Personality Type Preference Assessment as a Component of Pilot Training

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In aviation education and training, students experience a number of tests to determine their technical abilities and theoretical knowledge. When piloting an aircraft, many stage checks and examinations must be completed before a license is issued. Even then, the testing does not stop; pilots in commercial aviation are subject to a whole range of periodic checks in simulators and in the air. During these evaluations, shortcomings in technical abilities can be identified and corrective action taken before retesting. However, during testing, candidates are especially careful to minimize any tendencies they may have under normal circumstances to, for example, make a short cut in a checklist. Hazardous thought patterns are unlikely to surface under test conditions. In the past, numerous personality tests have been administered to pilots in attempts to determine the likelihood of success. Conversely, very few studies have been done to use such tests to attempt to determine the likelihood of failure or, even further, to determine the most likely type of failure. This paper discusses the possibility of using a personality type preference assessment (Myers-Briggs Type Indicator (MBTI®)) to determine the most likely type preferences conducive to failure (e.g. impulsiveness) of individuals and using the information to develop interventions at an early stage in training.

Flying can be a dangerous game in which human error, if not managed successfully, can lead to disastrous consequences. Crew Resource Management (CRM) uses what is already known about human error and combines it with accident analyses and critical incident reports to develop methods to reduce the incidence and consequences of such errors to a minimum. CRM advocates “error management” to avoid errors, trap errors and mitigate errors. CRM assumes that human error is inevitable, but the first line of defense is avoidance. In a perfect world, the only errors that cannot be avoided are those that cannot be predicted. Unfortunately, it is not a perfect world and humans will still occasionally commit those errors, intentional or not, that we do know are possible.

Many studies have been conducted regarding human error and although this has resulted in extensive knowledge of contributing factors, total elimination is still not possible and probably never will be. Several approaches to human error have been developed, including the “person model”, which is a traditional approach to human error that "names, blames, and shames" one or more individuals as "causing" the accident. The underlying assumption is that mistakes and errors are the result of faulty, negative mental processes such as negligence or lack of skill. This model uses fear and discipline to attempt to improve safety and considers errors a "moral" issue that "bad things happen to bad people” (Reason, 2000). Another model is the “system model” which recognizes that there are systemic contributions to and causes of error. It acknowledges that organizational culture, human-to-system interface design, and environmental elements can create "latent failure" conditions which contribute to human error. The model recognizes human limitations and accepts that human error is inevitable, and thus concludes that systems should be designed to anticipate human error and to mitigate the consequences (Reason, 2000).

If every effort is made to prevent the occurrence of human error, then inevitability can be reduced somewhat. Current CRM training seeks to encourage the avoidance of human error by some simple and common sense measures, such as complete pre-flight and in-flight crew briefings or strict adherence to Standard Operating Procedures (SOPs). Adherence to these CRM principles helps to maintain situational awareness on the part of the whole crew (FAA), which also reduces the inevitability of the errors that may be likely.

The International Civil Aviation Organization (ICAO) Safety Management Manual cites the need for intervention strategies in safety management systems (SMS). Safety risk management in SMS operations builds upon a system design in which appropriate safety risk controls intended to eliminate or mitigate the consequences of anticipated hazards are embedded in the system. Identification of these is therefore the first step in a formal process of
collecting, recording, acting on and generating feedback about hazards and safety risks in operations (ICAO, 2009). This paper is concerned about dangers from individuals who, although seemingly professional in their work attitudes, may nevertheless be prone to particular types of hazardous thought patterns due to their fundamental personality type preference. If correlations can be made between personality type preferences and types of errors, then intervention during training to bring awareness of these correlations may reduce the number of occurrences.

**Personality profiles concept**

Profiles administered in an effort to determine psychological type concentrate on identifying traits and measuring the strength of these traits, and are often used as a predictor of suitability for certain career paths. However, traits are the result of quantitative analysis, using continuous data, and have scores in relation to a comparative group. When graphed, the results of such measurements usually form a bell curve and often the greatest importance is given to how close or far an individual is from the mean. These tests are often used diagnostically and results are described in terms of means and standard deviations. In comparison, instruments such as the Myers-Briggs Type Indicator (MBTI®) assess type preferences – a description of an individual’s preferred way of behaving or acting. These assessments do not measure; instead, they sort into categories. Furthermore, they do not indicate a strength of a particular preference but, instead, a clarity which merely indicates how certain a person is of his or her preference at the time he or she took the test. Type assessments are qualitative and results should never be used diagnostically (Briggs-Myers, McCaulley, Quenck, & Hammer, 1998).

The MBTI® assessment is based on a theory of personality type developed by Carl G. Jung. Jung’s theory is intended to explain the normal differences between healthy people and, based on his observations, led him to conclude that differences in behavior result from inborn tendencies to use one’s mind in different ways. More importantly, Jung theorized that as people act on these tendencies, they develop predictable patterns of behavior. Jung observed that active minds are involved in two mental activities: taking in information (perceiving) and organizing information and reaching conclusions (judging). Jung defined two opposite ways that people perceive (sensation and intuition, the S-N dichotomy) and two ways of judging (thinking and feeling, the T-F dichotomy). He also observed two opposite ways in which people focused their energy, basically outward (extraversion) or inward (introversion) or the E-I dichotomy. Briggs and Myers further developed Jung’s theory and added another dichotomy describing how people orient themselves to the outer world, or organize – the judging-perceiving dichotomy (J-P) (Myers, 1998).

The MBTI® instrument has undergone decades of reliability and validity testing. Test-retest reliabilities show consistency over time, with levels of agreement much greater than by chance. Changes, although rare, are most likely to occur in only one preference pair, usually in cases where the original clarity was low. Evidence exists for the validity of the four preference scales along with evidence for the validity of whole types. Detailed descriptions of research into reliability and validity may be found in the MBTI® manual (Briggs-Myers, McCaulley, Quenck, & Hammer, 1998).

Personality tests may be administered at various stages of career progression – training, pre-employment, concurrent and post-employment and are often used for selection and placement. However, the MBTI® tool is bound by a strict code of ethics which prohibits its use for evaluation of performance and suitability for employment. Administration of the assessment must be purely voluntary and results are confidential between the responder and the practitioner. Only those properly certified as MBTI® practitioners may administer the instrument and conduct the interpretation. Furthermore, individuals are subject to type development as they mature. This is not to say that their four-letter type is going to change as they grow older, but merely that they develop their less preferred side and learn when to use them. In fact, people of the same four-letter type may well exhibit different behaviors.

**Use of personality studies in aviation**

Personality characteristics have historically been used in attempts to predict those who would be successful and safe pilots. Bearing in mind that personality is the characteristic way in which a person normally thinks, feels and behaves (American Psychiatric Association, 1980), it is difficult to apply a personality characteristic to success in
aviation due to the stressful nature of the field. In fact, several studies have failed to find a relationship between pilot personalities and success in pilot training programs (Dillinger, Wiegmann, & Taneja, 2003). The Army Air Force’s aviation psychology program conducted one of the earliest studies to identify personality characteristics that would predict aviation performance (Guildford, 1947). In general, the personality measures used did not predict success in primary flight training. By far the majority of similar studies have been done using data on military pilots and very few studies have been conducted using data on commercial pilots. Furthermore, a study completed in 1983 (Ramachandran, Wadhawan, Kumar, Chandramohan, & Rao, 1983) found that the personality profiles of commercial aviation pilots differ from those of military pilots. However, a study carried out by a team from the University of Illinois, Human Factors Division (Dillinger, Wiegmann, & Taneja, 2003) concluded that civil aviation pilots have different personality characteristics than non-pilots.

Do some people cope better with stressful situations than do others, and can behaviors linked to certain personality traits actually be changed through intervention and training? Indeed, many intervention strategies have been applied in the field of aviation to try and reduce the occurrence of human error, mostly in the form of improved ergonomic design, improved training and hazard awareness. The FAA has long used awareness training of five hazardous attitudes – anti-authority, invulnerability, impulsiveness, machoism and resignation – in its aeronautical decision making (ADM) training guidelines. However, few studies have investigated whether or not any links exist between personality characteristics and a tendency to display these behavioral characteristics.

Dr. Ganesh A and Dr. Catherine Joseph provide an excellent overview of personality studies in aircrew (A & Joseph, 2005), using Raymond Cattell’s definition of personality as “that which permits a prediction of what a person will do in a given situation”. When discussing the historical background of aviation psychology, they point out the results of two studies as being contradictory. One described successful pilots as “high-spirited, happy-go-lucky sportsmen” while another described the best aviators as “quiet and methodical men” (Hunter & Burke, 1995). Later tests, using different methods, portrayed aviators as dominant, confident, outgoing and stable. A 2002 study of military trainees (Berg, Moore, Retzlaff, & King, 2002) identified three different types of military pilot and classified them as “typical” (achievement oriented, dominant, affable and stable), “the right stuff” (similar but also aggressive, self-aggrandizing and exhibitionistic) and “the wrong stuff” (cautious, compulsive and socially retiring). A further study conducted on experienced military pilots (Picano, 1991) identified three very similar groups. These two studies do not indicate any stereotype of successful military pilot personality.

The cost of training pilots is very high, thus the military has spent a great deal of time and money in developing and researching methods to select those candidates likely to be successful. However, the studies just described show that this is difficult since no two successful pilots are the same. With the increasing population of female aviators, a recognition of gender differences is also needed. Studies have been conducted on female pilots and one (Novello & Youssef, 1974) concluded that the personality profile of female pilots was more similar to the male pilot profile than to any norms established for U.S. adult males or females. Other studies showed that female pilot profiles differed only slightly from male pilots but differed greatly from non-pilot females. It is generally accepted that selection can be done with personality testing, but only to reject the obvious, such as those with emotional instability, high anxiety or extreme impulsiveness.

Companies in the U.S. and in Europe that offer sponsorship or scholarships for commercial pilot training generally use selection tests to determine aptitude rather than personality. However, the requirements for being accepted into most commercial pilot training programs in the U.S. are medical, as regulated by the FAA. For example, at the institution where the authors of this paper are employed, the only requirement for enrollment is a FAA 2nd class medical and a suitable GPA and ACT score. In the authors’ experiences, a whole variety of personality types have found success whereas others, with the same types, have not.

Studies have been conducted to determine relationships between personality and involvement in mishaps. Evidence indicates that many “accident-prone” pilots do indeed share particular traits such as inadequate stress coping ability and blaming of others (Frank, 1981), (Alkov, Giaynor, & Borowsky, 1985). Although the five hazardous attitudes have been found to correlate with certain personality characteristics (Stokes & Kite, 1994) opinions are divided as to whether or not these attitudes are changeable or are traits that will resist change (A & Joseph, 2005).
In aviation training, a method for identification of personality traits or type preferences of those pilots who are most likely to be involved in any kind of mishap would be desirable, allowing early intervention. The goal would be to make individuals aware of their own potential pitfalls and recommend actions to enable them to avoid errors. Some factors already identified in the failing aviator are excessive aggressiveness and resentment of authority (Voge, 1989).

Hypothesis

This paper hypothesizes that certain behaviors, in particular inadvertent or intentional disregard for policies or procedures (rules!) and attention to detail, are more often observed among those with a particular personality type preference. Evidence of this theory would allow intervention at an early stage of pilot training.

Proposed study method

Currently, students in the College of Aviation are asked to take the MBTI® assessment as part of their Crew Resource Management class. Thus far, no student has refused to take the assessment and depersonalized data has been recorded; types are recorded in relation to gender and program only, although the names are also stored for use only by the instructor for class assignment assessment purposes. In addition, a comprehensive safety reporting system has been developed which records details of accidents and incidents categorized by major cause. These two sets of data may be processed to produce a single data set of pilot personality type preference versus mishap cause, in particular policy disregard and attention to detail.

Preliminary results

A preliminary collation of existing data has shown signs of correlation between the results of student pilots’ MBTI® assessments and the College safety records. However, this data has also revealed some other interesting tendencies which may necessitate a different approach toward data analysis. Table 1 shows that 62.32% of the 337 students (210) were in the flight program whilst 37.39% (127) were in the management program. Since only around 10% of the management students complete actual flight training, the investigators are considering basing the study only on those in flight.

Table 1

Initial Data Analysis by Type Preference

<table>
<thead>
<tr>
<th>Type</th>
<th>Flight Admin</th>
<th>Flight only</th>
<th>Flight only</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISTJ</td>
<td>8.31%</td>
<td>5.93%</td>
<td>13.33%</td>
</tr>
<tr>
<td>ISTP</td>
<td>8.90%</td>
<td>4.15%</td>
<td>14.29%</td>
</tr>
<tr>
<td>ESTP</td>
<td>8.61%</td>
<td>3.86%</td>
<td>13.81%</td>
</tr>
<tr>
<td>ESTJ</td>
<td>4.45%</td>
<td>6.23%</td>
<td>7.14%</td>
</tr>
<tr>
<td>ISFJ</td>
<td>2.67%</td>
<td>2.37%</td>
<td>4.29%</td>
</tr>
<tr>
<td>ISFP</td>
<td>4.15%</td>
<td>1.19%</td>
<td>6.67%</td>
</tr>
<tr>
<td>ESFP</td>
<td>5.04%</td>
<td>2.08%</td>
<td>8.10%</td>
</tr>
<tr>
<td>ESFJ</td>
<td>2.08%</td>
<td>1.78%</td>
<td>3.33%</td>
</tr>
<tr>
<td>INFP</td>
<td>0.59%</td>
<td>0.30%</td>
<td>0.95%</td>
</tr>
<tr>
<td>ENFP</td>
<td>2.97%</td>
<td>1.48%</td>
<td>4.76%</td>
</tr>
<tr>
<td>ENFJ</td>
<td>3.86%</td>
<td>3.26%</td>
<td>6.19%</td>
</tr>
<tr>
<td>INTJ</td>
<td>8.90%</td>
<td>0.00%</td>
<td>1.43%</td>
</tr>
<tr>
<td>INTP</td>
<td>1.19%</td>
<td>0.30%</td>
<td>1.90%</td>
</tr>
<tr>
<td>ENTP</td>
<td>2.97%</td>
<td>1.19%</td>
<td>4.76%</td>
</tr>
<tr>
<td>ENTJ</td>
<td>4.15%</td>
<td>2.67%</td>
<td>6.67%</td>
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<td></td>
<td>1.48%</td>
<td>0.59%</td>
<td>2.38%</td>
</tr>
<tr>
<td></td>
<td>62.31%</td>
<td>37.39%</td>
<td>100.00%</td>
</tr>
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</table>
Table 1 shows that, of these, 14.29%, 13.81% and 13.33% respectively are ISTP, ESTP and ISTJ. The next largest group is the ESTJs at 7.14%. Thus these types are more likely to be the subject of a safety report purely by being in the majority in the program. Initial data gathered from safety reports revealed only 52 incidents with a the relevant factor(s). However, data collection only began recently and the available sample is not yet large enough to be able to draw any valid conclusions to prove or disprove the hypothesis.

Discussion

The theory to be applied here is that type preference is different from behavior because attitudes shape behaviors. The behaviors that one’s type preference tends to produce needs to be examined to determine whether or not it is appropriate, so that the individual can make appropriate behavioral adjustments to function properly and cooperatively in society and in the workplace. Before behavior can be changed, individuals need to be aware of why it needs to be changed, what the benefits are and how changes are made. The MBTI® instrument is not the final answer, but it is a start and could be a useful tool at an early stage. The MBTI® assessment is often used in career advising to determine suitable careers. It can also be used to raise awareness of how individuals need to change their outward behavior and possibly their inner thought processes in order to be successful in their chosen field.

The authors are already using the MBTI® tool in the classroom to raise awareness in aviation students of their type profile and what it means. The students are taught how it may affect their interaction with others and how they can make an assessment of the preference types of others and compensate accordingly. They are also asked to analyze their results and determine what kind of hazardous thought patterns their type may encourage and learn to detect their onset and apply their own antidote. This fits with CRM philosophy in error management by providing students with tools to avoid errors they may commit.

Conclusions

At this point, the authors have concluded that there is insufficient data to either prove or disprove the original hypothesis, however some interesting possibilities for other studies have been revealed. The intention is to continue to gather date related to the original hypothesis whilst exploring other areas of study using data already available.

Bibliography


