DOT/FAA/AM-00/32

Office of Aviation Medicine
Washington, D.C. 20591

The Relationship Between Aviators' Home-Based Stress To Work Stress and Self-Perceived Performance

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October 2000

Final Report

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U.S. Department
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**Federal Aviation
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1. Report No. DOT/FAA/AM-00/32	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle The Relationship Between Aviators' Home-Based Stress to Work Stress and Self-Perceived Performance		5. Report Date October 2000
		6. Performing Organization Code
7. Author(s) Fiedler, E.R., Della Rocco, P.S., Schroeder, D.J., and Nguyen, K.		8. Performing Organization Report No.
9. Performing Organization Name and Address FAA Civil Aeromedcial Institute P. O. Box 25082 Oklahoma City, OK 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, D.C. 20591		13. Type of Report and Period Covered
		14. Sponsoring Agency Code

15. Supplemental Notes

Work was accomplished under approved subtask AM-B-99-HRR-518.

16. Abstract

This paper investigates the relationship between domestic-based stress and pilots' perceptions of their effectiveness in the cockpit and in the office. Despite the importance placed on the family as a source of social support, there have been few systematic studies of the relationships between pilot family life, workplace stress, and performance. As part of a larger study, 19 United States Coast Guard (USCG) helicopter pilots at two air stations completed a stress questionnaire (adapted from Cooper and Sloan, 1986), rated the importance of various coping strategies, and evaluated their own flying performance The results of this study indicate that the effects of domestic stress carry over to the pilots' work world, directly influencing work stress and indirectly affecting pilots' perceptions of their flying performance. The positive influence of home life in mediating stress was noted when pilots were asked to rate the importance of various coping strategies. Pilots rated three aspects of home life as the most "important" factors in helping them cope with problems or stress. Thus, domestic-related issues were very important to this group of USCG pilots, suggesting the need for management to maintain awareness of how the quality of home life may affect the work environment and overall performance.

17. Key Words Aviators, Pilots, Stress, Job Performance		18. Distribution Statement Document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 10	22. Price

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

The Relationship between Aviators' Home-Based Stress to Work Stress and Self-Perceived Performance

The importance of stress to pilot job performance has been an aviation safety issue for many years, often discussed under the category of pilot error or human factors. Despite the importance placed on the family as a social support, there has been little systematic study of the relationships between the pilot's family life, workplace stress, and performance.

Lehrer, Erickson, and Gilson (1990) asked pilots to rank order the sources of stress in their lives, based on a modified Social Readjustment Rating Questionnaire (Holmes & Rahe, 1967). Of the 53 items in the questionnaire, 14 items related to domestic stress. The top three ratings of the most stressful situations were domestic stress items. They were 1) death of a child, 2) death of a mate, and 3) death of a parent. Seven domestic stress items were among the top ten stressors. Home-based stressors are important chronic stresses for a pilot, and should be given consideration when studying the relationship between the pilot, work effectiveness, and safe performance.

Sloan and Cooper (1986) completed an in-depth study of various sources of stress and coping mechanisms in British commercial pilots. They found that home-based factors were important in both their impact on work itself and on the ability to cope with stress. Stability in relationships and home life were the most important factors in helping pilots cope with stress. Sloan and Cooper concluded that, in general, the primary effect of home stress on work is in the mental or cognitive consequences: recurring thoughts during periods of low workload, decreased concentration, and a tendency not to listen. Actual flying performance was less directly affected by home-based problems.

The study of the degree and effect of home stress on job performance is a necessary part of preventive aviation safety and efforts to create a more effective workplace (Lehrer et al., 1990). Stokes and Kite (1994) discussed how stress can produce psychological distress, distraction, and worry in the pilot's workplace, even when not directly implicated in aviation safety. Alkov, Gaynor, and Borowsky (1985; also see Alkov, R.A., Borowsky, M.S., 1980) concluded that military pilot error could be a symptom of inadequate stress coping. Raymond and Royce (1995) made the same point in their discussion that an over-stressed pilot becomes at risk for impaired performance.

The purpose of this paper was to examine the relationship between self-reported home stress, work stress, and perceived performance in U.S. coast guard (USCG) pilots. Because they frequently change duty stations, home support systems may be particularly important within the coast guard pilot population. It was hypothesized that home-based stress would be significantly related to pilots' overall ratings of both job stress and their flying performance. Also, the more home stress carries over into the workplace, the more likely pilots' ratings of flying performance decrease. The importance of various coping mechanisms and types of home stress were explored and compared with Sloan and Cooper's findings.

METHOD

Participants

As part of a larger study, 19 USCG helicopter pilots at two air stations volunteered to respond to the questionnaires. One pilot did not complete the demographic information. Of the 18 pilots who provided demographic information, the average age of the sample was 32.9 years (sd = 5.4) with a range between 26 and 47. The average number of years in the USCG for the sample was 9.7 (sd = 4.7); on average, they had been in their assignment for 1.8 years (sd = 1.2). Of the 18 pilots with demographic data, 14 were married, three were single, and one was divorced. Nine reported having dependents in the family, and nine reported no dependents.

Measures

A modification of Sloan and Cooper's questionnaire (1986) was selected to measure the psychosocial aspects of stress. The questionnaire assessed sources of stress, coping strategies, and self-reported outcomes of stress on performance. Five sections from the larger battery of questionnaires are reported in this study. The sections measuring home stresses and job stresses each consisted

of 29 items on a 5-point scale, with 5 indicating "Causes me very much stress" and 1 being "Causes me no stress." The section on "Effect of home stress on work" consisted of 12 items, again scored on a 5-point scale. Types of coping strategies were measured by 33 items on a 7-point scale, ranging from 1 for "Of no importance whatsoever to me in coping" to 7 for "Of paramount importance to me in coping." Self-perceived flying performance was assessed by a 15-item scale with a 5-point range. Modification on these scales consisted of changing "wife" to "spouse/partner" and the use of "one's" to "my" (ex: "success or failure of one's effort to achieve" was changed to "success or failure of my effort to achieve"). This rephrasing was to align the usage of the pronoun to American English, eliminating ambiguity of the British English for American readers, while the change to spouse/partner was done to reflect the American English emphasis on gender-neutral terms.

Procedures

Data were collected as part of a larger study on crew rest. The study was reviewed and approved by the Federal Aviation Administration Civil Aeromedical Institute Institutional Review Board. Participants were individually briefed on the purpose and study protocol, and they were assured that all data and information provided would be kept strictly confidential. An informed consent form to participate in the study was obtained from each participant. Identification numbers were assigned and were used on all measures (i.e., logbooks, questionnaires, performance data files, etc.) to assure anonymity. Participants completed the questionnaire as part of a group of several other questionnaires.

Data Analysis

To examine the relationship among home stress, job stress, and self-reported flying performance, total scale scores were computed. These scale scores included responses on home stressors (*Home Stress*), stress experienced in the work environment (*Job Stress*), how home stress is experienced or carried over to the job (*Home Stress at Work*), types of coping strategies used (Coping), and self-perceived flying performance (*Flying Performance*). Descriptive data and Pearson correlations were computed among the scales. The original two databases, consisting of data from the two different air stations were analyzed to determine if there were significant differences between pilots at one air station compared with the other. As there were no significant differences, data from the two air stations were combined into one database. Some items referred to interactions with a "significant other in the home." Pilots who were living alone were instructed to leave these items blank but may have stressors not identified in this study. Therefore, the numbers of responses do not always total 18.

RESULTS

Home stress, job stress, and self-perceived flying performance

As *Home Stress* scores increased, so did pilots' rating of *Job Stress* (r = .81, p. < 01). Also, the more home stress that was felt in the workplace (*Home Stress at Work*), the higher pilots' ratings of *Job Stress* (r = .80, p. < 01). However, neither *Home Stress* nor *Job Stress*, by itself, was significantly related to self-reported *Flying Performance* (See Table 1).

Table 1.
Relationships of Home Stress, Job Stress, and Flying Performance

	Home Stress at Work (n)	Job Stress (n)	Flying Performance (n)
Home Stress	.493(14)	.813**(12)	-.054 (14)
Home Stress at Work		.802**(17)	-.470*(18)
Job Stress			-.190 (16)

*p.< .05. **p.< .001

2

Home stress experienced at work and self-perceived flying performance

Pilots perceived their own *Flying Performance* to be detrimentally affected when stress in the home carried over to the work setting. There was a significant relationship between *Home Stress at Work* scores and pilots' self ratings of *Flying Performance* (r = -.47, p.<.05). Items of *Home Stress at Work* that were significantly correlated with poorer flying performance were tendencies to worry at work (r= -.53, p. < .05), not listen as intently (r= -.49, p. < .05), and feeling slowed down at work (r= -.51, p. < .05). *Home Stress at Work* was significantly and negatively related to specific *Flying Performance* items of being ahead of the game (r= -.47, p. < .05), smoothness and accuracy of landings (r= -.45, p. < .05), degree of airmanship exhibited (r= -.42, p. < .05), and the ability to divide attention (r= -.39, p. < .05).

Coping strategies and self-perceived flying performance

The importance of home life in mediating stress was also seen when pilots rated the importance of various coping strategies. Coping strategies significantly correlated with higher ratings of *Flying Performance* were spouse/partner who had prior knowledge of flying or who flies (r= .47, p. < .05) and hobbies (r= .49, p. < .05). The coping strategy of living in a non-flying social environment was significantly related to a lower *Flying Performance* score (r= -.57, p. < .05).

From a list of 33 coping strategies, over 80% of pilots rated 11 coping mechanisms as having importance to paramount importance. The three most important strategies all involved family support. The first two, stability of relationship with spouse and a smooth and stable home life, were rated as important to paramount importance by 100% of the pilots. The third item, talking to an understanding spouse or partner, was rated as important to paramount importance by 89% of the pilots. See Table 2.

Specific home stresses

Of the 29 items measuring home stress, more than half of the pilots rated two items as causing moderate to very much stress: "Build up of tasks, duties, and things to do (63%)," and "Disagreements, arguments, different opinions (58%)." Another 12 items were rated as causing moderate to very much stress by over one-third of the pilots. On the other hand, more than 80% of the pilots listed seven home factors as causing them little or no stress. Table 3 lists ratings of stress by item.

How home stress is experienced at work.

The most frequently reported ways in which home stress was felt at work were fatigue and rumination about the home-based stress About one-fifth of pilots reported that they could usually or always tell when they were experiencing home stress at work by feeling tired due to disrupted sleep, having a tendency to worry, and intruding thoughts during low workload. Most pilots believed that home-based stress seldom or never was experienced at work by: decreased quality of preflight preparation (84%), increased alcohol consumption (95%), making errors without knowing why (74%), or making errors of omission (79%). Table 4 shows the ratings of the 12 items that measure how home stress was experienced at work.

Flying performance

Pilots generally rated themselves highly with regard to their flying performance measures. Of a possible range of 15 to 75, actual scores on *Flying Performance* ranged from 47 to 74 (mean of 63; median of 64). Almost all of the pilots (95%) rated their ability to cope with things that go wrong and their overall quality of performance as good to very good. Items receiving the lowest performance scores included 16% of pilots rating themselves as having a relatively moderate to high number of errors and 5% of them rated their errors as being of relatively moderate to high importance (See Table 5).

Age and years in the military

Age and years in the USCG were not significantly related to the stress measures or flying performance.

Aircrew vs. pilots

Data collected on aircrew were analyzed separately since the criterion measure of flying performance was focused on the pilot, not the aircrew member. There were no significant differences between aircrew and pilots on domestic stress, effects of home stress on the job, or level of job stress. There were also no differences between the aircrews by base location.

Table 2.
Factors Important in Coping

Items	% Endorsing Importance			Mean	SD
	1-3	4	5-6		
Stable relationship with partner	0	0	100	6.33	.77
Smooth and stable home life	0	0	100	6.00	.67
Talking to understanding partner	5	6	89	5.72	1.13
Sleep	0	5	95	5.68	.89
Planning ahead	0	11	89	5.63	.90
Working things out by logic	0	11	89	5.47	.90
Physical pastimes/exercise	5	5	90	5.47	1.02
Partner efficient at looking after things	0	6	94	5.44	.70
Home is a 'refuge'	5	5	90	5.37	1.07
Talking to understanding colleagues	5	11	84	5.26	1.10
Stable relationships with colleagues	11	0	89	5.21	1.18
Home as psychological platform	0	32	68	5.16	.96
Partner is interested	11	6	83	5.00	.97
'Staying busy'	5	16	79	5.00	.82
Talking to understanding friends	11	21	68	5.00	1.29
Hobbies	11	16	74	4.95	1.22
Flying itself helps	0	32	68	4.84	.69
Not 'bottling things up'	26	5	68	4.63	1.38
Separating home and work	16	21	63	4.58	1.12
Partner known me for flying career	22	22	57	4.56	1.46
Home life is 'geared to flying'	33	17	50	4.39	1.54
Selective attention	26	21	53	4.32	1.25
Partner modifies behavior to suit me	28	22	50	4.28	1.13
Using distractions	21	32	47	4.26	.81
Interests outside aviation	21	42	37	4.26	1.10
Avoid confrontation	37	21	42	4.05	1.27
Staying emotionally aloof	42	16	42	3.79	1.55
Live in non-flying social environment	42	47	11	3.63	1.16
Deliberately suppressing emotion	47	42	11	3.53	1.07
Role reversal at home	52	42	5	3.37	.90
Partner has flying knowledge	50	28	22	3.00	1.75
Drinking alcohol	74	16	10	2.37	1.42
Smoking	100	0	0	1.05	.23

Note. 1 = Of no importance whatsoever   2 = Very unimportant   3 = Unimportant   4 = Neither important nor unimportant
       5 = Important   6= Very Important   7 = Of paramount importance to me in coping.

Table 3.
Pilots Ratings of Home Stress

Stress Items	% Rated			Mean	SD
	1-2	3	4-5		
Build up of tasks, duties, and things to do	37	37	26	3.00	1.00
Disagreements, arguments, different opinion	42	42	16	2.79	1.03
Lack of money	58	21	21	2.58	1.07
Disappointed others don't meet expectations	53	26	21	2.58	0.96
Issues associated with children	60	20	20	2.53	1.13
Others not obeying / things that go wrong	63	21	16	2.53	0.96
Success or failure of my effort to achieve	53	32	16	2.47	1.12
Degree to which home life is way I want it	68	11	22	2.37	1.42
Constant, ongoing irritations	63	16	21	2.37	1.34
'Good' use of time at home and how spent	63	16	21	2.32	1.11
Conflicts of interests, resulting compromises	58	21	21	2.32	1.29
Achievement of personal goals and aims	68	21	11	2.26	1.05
Quality of relationship with partner	72	6	22	2.22	1.26
New and unfamiliar experiences	58	32	11	2.21	1.03
Domestic situations that aren't clear cut	77	12	12	2.18	1.07
Worries on behalf of others	63	32	5	2.16	0.90
Inability to identify problems	74	16	10	2.05	1.13
Absence of calm, stability and dependability	74	11	16	2.00	1.49
Interpersonal relationships	79	5	16	1.95	1.35
Nature of home social environment	72	22	6	1.94	0.94
Inability of partner to fulfill own abilities	77	12	12	1.94	1.20
Partner's lack of understanding about job	65	24	12	1.88	1.17
Dependability in, and competence of, partner	81	13	6	1.81	1.33
Responsibilities of home activities	83	11	6	1.78	0.88
Family health	83	11	6	1.72	1.07
Degree to which household geared to flying	88	6	6	1.59	0.87
Not having someone to talk to about work	84	10	5	1.58	1.07
Enforced or adopted roles at home	94	6	0	1.56	0.78
Potential for extra-marital relationships	88	6	6	1.47	1.07

Note. 1 = Causes me no stress   2 = Causes me little stress   3 = Causes me moderate stress
    4 = Causes me much stress   5 = Causes me very much stress

Table 4.
Effect of Home Stress at Work

Items	% Experienced Symptom			Mean	SD
	1-2	3	4-5		
Tired due to disrupted sleep	42	37	21	2.84	1.07
Tendency to worry	31	47	21	2.84	1.01
Intruding thoughts during low workload	53	21	26	2.74	1.05
Slows me down	58	26	16	2.37	1.01
Mind detached from tasks at hand	63	32	5	2.32	0.75
Decreased Concentration	58	37	5	2.26	0.87
Tendency not to listen as intently	63	32	5	2.21	0.86
Make error without knowing why	74	26	0	2.05	0.71
Make errors of omission	79	21	0	2.00	0.67
Tendency to talk about issue at work	68	32	0	1.95	0.85
Decreased quality of preflight preparation	84	16	0	1.84	0.69
Increased alcohol consumption	95	5	0	1.42	0.61

Note. 1= Never, 2 = Seldom, 3= Sometimes, 4 = Usually, 5 = Always

Table 5.
Self Ratings of Performance

Performance Items	% Rated			Mean	SD
	1-2	3	4-5		
Being ahead of the game	11	5	85	4.00	.88
Excess mental Capacity	11	5	85	4.05	.78
Coping with things that go wrong	5	0	95	4.32	.75
Attained self-set levels of performance	5	16	79	4.26	.93
Smoothness & accuracy of approaches	5	11	84	4.05	.78
Smoothness & accuracy of landings	11	11	88	4.05	.97
Degree of basic airmanship exhibited	0	11	89	4.32	.67
Overall smoothness of flights	0	16	84	4.26	.73
Quality of aircrew interpersonal relations	0	11	89	4.39	.70
Degree of mental & physical coordination	5	16	84	4.00	.75
Number of errors (higher score/ lower errors)	16	16	68	3.79	1.32
Error importance (high score/less important)	5	26	69	4.11	.99
Satisfaction with flights generally	5	5	90	4.26	.81
Ability to divide attention	5	11	84	4.21	.86
Quality of performance	0	5	95	4.37	.60

Note: 1-2 low to very low performance   3 average performance   4-5 good to very good performance

DISCUSSION

As stress in the home increased, so did the experience of job stress. Pilots under stress at home felt tired and worried with recurring thoughts at work. The lack of a direct relationship between home stress and flying performance is similar to Sloan and Cooper's (1986) results for British aviators, as is the importance of the indirect home-work interface on job stress and performance. Both British civilian and American military aviators noted the high importance of a stable marital relationship and home life (Lehrer et. al.,1990; Sloan & Cooper,1986) . In the current study, pilots reported fighting at least mild fatigue and distractibility as they experienced the stress of home factors overlapped into the job. Pilots indicated that as the home stress experienced at work increased, self-perceptions of flying performance decreased - especially the sense of "not feeling ahead of the game." This result is interpreted as supporting Sloan and Cooper 's (1986) conclusion that the primary effect of home stress at work is on the mental or cognitive processes.

Not only did home-based stress influence work in similar ways for USCG and British civilian aviators, the self-ratings of important coping strategies were similar. The first three coping strategies most often endorsed in the American study were also endorsed in the first factor for coping strategies by the British civilian aviator sample (Sloan & Cooper, 1986). Those items were a stable relationship with partner, smooth and stable home life, and talking to an understanding partner. In their analysis, Sloan and Cooper suggested that their first factor reflected a need for stability and predictability in which the pilot had control (1986, p. 85). Coast Guard pilots' self-ratings of home stress showed a similar concern. As a pilot's partner/spouse support system became less effective, the pilot began to lose the most important ways of coping with stressors. One speculates that, if home-based stress increases significantly and partner support lessens, the pilot may be moving closer to a negative significant life event such as divorce, separation, or alienation, with possible ramifications on cockpit error. However, even without a life event marker, the pilot's cognitive functioning may be at risk for compromise and reduced efficiency.

It is suggested that the first warning signs of home-based psychological distress may be more evident in the daily work activities rather than in cockpit error. If support services and management recognized the early warning signs at work that were symptomatic of home-based stress, they could provide timely intervention before the occurrence of more serious flying performance decrements. Certainly, continued support of family and home services within the USCG will have beneficial effects. Further research into the impact of the family as both a source of stress and support could help the aviation community make wise policy decisions regarding family-work issues and appropriate intervention, giving insight into the interplay of the pilot's coping strategies and personal support system.

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