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**PERSONALITY AND HAZARDOUS JUDGMENT PATTERNS  
WITHIN A STUDENT CIVIL AVIATION POPULATION**

John R. Ives

**ABSTRACT**

*The purpose of this study was to investigate the relationship between personality profiles and hazardous judgment patterns within a student civil aviation population. Thirty subjects receiving private pilot instruction from the Federal Aviation Administration (FAA) certified flight schools or independent private instructor pilots in central Texas successfully completed testing. Two instruments were employed: the Myers-Briggs Type Indicator (MBTI), Form G--Self-Scorable (Briggs & Myers, 1987), and an inventory designed by researchers at Embry-Riddle Aeronautical University to measure pilot hazardous attitudes (Berlin, et al., 1982). Data analysis was conducted using Pearson's r. While the results provided limited support for the existence of personality/hazardous attitude relationships, they failed to support the research hypothesis at the level of significance established ( $p < .05$ ). Results from the Embry-Riddle inventory demonstrated strong similarities to those obtained by earlier researchers (Lester & Bombaci, 1984). Type distribution from the MBTI suggested the existence of an aggregate personality profile considerably distinct from the general population at large.*

**INTRODUCTION**

Analysis of the human/machine relationship demonstrates a propensity for the living system to break down both systematically and in a random, virtually unpredictable, manner. As technology becomes progressively more reliable, the role of human error in accident causation becomes proportionally greater and the need to understand it, correspondingly more germane. Nowhere is such research more relevant than within the context of aviation operations, where approximately two-thirds of all accidents are attributable to human causes (Foushee & Helmreich, 1988; Nagel, 1988). With human error as the leading causal factor in 90 percent of all general aviation accidents (Nagel, 1988), the need for research in this area is especially acute. Indeed, the challenge of unraveling and understanding the myriad complex human factors in aviation has been aptly qualified by Billings and Reynard (1984) as "the last great frontier in aviation safety" (p. 961).

Within this frontier lies the realm of

human judgment, errors which Jensen and Benel (1977) have advanced as the primary cause of more than half the pilot fatalities recorded by the FAA between 1970 and 1974. Subsequent research has addressed the importance of pilot judgment training and potential approaches to its application within various operational settings (Jensen, 1982; Jensen & Benel, 1977). The encouraging results obtained by researchers studying the effects of judgment training upon the incidence of pilot decisional errors (Berlin et al., 1982; Buch & Diehl, 1984) underscore the importance of further research in this area. Given the demonstrated impact of education upon the quality of pilot decision making and corresponding importance of developing sound feedback and instructional tools, further research conducive to the formulation of correlational and causal models of pilot judgment is imperative.

**Statement of the Problem**

The purpose of this study was to investigate the relationship between personality profiles and hazardous

judgment patterns within a student civil aviation population. The term personality profile was defined as the aggregate of innate tendencies comprising one's orientation towards life, manner of perceiving things, method of arriving at decisions, and way of dealing with the outside world as measured respectively by the extraverted/introverted (E-I), sensing/intuiting (S-N), thinking/feeling (T-F), and judgment/perception (J-P) indices of the (MBTI), Form G--Self-Scorable (Myers & McCaulley, 1985; Myers & Myers, 1987). Hazardous judgment patterns were defined as trends in decision making that reflect tendencies towards one or more of the five hazardous attitudes (anti-authority, impulsivity, invulnerability, macho, and resignation) measured by the inventory developed by researchers at Embry-Riddle Aeronautical University (Berlin et al., 1982).

#### **Review of Related Literature**

A wide range of research has been conducted that supports a relationship between distinct personality types and various military and civil aviation populations (Fry & Reinhardt, 1969; Picano, 1991; Retzlaff & Gibertini, 1987; Ashman & Telfer, 1983; Novello & Youssef, 1974a, 1974b). Additional studies support the existence of a relationship between personality profiles and success in pilot training (Jessup & Jessup, 1971; Bucky & Ridley, 1972), while further research suggests a relationship between elements of pilot personality and adverse operational performance (Sanders & Hofmann, 1975; Levine, Lee, Ryman, & Rahe, 1976; Alkov & Borowsky, 1980). Apparent is the availability of a large body of literature supporting the existence of distinct pilot personality profiles and personality/performance relationships within the context of

various research populations and methodologies. Yet a deficiency lies in the shortage of cross-validation research and, where cross-validation research has been conducted, the failure of this research to support previous findings (Sanders, Hofmann & Neese, 1976).

Research has been conducted that advances evidence for a relationship between pilot personality and patterns of irrational judgment. In a study involving 35 civil pilots, Lester and Bombaci (1984) employed Cattell's Sixteen Personality Factor Questionnaire (16PF) (Cattell, Eber, & Tatsuoka, 1970), the Rotter Locus of Control Scale (Rotter, 1966), and an inventory developed by researchers at Embry-Riddle Aeronautical University (Berlin et al., 1982) to assess the relationship between elements of personality and pilot hazardous attitudes. Three hazardous attitudes predominated: invulnerability (strongest in 43 percent of the population), impulsivity (strongest in 20 percent of the population), and macho (strongest in 14 percent of the population). While no significant relationship existed between the hazardous thought patterns and impulsivity or superego scales of the 16PF, the study revealed a significant relationship between the three hazardous attitudes and 16PF integration/self-concept control scale. A significant relationship was also found between the three hazardous attitudes and Rotter Locus of Control Scale.

#### **METHOD**

##### **Subjects**

Thirty-three individuals, 29 male and 4 female, were identified as currently receiving private pilot instruction from FAA certified flight schools or independent private instructor pilots in central Texas. The population included only those indi-

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viduals that possessed a current student pilot certificate, had completed a minimum of one solo flight, and held no previous rating relative to civil or military flight operations. All 33 individuals identified were contacted for participation. Thirty subjects, 27 male and 3 female, successfully completed the two inventories. Two individuals declined to participate, and one terminated testing prematurely due to objections to inventory content. Subjects completing the two inventories ranged from age 17 to 46 ( $M=30.5$ ,  $SD=8.4$ ).

Student pilots were accessed through five flight schools and one independent private instructor pilot. Subject participation was voluntary and did not involve payment. Efforts to identify eligible student pilots continued until 30 subjects successfully completed the two inventories. Suitability of the sample size was based upon the acceptable sample minimum of 30 subjects in correlational research designs (Gay, 1987). While the study yielded potentially valuable findings, the lack of random sampling may limit generalization of the results obtained.

**Instruments**

The study employed two instruments: the MBTI, Form G--Self-Scorable (Myers & Myers, 1987), and an inventory designed by researchers at Embry-Riddle Aeronautical University to measure pilot hazardous attitudes (Berlin et al., 1982). The MBTI is a personality measure based upon Jungian theory of personality type, a theory that approaches human behavior as orderly and consistent and behavioral differences as the product of variations in the innate tendencies that compose an individual's approach towards life (Jung, 1968). A forced-choice, self report inventory, the MBTI measures four indices

of personality through the assessment of 94 scored, bipolar item responses. These indices--extroverted/introverted, sensing/intuiting, thinking/feeling, and judgment/perception--represent respectively the innate tendencies in an individual's orientation towards life, manner of perceiving things, method of arriving at decisions, and way of dealing with the outside world. The instrument offers the option of presenting scores relative to each scale in either a continuous or dichotomous manner. For purposes of this study, both options were employed, the former to more accurately and precisely assess the relationship between personality and hazardous judgment variables and the latter to identify type distribution within the population. The reliability and validity of the MBTI stand well established through extensive use and testing (Carlyn, 1977; Carskadon, 1979). While evidence supports the usefulness of the instrument within the context of decision making tasks (Davis, Grove, & Knowles, 1990), an extensive review of the literature revealed no similar aviation related applications.

The Embry-Riddle inventory is a 10-item, forced-choice, self-report measure designed to measure the five major hazardous thought patterns associated with irrational pilot judgment. These attitudes--anti-authority, impulsivity, invulnerability, macho, and resignation--reflect respectively resistance to external control, impetuosity, delusions of harm transcendence, occupation with the affirmation of prowess, and passive submission to external forces. The inventory consists of 10 flight scenarios, each involving an error in pilot judgment accompanied by five possible explanations. These explanations correspond to each of the five hazardous attitudes discussed.

Based upon an assessment of why they themselves would have made the judgment error, subjects are required to rank the explanations presented on a scale from least to most probable. The product is a set of scores for each subject that reflects the relative strength of each of the five hazardous attitudes measured. "These five hazardous thought patterns," according to Lester and Bombaci (1984), "have the status of intervening variables or constructs, mediating the link between more basic psychological processes and irrational pilot judgement" (p. 567). The study by Lester and Bombaci provides statistical evidence to support the inventory's construct validity, while the content validity of the measure appears reasonable. An extensive review of the literature revealed no information concerning the inventory's reliability.

#### **Procedure**

Testing took place throughout a series of sessions beginning in August 1992 and concluding in November 1992. Library study areas, flight school lounges, office areas, restaurants, and subject homes were employed. Locations and times of testing sessions were determined on a case-by-case basis, contingent upon subject, administrator, and facilities availability. Each subject participated in one testing session. The investigator, with a manager from one of the flight schools, administered the two instruments involved. The manager was trained in commonly accepted testing procedures.

Initial contact with subjects involved introductions, explanation of the testing session as an element of academic research, and determination of suitable times and places for testing. Prior to testing, subjects were verbally informed that test

results would be held in strict confidence through a control scheme that ensured anonymity by associating test values solely with numerical subject designators. In no manner were test data or numerical designators associated with the actual names of test participants. Designators were randomly assigned at the conclusion of all testing in order to avoid linkage based upon the chronological order of individual subject testing.

During each session, participants were asked to complete both inventories, the relevance of which was withheld until completion of the testing session. Instructions were presented orally and any questions regarding test mechanics entertained. Subjects were instructed to proceed in a self-paced manner, complete each item, and continue through completion of both inventories. No time constraints were associated with the administration of either inventory. As testing concluded, the administrator reviewed each inventory to ensure a valid response had been provided for each item. Participants were offered a brief explanation of the study, and questions addressing the research were addressed.

#### **RESULTS**

Pearson's  $r$  was employed to determine the correlational strength between the values obtained from the individual personality indices of the MBTI and those obtained relative to each of the hazardous attitudes measured by the Embry-Riddle inventory. This was appropriate given the interval nature of the data obtained from each of the two tests. Correlation coefficients are presented in **Table 1**. With  $p < .05$ , all correlation coefficients calculated failed to demonstrate significant linear relationships between the variables measured by the

**Table 1**  
**Correlation Coefficients for Hazardous Attitude/Personality Index Measures**

Hazardous Attitude	Personality Index			
	E-I	S-N	T-F	J-P
Anti-Authority	-.12148	.16289	.12232	.14848
Impulsivity	-.02064	.18860	.09107	.07541
Invulnerability	.03016	-.15972	.12789	-.33591
Macho	-.19095	-.20254	-.07880	.08582
Resignation	.31205	.05768	-.30429	.11046

Note: Significant linear correlation at  $p < .05 = +$  or  $- .36109$  and for  $p < .01 = +$  or  $- .30612$ .

MBTI and those measured by the Embry-Riddle hazardous attitudes inventory. With  $p < .1$ , however, the coefficients calculated supported the existence of significant relationships between the J-P/invulnerability and the E-I/resignation indices. In the former relationship, greater J and lesser P affiliation correlated directly with greater invulnerability affiliation. In the latter relationship, lesser E and greater I affiliation correlated directly with greater resignation affiliation.

Affiliation with three hazardous attitudes predominated, with invulnerability, impulsivity, and macho strongest in 40, 20, and 17 percent of the population respectively. Anti-authority and resignation appeared strongest in approximately 13 and 7 percent of the population respectively. One individual, approximately three percent of the population, did not manifest a single dominant hazardous judgment pattern.

Type distribution within the population

reflected the following percentages: 50 percent E, 47 percent S, 89 percent T for males, 33 percent F for females, and 47 percent J. These results suggest that a given student pilot will likely manifest type T personality preferences, but will manifest type preferences associated with the E-I, S-N, and J-P indices at almost equal levels of predictability. This is an important observation that, if supported by further research, could be used to great benefit for purposes of formulating/selecting student pilot curricula, educational materials, and instructional approaches.

#### CONCLUSIONS

Based upon the results obtained, it would be inappropriate to firmly assert or deny the existence of personality/hazardous attitude relationships within the student civil aviation population measured. While the results provide limited support for the existence of personality/hazardous attitude relationships, they fail to support the research hypothesis at the level of signifi-

cance established ( $p < .05$ ). As a result, additional research is required to determine conclusively whether or not actual relationships exist.

Strong similarities between the results obtained from this study and those obtained by Lester and Bombaci (1984) stand worthy of investigation. In both studies, results from the Embry-Riddle inventory supported predominant affiliation with the same three hazardous attitudes and very similar distributions of predominant hazardous attitude affiliation. These similarities between student civil aviators and their more seasoned counterparts suggest possible propensities within the civil pilot population as a whole and raise important questions concerning the impact of experience upon pilot attitudinal patterns over time.

Equally important are differences between the number of subjects manifesting particular personality traits as measured by the MBTI and type distribution within the general population of the United States as projected by Myers and McCaulley (1985). Myers and McCaulley projected a type distribution of 75 percent E, 75 percent S, 60 percent T for males, 65 percent F for females, and 55 to 60

percent J. Apparent is a large disparity between the percentages obtained from the present study and those projected by Myers and McCaulley for a general U.S. population. This suggests the existence of an aggregate personality profile for the student civil pilot population that is considerably distinct from the general population at large.

While this study fails to unequivocally support certain correlational models, it does substantiate the findings of earlier researchers conducting similar work as well as provide potentially valuable information concerning the distinct character of the student civil pilot population. One of the most valuable applications of such research lies in the area of training--in the development of curricula, educational materials, instructional methods, measures, and feedback instruments--as supported by the impact of education upon the quality of pilot decision making. The development of models that further an understanding of pilot personality and hazardous judgment patterns contributes significantly to this process. An important area of study, it warrants further attention and carries with it the potential for major training applications. □

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