60 (10.06)	51.34 (9.52)	2.29*

Note: Combined sex norms were used in calculating T scores to facilitate gender comparisons. *$p < .05$, **$p < .001$

The results of the semi-structured clinical interview revealed 27 significant responses which differed between men and women. These were found out of a possible 323 responses to 20 questions with 39 subquestions. The significant responses are listed in the table below with percentages and p values obtained by Chi Square.

Question	Men		Women			
		%		%		
	n=64		n=50		CHI SQ	p
1. Why did you want to be a pilot?						
Always wanted to since childhood	32	50.00	11	22	9.37	0.01
Went to the Academy and was PQ	10	15.63	18	36	6.29	0.05
6. Health concerns you have related to your present aircraft						
Bathroom facilities	0	0.00	5	10	6.69	0.05*
Long periods of sitting, seats	0	0.00	6	12	8.11	0.05*
8. Working relationships with colleagues of both genders and their effect on you?						
With female colleagues						
They (female colleagues) are more personal/friendly	0	0	13	26	18.78	0.001*
With male supervisors	61	95.31	31	62	20.00	0.001
They don't have an effect on me						
Men are still working through the issue of female aircrew	0	0	14	28	20.43	0.001*
With female supervisors	30	46.88	4	8	20.27	0.001
They don't have an effect on me						
I have no experience with a female supervisor	23	35.94	30	60	6.53	0.05
With male subordinates	55	85.94	26	52	15.72	0.001
They don't have an effect on me						
Other	0	0	6	12	8.11	0.01*
With female subordinates	48	75.00	26	52	6.52	0.05
They don't have an effect on me						
How do men treat you differently than women?						
More camaraderie with men	18	28.13	3	6	9.14	0.05
More polite and cautious with me	1	1.56	17	34	22.21	0.001*
How do women treat you differently than men?						
More friendly/personal with me	9	14.06	24	48	15.72	0.001
What stressors experiencing in career advancement						
Sexual discrimination	0	0	8	16	11.01	0.01*
OPR/promotion system unfair	11	17.19	1	2	6.87	0.05*
Compare your stressors to others in squadron						
Compared to men	15	23.44	24	48	7.52	0.05
Men have fewer than I						
Compared to women	29	45.31	0	0	30.39	0.001*
Women have more than I						
Working relationships in squadron worse or better with both genders present?						
Other	1	1.56	22	44	31.39	0.001*
Concerns about being a POW						
Being exploited/used to break others	3	4.69	14	28	12.02	0.01*
Would you be more protective of one gender in combat?						
Yes	47	73.44	3	6		
No	15	23.44	46	92	53.04	0.001
Why yes?						
Women are at greater risk of being harmed as a POW	14	21.88	0	0	12.47	0.01*

Protection of women is part of my personal code of ethics	35	54.69	0	0	39.46	0.001*
What stressors has your family/significant others experienced due to your military career?						
Frequent moves disrupted kids schooling, spouse's career	23	35.94	7	14	6.97	0.05
Frequent absences have strained the relationship	49	76.56	25	50	8.70	0.05
Military spouse and I had to choose which career to push	3	4.69	10	20	6.51	0.05*

*Questions with only 0-3 responses might not be replicable using Chi square due to the small variability within the response set.

Conclusion:

The collection of data proceeded as planned and adequate numbers of pilots volunteered at each base to ensure statistical significance at the end of the study period. We anticipate this study will help define unique needs of male and female aviators, help us understand effective communication and performance within mixed-gender squadrons, and provide new information on occupational norms in non-referred pilots. Collecting occupational norms will help define the personality and strengths of the successful pilot, and allow a better understanding than is possible when relying on information collected from individuals psychiatrically referred to the Aeromedical Consultation Service at Brooks. This study will assist the Armed Forces in understanding and coping with the psychological stress associated with combat, deployment, and mixed-gender squadrons. It will also add significantly to much-need research efforts into gender issues.

The flying community is atypical of the general population as demonstrated by the superior IQs and small standard deviations, possibly due to multiple selection forces and self-selection. Of note, the IQ's of the men and women were not significantly different, even on performance measures. Personality-wise, female may have even more of a good thing. On interview, men and women again demonstrate more similarities than differences since only 27 responses out of a possible 323 significantly differed between the genders. However, the items endorsed may indicate areas important for policy making and training. The Air Force Academy appears to be an important avenue for women to enter an aviation career. More men endorsed a lifelong wish to be a pilot while women discovered the idea when they entered the Air Force Academy. When it came to discussing working relationships within the squadron, women more often identified difficulty with supervisors and felt they had more friendly relationships with other women. Men, on the other hand, more often endorsed greater camaraderie with other men. Women also reported more instances of sexual discrimination and reported that they believed they had more stressors than men. Men endorsed a greater number of stressors affecting their families with more endorsement of frequent moves and absences straining their relationships with their spouses and children. Women more often noted difficulties with dual-military careers. One issue important for training proved to be the mens' desire to protect women in combat. 73% of the men believed they would be more protective of women in combat. Men also expressed concern about women being at greater risk of being harmed in a Prisoner of War situation.

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