

## Personality studies in aircrew: An overview

Dr. Ganesh A\*, Dr Catherine Joseph<sup>+</sup>

### ABSTRACT

Personality traits determine how an individual reacts to different events and situations. The pilot's personality and its influence on flying performance have an important bearing on flight safety. The study of personality in pilots began to fulfil the demands of the World Wars and concentrated on issues related to selection and training. Present day criteria comprise of "select in" and "select out" tests. The right people who have desirable personality traits for the job are selected and those individuals with abnormal behaviour and mental disorders are disqualified. If required, later evaluation needs to address not aeronautically adaptable traits and failing aviator syndrome traits. Personality studies in trying to provide a "typical" pilot profile have portrayed a number of different facets, which shows, there is no single personality type, which can be considered successful. The determination of personality comparison of female versus male pilots indicates differences. More recent studies suggest that personality interacts with flying performance and could be one of the many factors, which contribute to accidents or incidents. Interpersonal relationships and individual contribution to teamwork are important aspects of personality manifested in crew resource management. Crew interaction styles are related to stress coping strategies, which are found to be more action oriented in pilots. Future research needs to substantiate the possible interactive effects of training, operational stressors and personality as determinants of operational performance.

IJASM 2005; 49(1) : 54-62

**Keywords:** Personality, aviator characteristics, selection, performance

The word personality originated from the Latin word "persona", meaning "mask". In ancient Greek and Roman plays, masks were used to distinguish one character from the other. Similarly, personality distinguishes one person from the other. Personality is defined by Cattell as "that which permits a prediction of what a person will do in a given situation. Personality traits are mechanisms within the individual that shape how he/she reacts to classes of events and occasions" [1]. Personality traits are a set of categories that are used for describing, remembering and communicating characteristics of people. Trait characteristics lead people to behave in more or less distinctive and consistent ways across situations. The aviation scenario encompasses

many demanding and challenging situations in the air and/or the ground. The personality of the aviator is likely to have its own impact on tackling or approaching those demanding situations. Hence, knowledge about the pilot's personality and its influence on flying performance has an important bearing on flight safety.

This review explains the historical background of personality studies on pilots and the study of typical aviator characteristics. With the increasing number of female aviators, studies on them and their concerns are also important.

---

\*Resident, Aerospace Medicine  
Institute of Aerospace Medicine, IAF, Bangalore

<sup>+</sup>Sc'E', Professor & Head  
Dept. of Aviation Psychology  
Institute of Aerospace Medicine, IAF, Bangalore

The role of personality on selection and prediction of future flying performance, crew resource management, accident proneness and stress coping are discussed.

### **Historical Background**

The birth of Aviation Psychology dates back to World War I, when there was a demand for a continuous stream of new pilots and effective methods for selecting pilot candidates [2]. Since then a number of studies were conducted to find the aircrew personality characteristics and to devise scientifically based selection methods, so that the attrition due to failure or dropout during training could be minimized.

One of the initial studies described successful pilots as “high-spirited, happy-go-lucky sportsmen”. Within a few years another study stated “quiet and methodical men” as the best flyers [2]. Though a number of studies were conducted before World War II, they did not contribute much in emphasizing the relationship between the personality characteristics of pilots and their performance. In the ensuing years more rigorous research work was carried out.

In the early endeavour to assess personality characteristics of pilots, traditional personality tests such as Rorschach Test and Thematic Apperception Test were used. But the results had little correlation with the outcome of flight training. Hence the researchers started using tests designed for use in occupational testing. Some of the tests used were Millon Clinical Multiaxial Inventory, Personality Research Form, Minnesota Multiphasic Personality Inventory (MMPI), Eysenck Personality Inventory (EPI) and Edwards Personal Preference Schedule (EPPS). These tests portrayed the aviator as dominant, confident, competitive, achievement oriented,

un-anxious and socially outgoing [3].

### **Typical Aviator Characteristics**

Although various studies conducted on pilots reported that aviators do not form a homogenous population, a descriptive study on “the outstanding jet pilot” found that majority of them were first born children or functional equivalent of first born with a more close relationship with their father, reinforcing “positive male identification”. One interesting finding from the study was that 21 of the first 23 astronauts who went on space flights were first born. The pilots were self-confident, showed a great desire for challenge and success and were non-introspective [4]. Most of them shared the following traits of being intelligent, emotionally mature and stable, action oriented and reasonably adaptable.

A follow up study of 350 US Air Force pilot trainees for 10 year period found three types of aviators among the subject pool [5]. The first type, which comprised 58% of their sample, also labelled as ‘typical’ military pilots were described as achievement oriented, dominant, affable and stable. The second type, which accounted for 21% of the sample, had similar characteristics like the first type but also were unusually aggressive, dominant, self-aggrandizing and exhibitionistic. They were described as the ‘right-stuff’ group. The final 21% described as the ‘wrong stuff’ for military aviation had traits like being cautious, compulsive and socially retiring.

A similar study conducted on experienced military pilots using “Occupational Personality Questionnaire”(OPQ), which was specifically designed for use in work settings, revealed three distinct personality types [6]. The pilots in the largest cluster (48%) were labelled as ‘methodical extroverts’ and had strong needs to master their

environment and strong desire for novelty and change. The second group, which comprised 36% of the total sample, was described as apprehensive, emotionally controlled, inhibited and socially retiring. They were labelled as 'introverted worriers'. Finally a third type, which comprised 16% of the sample and labelled as 'competitive individualists', was described as competitive, highly independent and decisive. These types were similar to the 'typical', the 'wrong stuff' and the 'right stuff' of the previous study. These different clusters also existed in a recently conducted analysis on final stage selection of an astronaut population [7].

The fact that these subtypes were found among experienced military pilots suggests that there is no one stereotype of pilot personality, which is suitable for aviation. From both studies, it is evident that mere labelling as 'right stuff' or 'wrong stuff' did not help in predicting success or failure in military aviation.

The study done in India to find the "personality profile of a highly rated IAF pilot" described them as "above average in abstract thinking and high in stress tolerance, resilient, decisive, practical, sober and dependable". In a comparison of fighter and transport pilots, no statistical difference was found between the two groups. However, in absolute scores, fighter pilots were found higher on intelligence, self-sufficiency and emotional stability scores [8].

The "modal" or "typical" aviator as observed in many studies is nothing but the most frequently occurring type. But no two pilots can ever be the replica of the other and the above studies reveal that there is no one single type which can be labelled as successful. The "modal" aviator is a controller, who wants to control everything in

his/her life. They hate surprises and hence practice as much as possible to avoid them. They maintain emotional distance from others and hence find difficulty with intimacy in their marriages. On psychometric evaluation, they usually get high scores in gregariousness but are low in warmth. They are mission-oriented compartmentalizers, systematic and methodical, rely on checklists and feedback and have the ability to separate flying from non-flying-related issues [9].

Some contradictions reported to above mentioned psychological make-up of pilots include "high intelligence, but not intellectually oriented; team player but have anxiety in close relationships and appear easy-going despite driven quality" [9]. Though the characteristic traits of the typical aviator have been described, it has to be kept in mind that there is no single personality type, which can be considered successful. The role of self-selection to this career is downplayed in many of the studies and to what extent the self-selection has influenced this "typical" aviator portrait is difficult to comment.

The major limitations of many personality studies that were conducted are that, they concentrated mainly on male subjects, the subject pools were often from fighter pilots or astronauts at the expense of other aircrew like transport or helicopter pilots and navigators. Extrapolating findings from one group to other is highly complicated and may not be reliable.

### **Personality Studies on Female Aviators**

As the strength of female aviators is increasing, it is important to understand the gender differences in the personality characteristics of pilots. Only a few studies have been conducted on female pilots. One such study reported that

EPPS personality profile of female pilots was more similar to the male general aviation pilot profile than to the norms established for US adult male or female [10]. All aviators have a unique psychological profile and female pilot candidates are not a representative sample of the general population [11]. Hence determination of female psychological fitness to fly is complicated.

One study found men scored higher than women on competitiveness, but lower on expressivity and achievement striving [7]. Another study suggested greater female extraversion, agreeableness and conscientiousness. Females scored high on these scales and lower on neuroticism and openness than the male comparison group. These personality traits are highly adaptive for military pilots. Of particular interest is the fact that there were relatively large differences between female pilots and non-pilot females, whereas there were small differences between male and female pilot [7, 12, 13]. A study conducted at US Air Force School of Aerospace Medicine brought out the particular challenge for flight surgeons; the male aviators may cast female counterparts into inappropriate roles. The majority of male pilots interviewed voiced concern about their proclivity to protect women in combat. Female pilots were concerned about potentially being used to exploit men in prisoner of war camps [14].

### **Personality in Pilot Selection**

Personality assessment plays a vital role in pilot selection. Since the cost of training pilots is high, the dropout or failures are a big loss for the organization. Hence a selection system that is cost effective and decreases attrition is required [15].

Initial aeromedical assessment of many national Air Forces uses “select-in” and “select-

out” criteria at entry-level pilot selection. The select-in process was introduced in 1988 by a panel comprising aeromedical specialists. They gave the concept that mental health comprises three factors namely motivation, aptitude for the job (ability) and sensitivity to others (stability) [16]. “Select-out” is basically psychiatric criteria by which people with mental disorders will be disqualified during selection. However this eliminates only a very small unhealthy subset of total applicants. On the other hand “select-in” is a psychological criterion and not based on the presence or absence of mental illness, but forms the basis for identifying the right person with desirable personality traits for a particular job. Criteria must be validated before being used for selection. More over the psychometric tests used for selection must be culture and language specific because though everyone comprehends the language, some of the questions might not be applicable to everyone [17].

US Navy uses the concept of ‘Aeronautical Adaptability’ (AA) for assessing the psychological fitness of aviation personnel. In early 1920’s and 30’s the assessment of AA was simply what the flight surgeon felt about the candidates personality. But later a standardized approach was made. By definition, “all aviation personnel with a diagnosed personality disorder or those with maladaptive personality traits that have a documented effect on safety of flight, crew coordination or mission completion, are determined to be not aeronautically adapted (NAA)” [18]. One recent study suggests that the NEO-PI-R, which is based on the Five Factor theory of “normal” personality, is relevant in assessing AA. This study describes NAA individual as “inefficient, undependable, self-effacing, pessimistic, easily-overwhelmed, sober and sedentary relative to AA individuals” [19].

Personality traits that are important to be considered during the selection are achievement-oriented traits like motivation, rigidity, mobility and vitality. Interpersonal behavioural traits like extraversion, empathy, aggressiveness and dominance, emotional stability and positive coping skills are also pertinent. Candidates with traits like high anxiety and impulsiveness should be excluded [1]. Dependent and avoidant personality traits are incompatible with aviation. These individuals have the tendency to belittle their own accomplishments and may choose flying for wrong reasons [18].

The identification of desirable personality traits among successful pilots might, at first glance, provide a convenient and useful way for evaluation of psychological suitability of an individual for military aeronautics. However, there are difficulties with this approach. First, psychometric studies of pilot personality have relied on “mean” comparisons among the groups using the scale averages for the samples. This approach empirically emphasizes homogeneity and obscures variability or heterogeneity within the sample. Secondly, such studies imply that the nature and degree of the characteristics identified constitute the “right stuff” for military aviation and anything less is not adaptive. The right stuff is not the “only stuff” when it comes to personality types likely to be successful in military aviation [6]. Thirdly, there are many different motivations to fly. What is not known is whether particular characteristics are required for the job or if the job attracts people with these traits, or if both factors are operative. Therefore, attempting to understand the individual aviator is very important. Such findings warn against relying on pilot personality stereotypes and preconceived notions for determining suitability for military aviation. These, especially if they are personalized, need to be avoided.

## **Personality in Relation to Flying Performance**

Though there are a number of studies on pilot personality, the debate on whether personality predicts flying performance still exist. One of the shortcomings of pilot selection batteries is that most of the selection batteries predict training performance but not the operational performance and hence, have a low correlation between the tests and performance [5]. Moreover, the short-term research on training performance can be affected by the “honeymoon effect”. So the student pilots who try to do their best can perform well for a short-run. Data obtained from large sample analysis and using the Big Five taxonomy suggest that personality measures contribute significantly in predicting the post training performance [2]. A study on US student Naval aviators and student Naval flight officers using “Tridimensional Personality Questionnaire” and the “Hand Test” depicted the prototypical naval aviation candidate as having high goals and engaging in constructive activity to achieve those goals. The results also suggested that personality interacts with performance [15]. Conscientiousness was considered the most important dimension and predictor of performance among the Big Five personality traits, viz. neuroticism, extraversion, openness to experience, agreeableness and conscientiousness [20]. A recent study was done to determine whether significant personality differences exist between pilots flying different types of aircraft. On the Big Five traits the fighter pilots (FP) scored lower on agreeableness and higher on conscientiousness than the airlift/tanker (AP) pilots. On the facet scores the FP scored higher on assertiveness, activity, competence and achievement striving. They were lower on anxiety, self-consciousness, vulnerability, warmth and tender mindedness, as

compared to the AP group [21]. Future research needs to substantiate the possible interactive effects of training, operational stressors and personality as determinants of operational performance.

### **Pilot Personality and Accident Proneness**

Many studies were carried out to find whether there is any relation between personality and performance in terms of accident rates. Accident proneness starts from birth or at a young age. Accident-prone aircrew share certain personality traits, which make them vulnerable to accidents. They fail at stress coping, may internalise their feelings and become self-destructive or externalise their feelings and blame others. These traits may cause personality conflicts [22,23]. If a pilot is highly accident prone, he or she may commit errors either by an act of commission or omission [24].

The five hazardous thought patterns namely Anti-authority, Impulsivity, Invulnerability, Macho attitudes and Resignation which increases the accident risk have been identified to have correlation with certain personality dimensions [3]. But there are dividing opinions on whether these thought patterns are modifiable or enduring personality traits that resist changes.

Initial studies using the standard personality tests identified the pilots previously involved in accidents in which pilot error was cited as the cause [3,25]. One study found that three of Cattell's sixteen personality factors correlated highly with accident history. The investigators were able to determine with 86% accuracy whether a pilot had previously been involved in a pilot error. As defined by these three factors, pilots in this accident group were more group dependent,

practical and shrewd [25]. But a cross validation study made on another group of pilots failed to replicate these findings [26]. Personality may thus be one of the many factors, in the chain of events and situations, which may cascade to ultimately precipitate an accident or incident.

### **Crew Resource Management (CRM)**

Due to the changing trend in mission, fighter flying is no longer just an individual performance. It is teamwork and has changed from dog fighting to multi-crew mission. CRM plays a vital role in mission accomplishment and flight safety. Hence it is not only the individual personality per se that is important during selection but due consideration should be paid to interpersonal relationships and the individual contribution to teamwork [1].

The two important dimensions of personality, that are important for CRM, are instrumentality and expressivity. Instrumentality traits are goal seeking and achievement motivation. The achievement motivation has three aspects namely the work, mastery and competitiveness. Expressive traits are interpersonal communication and sensitivity. Three categories of aviators were identified in a study on CRM. The first group was found to have both positive instrumentality and positive expressivity; the positive expressivity being low competitiveness and low verbal aggression. This group is the best for multi-crew cockpit. They are hard working to achieve their goals and at the same time give respect to other's desires and needs. The second group had high instrumentality and low expressivity (the negative component of expressivity is verbal aggression) but poor communication skill. The third and final group was low in both expressivity and instrumentality. The negative instrumentality being negative communion (subordinating oneself to others and gullible) and

had negative goal seeking behaviour like arrogance and dictatorship [27,28].

All these groups were assessed on three attitudes relevant to CRM using the 'Cockpit Management Attitudes Questionnaire' (CMAQ). The results revealed that 'communication and coordination' was highest in the first group and lowest in the third group. The other attitude dimension 'command responsibility' did not correlate well with personality before training. However after training the first group showed marked improvement. The second and third groups showed little change and deterioration of responsibility respectively. In the last dimension, 'recognition of stressor effects', the first group initially had the lowest score. But after training they scored the highest, which denotes the marked attitude change with training when compared with the other two groups [3].

### **Stress Coping**

Typical pilots are seen to have effective psychological resources for managing life styles. Stress coping strategies are related to personality predisposition of the pilots and crew interaction styles [29]. Pilots use less of defence-oriented strategies like arguing, denial and withdrawing and they tend to use more of action-oriented strategies to cope up with stress. Pilots who fail to cope up may internalize their feelings and become depressed or externalize them by denying or projecting them on others. These personality traits were identified to interfere with CRM and could lead to personality conflicts [30].

### **Personality Characteristics of Failing Aviator**

It is important to understand the personality characteristics of the failing aviator, so that he/she can be recognized in advance by the observer

before any mishap. Some factors found in this syndrome were excessive aggressiveness, impulsivity, decreased tolerance for tension/stress, resentful of authority, less in harmony with environment, being ego involved and hence overtly sensitive to criticism of flying abilities, strict moral and/or religious upbringing, financial problems, recent major career decision and difficulty with interpersonal relationships [31].

### **Conclusion**

It is evident that the personality of the aviator plays an important role especially in certain situations like the pilot selection process, interpersonal ability of relevance to CRM and gender differences in aviators. Personality may be one of a multitude of factors, which contribute to aircraft incidents or accidents. However it is difficult to comment on which personality profile is more suitable for aviation as measured by select-in tests. There are certainly some incompatible traits, such as the dependent and avoidant personality traits, which are not aeronautically adaptable. These assume importance in pilots who may choose flying for the wrong reasons and in those who exhibit the failing aviator syndrome. Such aircrew should be recognised in advance and taken out of risky flying if required, as they are likely to pose a threat to flight safety. In conclusion, personality is a pertinent issue as and when related to flying performance.

### **References**

1. Goeters KM. Aviation Psychology: a science and a profession. 1<sup>st</sup> ed. Hants: Ashgate Publishing Ltd, 1998.
2. Hunter DR, Burke EF. Handbook of pilot selection. 1<sup>st</sup> ed. Hants: Avebury Aviation, 1995.
3. Stokes A, Kite K. Flight Stress: stress, fatigue, and performance in aviation. 1<sup>st</sup> ed. Hants: Avebury Aviation, 1994.

4. Christy RL. Personality factors in selection and flight proficiency. *Aviat Space Environ Med* 1975; 46 (3): 309-11.
5. Berg JS, Moore JL, Retzlaff PD, King RE. Assessment of personality and crew interaction skills in successful naval aviators. *Aviat Space Environ Med* 2002; 73 (6): 575-59.
6. Picano JJ. Personality types among experienced military pilots. *Aviat Space Environ Med* 1991; 62 (6): 517-20.
7. Musson DM, Sandal GM, Helmreich RL. Personality characteristics and trait clusters in final stage astronaut selection. *Aviat Space Environ Med* 2004; 75 (4): 342-49.
8. Ramachandran N, Wadhawan JM, Kumar V, Chandramohan V, Rao PLN. Personality profile of an IAF pilot: its usefulness in pilot selection. *Av Med* 1983; 21 (2): 131-39.
9. King RE. *Aerospace clinical psychology*. 1<sup>st</sup> ed. Hants: Ashgate Publishing Ltd, 1999.
10. Novello JR, Youssef ZI. Psycho-social studies in general aviation: II. Personality profile of female pilots. *Aerospace Med* 1974; 45(6): 630-33.
11. Lyons TJ. *Women in the military cockpit*. Washington DC: US Government Printing Office; 1991 Report No AL-TR-1991-0068.
12. King RE, McGlohn SE, Retzlaff PD. Female USAF pilot personality: The new right stuff. *Mil Med* 1997; 162(10): 695-97.
13. King RE, Rowe PS, Breeck KJ. Female pilot personality and motivation to fly. *AsMA 2005 Meeting Abstracts* 317, *Aviat Space Environ Med* 2005; 76 (3): 280.
14. McGlohn SE, King RE, Butler JW, Retzlaff PD. Female USAF pilots: Themes, challenges, and possible solutions. *Aviat Space Environ Med* 1997; 68 (2): 132-36.
15. Lambirth TT, Dolgin DDL, Rentmeister-Bryant HK, Moore JL. Selected personality characteristics of student naval aviators and student naval flight officers. *Int J Aviat Psychol* 2003; 13 (4): 415-27.
16. Jones DR, Marsh RW. Psychiatric considerations in military aerospace medicine. *Aviat Space Environ Med* 2001; 72 (2):129-35.
17. Santy PA, Jones DR. An overview of international issues in astronaut psychological selection. *Aviat Space Environ Med* 1994; 65 (10):900-3.
18. Christen BR, Moore JL. A descriptive analysis of "not aeronautically adaptable" dispositions in the US Navy. *Aviat Space Environ Med* 1998; 69 (11): 1071-75.
19. Ellis S, Moore J, Dolgin D. Aviator personality assessment: Part I- Aeronautical adaptability. *AsMA 2001 Meeting Abstracts* 118, *Aviat Space Environ Med* 2001; 72 (3): 254.
20. Siem FM, Murray MW. Personality factors affecting pilot combat performance: a preliminary investigation. *Aviat Space Environ Med* 1994; 65 (5, Suppl.) A45-48.
21. Boyd JE, Patterson JE, Thompson BT. Psychological test profiles before training vs type aircraft flown. *Aviat Space Environ Med* 2005; 76(5): 463-68.
22. Alkov RA, Giaynor JA, Borowsky MS. Pilot error as a symptom of inadequate stress coping. *Aviat Space Environ Med* 1985; 56 (3): 244-47.
23. Frank LH. The myth of the accident prone. *Flying Safety* 1981; Feb:26-27.
24. Cooper CL. The stress of work: an overview. *Aviat Space Environ Med* 1985; 56 (7): 627-32.
25. Sanders MG, Hoffman MA. Personality aspects of involvement in pilot-error accidents. *Aviat Space Environ Med* 1975; 46 (2): 186-90.
26. Sanders MG, Hoffman MA, Neese TA. Cross validation of personality aspects of involvement in pilot-error accidents. *Aviat Space Environ Med* 1976; 47(2):177-79.
27. McFadden TJ, Helmreich RL, Rose RM, Fogg LF. Predicting astronaut effectiveness: a multivariate approach. *Aviat Space Environ Med* 1994; 65 (10): 904-09.



28. Jones DR. Aerospace Psychiatry. In: De Hart RL, Davis JR, editors. *Fundamentals of Aerospace Medicine*. 3<sup>rd</sup> ed. Philadelphia: Lippincott Williams & Wilkins, 2002; 405-6.

29. Berg JS, Moore J. Relationship of personality and stress coping styles in experienced Naval aviators. *AsMA 2001 Meeting Abstracts* 121, *Aviat Space Environ Med* 2001; 72 (3): 255.

30. Raymond MW, Moser R. Aviators at risk. *Aviat Space Environ Med* 1995; 66 (1): 35-39.

31. Voge VM. Failing aviator syndrome: a case history. *Aviat Space Environ Med* 1989; 60 (7,Suppl.): A89-91.