

THE RELATIONSHIP OF PERSONALITY TYPE  
AND SUCCESS OF AIR TRAFFIC CONTROL  
SPECIALIST TRAINEES

JOHN F. FIELDS

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The Relationship of Personality Type and Success of

Air Traffic Control Specialist Trainees

by

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### Abstract

This study focused upon the possibility of a relationship between specific personality types, as determined by Myers-Briggs Type Indicator (MBTI) results, and the performance of a sample of 320 Air Traffic Controllers (ATCSs) at three (3) phases of testing in the Federal Aviation Administration (FAA) Academy training program in Fiscal Year (FY) 1987.

It was hypothesized that more ISTJ (Introverted, Sensing, Thinking, Judging) personality types would initially enter the program and produce higher performance scores during the three (3) testing phases. Those results would then indicate that more ISTJs would enter the ATCS workforce following the training program. Results of the study showed that no there was no relationship between the ISTJ personality type and performance, depending upon their test scores. There was however, an indication that a greater number of ISTJs and ESTJs initially entered the program as compared to the remaining types.

No significant differences in performance were discovered among the IE, JP, SN, and TF preference scales nor among the ST, SF, or NT

function pairs. The NF function pair, however, performed significantly higher than the remaining pairs during the first phase of testing.

## Introduction

The role of personality type in the workplace is one of great interest from the smallest of businesses to the largest of corporations. Whatever the size, organizations are interested not only in how each type may possess similarities and differences in the way they behave or think, but why and how the types are attracted to and perform - in relationship to each other - within certain occupations or settings. One occupational group which has been subjected to this type of research is the Air Traffic Control Specialist (ATCS). Schroeder, Broach and Young (1993), for example, reveal that studies show evidence of personality relating to both occupational attraction and initial job performance among entry-level ATCSs. These studies, however, have not included those ATCSs who have completed, or received the chance to have completed, the entire required training curriculum, but rather focus upon when they initially enter the program only. Following a comparison of ATCS personality types with job performance upon completion of the entire first three (3) phases the training program, researchers should better be able to relate a specific type with superior performance and



their ability to be retained at the conclusion of the third phase, depending upon whether they passed or failed the testing.

### Background

For many years, researchers have found that a working knowledge of employee personality may benefit organizations in a variety of ways. For example, personality, as measured by various instruments, is now being researched concerning its use for predicting the general quality of employee job performance (Tett & Jackson, 1991; Barrick & Mount, 1991; Cortina, Doherty & Schmitt, 1992). Another study suggests that employers may also be able to better select their employees by finding those personalities that "fit" specific occupations (Villanova, 1994), which, in turn, may lead to higher rates of employee retention. Research continues to be conducted in an attempt to demonstrate the validity of a relationship between personality, job performance, and employee retention - not only in general, but within occupational groups.

### Employee Selection

Researchers suggest that personality may be related to the successful selection of qualified and productive personnel. One

example of this possibility is provided by Nourayi and Cherry (1993), who concluded that students classified as certain personality types as identified by the Myers-Briggs Type Indicator (MBTI) demonstrated superior performance in general accounting courses and had higher grade point averages than those classified as other types. The relationship between personality and the ability both to learn and perform is described by Booth (1993).

...different personality types do not have the same learning style preferences and motivations, and...there are distinct biases in the personality type profiles of students in different subject areas.

By noting how personality may indicate compatibility with particular jobs or positions, employee selections may be made with the intent of "fitting", or matching, employees with those positions. One organization utilized pre-employment psychological screening as a selection tool to target new employees possessing certain personality traits in order to avoid accidents and to decrease both employee turnover rates and the frequency of work absences (Borofsky, 1993). Though the specific screening instrument used was not indicated, results

showed that new employees given the screening who were involved in accidents comprised only 2.8% of the work force while the rate among current employees not given the screening comprised 5.6%. Similar results were found with regard to absenteeism with 4.71% among screened employees versus 7.37% among non-screened employees. The organization's employee turnover rate dropped from 25% to 8.33% within two years of the initial screening process.

These results may be useful for the selection of new employees based upon their performance as students or even in training situations to predict their success or failure within occupational groups. Chatman (1991) emphasized, through research, the importance of an organization/employee relationship in order for each party to succeed and concludes that employee values and personalities must closely match organizational values for maximum results.

### Job Performance

An acceptance that personality may be a valid predictor of employee performance (Barrick & Mount, 1991) continues to increase. By using the Inwald Personality Inventory (IPI) and the Minnesota Multiphasic Personality Inventory (MMPI), Cortina, Doherty, and



Schmitt (1992) found that extraversion, conscientiousness, agreeableness and neuroticism were directly related to the past performance of police officers and could possibly be used for the prediction of future performance.

Research results focusing upon other occupational groups have also indicated personality is related to job performance. Studies conducted within the last five years, for example, have found that successful performance levels of salespersons relate significantly to self-esteem (Day & Bedeian, 1991), as well as superior managerial performance being significantly related to conscientiousness and extraversion (Barrick & Mount, 1993).

### The Air Traffic Control Specialist (ATCS)

One group which has been the focus of ongoing personality-related research is that of the Air Traffic Control Specialist (ATCS) (Collins, Schroeder & Nye, 1989; Nye & Collins, 1991; Schroeder, Broach & Young, 1993). A brief summary of the ATCS selection process and performance expectations should help create a foundation for a better understanding of how personality may ultimately be related



to their ability to successfully perform and maintain their position of employment.

The information presented in the remainder of this section was based upon both the contents of the Position Classification Standard For Air Traffic Control Series GS-2152 (June 1978) and information received from personnel located at the FAA Academy in Oklahoma City, Oklahoma.

The majority of ATCSs are located at Air Route Traffic Control Centers, where they are responsible for the control and separation of en route air traffic. This function involves monitoring of the separation between aircraft flying in Federal airways to and from other terminal facilities. The remaining ATCSs are located at field facilities and are responsible for such actions as issuing air traffic clearances, advising pilots concerning flight conditions, and for the control and separation of air traffic at airports.

The ATCS position requires specific skills and abilities - both mental and physical - necessary to meet the performance standards required by the Department of Transportation (DOT) and the Federal Aviation Administration (FAA). The ATCS must constantly recall rules

and regulations governing the control and movement of air traffic, pay attention to detail, and make rapid and precise judgments and decisions without error. This must be done with little or even no supervision, in a very complex environment, and for prolonged periods of time. In order to select those who will successfully meet these requirements, a three-section written examination, offered by the Office of Personnel Management (OPM), is required for all applicants. The first section, an assessment of aptitudes, challenges the applicant to identify potential collisions, distances between the aircraft, route changes, and other air traffic-related situations. Section two poses questions regarding relationships among sets of both figures and letters and the final section includes questions pertaining to air traffic control knowledge within subject areas such as air traffic rules and procedures, aviation weather and inflight traffic control procedures.

To successfully complete this examination and be considered as eligible for the remainder of the ATCS training program, the candidate must score above 75.1 points on a scale of 0 to 100. Those who score 75.1 and below are considered as ineligible for the training program. The candidate's score is recorded as the Transmuted Composite score.

Upon successful completion, a personal interview is conducted, followed by a one-week screening process. The selection of candidates for this screening, which is designed to assess aptitudes, is based upon Transmuted composite scores, interviews and the FAA's anticipated hiring needs. Once the screening is completed, the candidate participates in both a medical examination and security investigation and then enters the extensive FAA Academy ATCS Training Program in Oklahoma City, Oklahoma. The trainee is under continuous observation while training in a simulated environment. While attending the Academy, the potential ATCS is issued an academic written test along with the Nonradar Laboratory Controller Skills Test, which applies actual skills learned while attending the Academy training program. The next test follows a 13-day classroom academic training session and consists of multiple choice questions. The test is not rated on a pass/fail basis as initial OPM test was, but scores of 70-100 are still desirable since the results will be recorded. The results then become the Phase II composite score, which represents higher and lower levels of performance.



The third testing phase involves the combination of the score produced on the previous academic test (Phase II) and the Nonradar Laboratory Controller Skills Test. The combined weighted scores are then recorded as the Nonradar Laboratory composite score. This score is rated on a pass/fail basis, so the trainee must score at least 70 out of 100 possible points at this point in order to pass and continue the program. The successful trainee then attends the Academy Radar Training Facility (RTF) for approximately one to two years and is issued a series of tests along the way to rate performance. This series consists of an academic test and five (5) laboratory problems with the combined weighted scores being issued as the Radar Training Facility composite score. This procedure is not issued on a pass/fail basis, but higher scores indicate superior performance. Finally, the ATCS enters on-the-job training at an assigned facility where job performance is measured by the length of time taken to reach Full Performance Level (FPL).

### The ATCS Personality

There exists some evidence that persons with certain personality traits are initially attracted to the ATCS occupational group. Collins, et al, (1989) used the State-Trait Personality Inventory (STPI) to find that



the average anxiety level of ATCS trainees was lower than that of college students and that high percentages of training academy failures and/or withdrawals resulted among those with higher anxiety scores. Nye and Collins (1991) later found that not only was the personality profile of ATCS trainees relatively low in anxiety, but they were also low in the anger dimension. Differences between the trainees and the general population have also been found to include the ATCS as being more extraverted and conscientious as indicated by the NEO Personality Inventory (NEO-PI) (Schroeder, et al, 1993).

Rocco, Milburn and Mertens (1992), found that the ATCS tends to be above average in intelligence. This may or may not be an indicator of personality *type*, but it may suggest the idea that a superior cognitive ability is necessary among ATCSs in order for them to perform successfully. This may also suggest that certain personality *traits* may exist among ATCSs enabling them to utilize certain cognitive functions and, therefore, perform at a highly desirable and successful level.

Perhaps the most common tool within the FAA, however, used to study personality is the Myers-Briggs Type Indicator (MBTI). Although administered to a large number of ATCSs, the MBTI has primarily been

utilized in the classroom setting to help employees recognize and understand the personality characteristics of their co-workers so that they may learn to work together more effectively, appreciate diversity, and improve their communication skills. The individual type differences are presented as interesting and valuable rather than as a stumbling block which only interferes with workplace productivity and harmonious relationships (Myers & McCaulley, 1985).

Perhaps a more concentrated effort to use the MBTI for discovering specific personality types among ATCSs could be very valuable to the FAA in order to recognize and select those most capable of performing, to understand their preferred methods of thinking, reacting and decision-making and, as a result, retaining the most valuable employees for maximum productivity and length of service.

### The Myers-Briggs Type Indicator (MBTI)

Developed by Isabel Myers and Katharine Briggs, the Myers-Briggs Type Indicator (MBTI) was designed to expand upon the theory of Carl J. Jung (Myers & McCaulley, 1985), who proposed that everyone prefers to use two of four primary mental processes which exist from birth and are influenced even more throughout the aging process.

Those processes are sensing (S), intuition (N), thinking (T), and feeling (F). The first two, sensing (S) and intuition (N), refer to one's preference for the gathering of information and are described as two ways of perceiving (P). The sensing (S) person prefers specific answers to their questions and looks sequentially at the information received in order to understand it. Persons with a sensing (S) preference prefer to use information observable by the senses while establishing what already exists and is presented immediately before them. Sensors are often described as specific, realistic, and focused upon details. The intuitive (N) person gathers information randomly and places it into some type of workable model while relying upon insight as a way to pursue additional possibilities before reacting to the information, often preferring concepts and theory as a basis for their reaction (Kroeger & Thuesen, 1988).

Thinking (T) and feeling (F) determine a person's preference for the decision-making process and are described as the judging (J) functions. The thinking (T) person relates separate ideas or situations and, through objectivity and analytical ability, applies some type of rational order to the information or problem given. Consequences of the



action are very important to the thinking (T) person. The feeling (F) person makes decisions only after weighing the issues and taking into consideration their own and others' values and are often described as subjective and personal while desiring meaningful human relationships (Myers & McCaulley, 1985).

Two additional preferences identified by the MBTI are judgment (J) and perception (P). These preferences are used to describe one's attitude toward the outer world or, more specifically, how that person "deals" with that world. The judger (J) is most likely to rely upon the thinking (T) or feeling (F) processes and prefers a structured and well-planned environment with a desire to regulate and control life. Perceivers (P), on the other hand, tend to rely largely upon the sensing (S) or intuition (N) processes and seem to prefer flexibility and spontaneity while wishing to understand life the way it exists and then adapting to it (Kroeger & Thuesen, 1988).

Two final complementary attitudes are included in Jung's theory. Extraversion (E) and introversion (I) pertain to one's attitude or orientation toward life itself or, in other words, whether they prefer to live in the outer or inner world. Extraverts (E) often rely upon their



immediate environment (co-workers, friends, family, etc.) as a source of energy and tend to develop characteristics such as sociability and an ability to communicate easily while introverts (I) rely upon the concepts, understandings and ideas of their own inner world while desiring a clear presentation of ideas. The introvert (I) is likely to be content working alone and on one project for a long period of time while enjoying solitude and privacy. Additional preferences for the introvert (I) are attention to details and a desire for time to concentrate (Myers & McCaulley, 1985).

With no responses recorded as being right or wrong, the MBTI is administered as a personality *indicator* rather than a *test*. Upon completion, answers are analyzed and grouped into a preference score. The score indicates which of four possible pairings the subject prefers: either extraversion (E) or introversion (I), sensing (S) or intuition (N), thinking (T) or feeling (F), and judging (J) or perceiving (P). The pairings comprise a total of sixteen profiles which are summarized in Figure 1.

Figure 1. Profile of the Sixteen (16) MBTI Types

		SENSING TYPES		INTUITIVE TYPES			
EXTRAVERTS	Perceptive	With Thinking	With Feeling	With Feeling	With Thinking	Perceptive	INTROVERTS
		ESTP Extraverted Sensing with thinking	ESFP Extraverted Sensing with feeling	ENFP Extraverted Intuition with feeling	ENTP Extraverted Intuition with thinking		
	Judging	ESTJ Extraverted Thinking with sensing	ESFJ Extraverted Feeling with sensing	ENFJ Extraverted Feeling with intuition	ENTJ Extraverted Thinking with intuition	Judging	
	Perceptive	ISTP Introverted Thinking with sensing	ISFP Introverted Feeling with sensing	INFP Introverted Feeling with intuition	INTP Introverted Thinking with intuition	Perceptive	
INTROVERTS	Judging	ISTJ Introverted Sensing with thinking	ISFJ Introverted Sensing with feeling	INFJ Introverted Intuition with feeling	INTJ Introverted Intuition with thinking	Judging	EXTRAVERTS

The MBTI was administered as early as 1957 by Isabel Myers who found, based upon a sample of students, that an estimated 75% of the population of the United States preferred extraversion (E) and sensing (S). It was also estimated that about 60% of males preferred thinking (T) over feeling (F) while about 65% of females preferred feeling (F) over thinking (T) (Myers & McCaulley, 1985). Later estimates from both the MBTI Data Bank and the SRI International Longitudinal Study of Values also show similar results.

### The MBTI and the ATCS

Past MBTI-related studies have provided a significant amount of information regarding specific preferences among specific occupational groups. Myers and McCaulley (1985), for example, reveal that the MBTI Data Bank suggests certain occupations are attractive to certain persons and indicates specific preferences among those persons. Others, such as Furnham (1993), found that the decision-making style which scientists preferred was that of thinking (T) while that which managers preferred was feeling (F). O'Conner (1992) obtained MBTI results from a sample of health care executives showing that 63% revealed a strong preference for extraversion (E).



Isabel Myers considered the combinations of sensing, intuition, thinking and feeling (ST, SF, NF, and NT) to be the most important of the groupings of the sixteen (16) types, particularly when career choices are concerned (Myers & McCaulley, 1985). These groups focus upon one's conscious mental activity which Jung called "functions" (Lawrence, 1993). Each person prefers one of the perceiving processes (S or N) and one of the judging processes (T or F). The INFJ, for example, may be attracted to the manager, psychologist or teacher careers because of an enthusiastic interest in resulting possibilities (N) and in the existence of meaningful human relationships (F) (Myers & McCaulley, 1985).

Because much is expected of the ATCS that is not of many other occupational groups, certain preferences may be noticeable. Although a comparison between the preferences and either job performance or retention was excluded, Deloney and Schroeder (1984) did find high percentages of entry-level controllers classified as sensing-thinking-judging (STJ). According to Myers and McCaulley (1985) and Lawrence (1993), the sensing-thinking (ST) function pair prevalent among the controllers determines their preferred mental activity. The focus on the

(ST) function pair may be related to their career choice as well as with their ability to perform once they enter the training program. Based upon this and the following information, the sensing (S), thinking (T), and judging (J) preferences seem to match most accurately what is expected of the ATCS to successfully complete training and perform following that completion. Whether the introvert (I) or extravert (E) would meet those expectations is also an important issue which will be covered following the discussion of the first three preferences.

Many requirements of the ATCS occupation rely upon the preferences which the sensing (S) person possesses. For example, as stated earlier, the sensor (S) avoids basing reactions upon theories or additional possibilities and, instead, uses observable information to establish what already exists and then reacts. Also, the sensor (S) will process information in a specific and realistic manner while focusing upon the details, therefore producing the desired reactions to common situations.

The ATCS is required to focus upon the consequences of every action or decision with very little time for weighing all of the issues and no room for personal feelings, which corresponds with the thinking (T)



preference. The thinker (T) is objective rather than subjective and also relies upon analytical ability to make a quick decision.

The judger (J) would be the likely candidate to successfully perform the role of the ATCS due to a preference for a structured and well-planned environment while regulating and maintaining control of each situation. In addition, there is little room for flexibility (as the intuitive (N) person would prefer) and a requirement for following specific rules and regulations governing air traffic.

Finally, there exists very little time for reacting and making decisions much of the time, the ATCS must think before reacting and/or communicating, as preferred by the introvert (I). Also a characteristic of the introvert (I), attention to details and concentration are important factors for the ATCS in order to ensure the safety of all those being affected by any decision made or action taken. Finally, the ATCS must perform successfully for long periods of time, which is another important preference of introversion (I). The characteristics of extraversion (E) are much the opposite of introversion (I) and, therefore, do not seem to match what is expected of the ATCS in order to perform successfully.

### Rationale and Purpose of the Study

Personality may play a vital role in the entire ATCS selection process, but what is required of them goes beyond an initial attraction - their ability to both perform successfully and retain their position must be taken into account. Certain types may be attracted to the occupational group, produce superior performance test scores, and successfully complete the training program while other types may not perform as well or even be dismissed from the program due to a failing score on any of the tests issued on a pass/fail basis.

The purpose of this study was to determine the relationship between MBTI preferences and types among those individuals selected for the ATCS occupational group who produced both higher and lower Transmuted, Phase II and Nonradar Laboratory composite test scores.

It was hypothesized that, according to the characteristics of each preference, the ISTJ would be the most common type to initially enter the ATCS occupation group. It was also hypothesized that the ISTJ would produce higher composite test scores during each of the first three phases of training. Third, it was hypothesized that the ISTJ would

be more successful as an ATCS based upon the three composite test scores.

## Method

### Subjects

Subjects for this study were a random sample of 320 (41 female and 279 male) ATCSs hired by the FAA in Fiscal Year (FY) 1987. The sample was taken from a national database accessible by authorized FAA personnel located at the FAA Civil Aeromedical Institute in Oklahoma City, OK, and was evenly distributed among each of nine regions. Only those ATCSs employed at en route facilities were included since they comprise approximately 60% of the ATCS workforce. The year FY1987 was used as the hiring date of the sample due to the Academy training program having been stabilized that year as well as the subjects having had sufficient time to complete the entire field training curriculum. Ages ranged from 20 to 36 years with a mean of 25.938. The education levels ranged from high school graduate to graduate college degrees with 92.5% of the sample either having completed some college or having obtained an undergraduate degree.



All subjects were treated in accordance with the ethical standards of the American Psychological Association (APA).

### Instruments

Dependent Variables of this study were three (3) major composite test scores issued during the Academy training program: (a) Transmuted Composite Scores; (b) Phase II Composite Scores, and; (c) Nonradar Laboratory Composite Scores. The Independent Variables were MBTI types from the sample of 320 ATCS trainees.

MBTI results, Form G Booklet, were used to compare the various preferences and types with each of the composite test scores. The results were drawn on a random basis from a national database by authorized FAA personnel. In order to maintain anonymity among the sample, names and other personal information were not included with the results. Age, gender and education levels were included, however, for background information purposes only.

### Procedures

A written request was submitted December 13, 1994, to the FAA Civil Aeromedical Institute in Oklahoma City, OK for the information needed in order to conduct the study (See Appendix). It was mutually



agreed that the researcher would submit a copy of the results upon completion of the study to the FAA for a review of applicability to the agency. Demographic information, MBTI results and training program composite test scores for 320 ATCSs were received by the researcher in the latter part of February, 1995. An error, however, was discovered concerning the exclusion of one category of test scores and, upon the researcher's request, the corrected information was received in early March, 1995. Statistical tests to compare MBTI results with test scores were initiated about the second week of March, 1995.

### Data Analysis

The frequency of each MBTI type represented within the ATCS sample was computed in order to test the hypothesis that the ISTJ would be most likely to initially enter the occupational group.

Descriptive statistics were run for the Transmuted, Phase II and Nonradar Laboratory composite test scores to determine the means and standard deviations for the entire sample.

The means and standard deviations of the Transmuted composite scores were evaluated to discover which types scored highest and lowest. An Analysis of Variance (ANOVA) was then computed with the

sixteen (16) scores and MBTI types to discover whether any significant differences could be found in the scores among the types. For the same purpose, the means and standard deviations, as well as an ANOVA, were also computed for the Phase II and Nonradar Laboratory composite scores.

T-tests were conducted on the three (3) composite scores with each of the four (4) MBTI preference scales (EI, JP, SN, and TF) to discover whether any significant differences existed between individual preference scales. Analyses of Variance (ANOVAs) were then performed to compare the four (4) MBTI function pairs (ST, NT, SF, and NF) with the three (3) composite scores to discover whether any significant differences existed.

## Results

MBTI types and their performance scores on all three (3) Academy training program tests for the entire ATCS sample were received. The frequency of each type was then calculated and the results confirmed the hypothesis that the ISTJ would be the most common preference to initially enter the ATCS occupational group. The results are presented in Table 1.

Table 1. Frequency of MBTI Types In ATCS Trainee Sample (N = 320)

<b>ISTJ</b> <b>N = 76</b>	<b>ISFJ</b> <b>N = 12</b>	<b>INFJ</b> <b>N = 3</b>	<b>INTJ</b> <b>N = 20</b>
<b>ISTP</b> <b>N = 19</b>	<b>ISFP</b> <b>N = 0</b>	<b>INFP</b> <b>N = 8</b>	<b>INTP</b> <b>N = 25</b>
<b>ESTP</b> <b>N = 14</b>	<b>ESFP</b> <b>N = 3</b>	<b>ENFP</b> <b>N = 13</b>	<b>ENTP</b> <b>N = 20</b>
<b>ESTJ</b> <b>N = 61</b>	<b>ESFJ</b> <b>N = 8</b>	<b>ENFJ</b> <b>N = 6</b>	<b>ENTJ</b> <b>N = 32</b>

As Table 1 indicates, there were noticeably many more ISTJs (N = 76) and ESTJs (N = 61) in the sample. The least represented types were the INFJs (N = 3), ESFPs (N = 3) and ISFPs (N = 0).

Descriptive statistics were run to determine the means and standard deviations for each of the three (3) composite test scores (Transmuted, Phase II, and Nonradar Laboratory) among all types represented. The results are presented in Table 2.

**Table 2. Mean Composite Test Scores and Standard Deviations for Sample of ATCSs (FY1987)**

Test	Mean Composite Score	Standard Deviation
Transmuted	91.06	4.60
Phase II	89.89	5.52
Nonradar Laboratory	70.38	11.52

### Evaluation of Transmuted Composite Scores

The means and standard deviations of the Transmuted composite scores by each MBTI type are presented in Table 3.



**Table 3. Means and Standard Deviations of Transmuted Composite Scores by MBTI Type**

<b>ISTJ</b>  <b>m = 91.2355</b> <b>sd = 4.2007</b>	<b>ISFJ</b>  <b>m = 89.8333</b> <b>sd = 5.2714</b>	<b>INFJ</b>  <b>m = 94.4</b> <b>sd = 4.1037</b>	<b>INTJ</b>  <b>m = 89.365</b> <b>sd = 3.8151</b>
<b>ISTP</b>  <b>m = 91.5526</b> <b>sd = 5.056</b>	<b>ISFP</b>  <b>N/A</b> <b>(N = 0)</b>	<b>INFP</b>  <b>m = 94.55</b> <b>sd = 3.7283</b>	<b>INTP</b>  <b>m = 90.996</b> <b>sd = 5.411</b>
<b>ESTP</b>  <b>m = 90.2571</b> <b>sd = 4.7849</b>	<b>ESFP</b>  <b>m = 88.0667</b> <b>sd = 3.0353</b>	<b>ENFP</b>  <b>m = 93.2077</b> <b>sd = 2.8365</b>	<b>ENTP</b>  <b>m = 90.69</b> <b>sd = 5.9710</b>
<b>ESTJ</b>  <b>m = 90.9492</b> <b>sd = 4.4243</b>	<b>ESFJ</b>  <b>m = 91.4</b> <b>sd = 6.7899</b>	<b>ENFJ</b>  <b>m = 91.9</b> <b>sd = 1.8504</b>	<b>ENTJ</b>  <b>m = 90.7344</b> <b>sd = 4.5182</b>

As can be seen from the means, the INFP, INFJ and ENFP scored the highest. The lowest means are found for the ESFP, INTJ and ISFJ.

An Analysis of Variance (ANOVA) with the sixteen (16) transmuted composite scores as dependent variables and MBTI types as independent variables was computed. No significant differences were found in the scores among the MBTI types.

#### Evaluation of Phase II Composite Scores

The means and standard deviations for the Phase II composite scores by each MBTI type were computed and the results are presented in Table 4.

**Table 4. Means and Standard Deviations of Phase II Composite Scores by MBTI Type**

<b>ISTJ</b>  <b>m = 90.022</b> <b>sd = 5.6185</b>	<b>ISFJ</b>  <b>m = 91.0858</b> <b>sd = 6.0115</b>	<b>INFJ</b>  <b>m = 90.28</b> <b>sd = 7.576</b>	<b>INTJ</b>  <b>m = 90.3020</b> <b>sd = 5.4371</b>
<b>ISTP</b>  <b>m = 89.1363</b> <b>sd = 6.8573</b>	<b>ISFP</b>  <b>N/A</b> <b>(N = 0)</b>	<b>INFP</b>  <b>m = 92.2325</b> <b>sd = 3.2303</b>	<b>INTP</b>  <b>m = 88.1276</b> <b>sd = 6.2385</b>
<b>ESTP</b>  <b>m = 90.32</b> <b>sd = 4.7551</b>	<b>ESFP</b>  <b>m = 89.1267</b> <b>sd = 3.9664</b>	<b>ENFP</b>  <b>m = 89.7446</b> <b>sd = 5.0365</b>	<b>ENTP</b>  <b>m = 89.162</b> <b>sd = 4.8888</b>
<b>ESTJ</b>  <b>m = 89.081</b> <b>sd = 5.7357</b>	<b>ESFJ</b>  <b>m = 91.9888</b> <b>sd = 3.8</b>	<b>ENFJ</b>  <b>m = 91.3833</b> <b>sd = 3.5655</b>	<b>ENTJ</b>  <b>m = 91.2031</b> <b>sd = 5.3199</b>

As can be seen from the means, the INFP, ESFJ and ENFJ scored the highest. The lowest scores were produced by the INTP, ESTJ and ESFP.

An Analysis of Variance (ANOVA) with the sixteen (16) Phase II composite scores as dependent variables and MBTI types as independent variables was computed. No significant differences were found in the scores among the MBTI types.

#### Evaluation of Nonradar Laboratory Composite Scores

The means and standard deviations for the Nonradar Laboratory composite scores by each MBTI type were computed and the results are presented in Table 5.



Table 5. Means and Standard Deviations of Nonradar Laboratory Composite Scores by MBTI Type

<b>ISTJ</b>  m = 70.5259 sd = 12.257	<b>ISFJ</b>  m = 67.1725 sd = 8.3084	<b>INFJ</b>  m = 70.8433 sd = 9.3119	<b>INTJ</b>  m = 71.3215 sd = 13.3694
<b>ISTP</b>  m = 69.8932 sd = 12.4432	<b>ISFP</b>  N/A (N = 0)	<b>INFP</b>  m = 75.4963 sd = 11.2918	<b>INTP</b>  m = 69.2036 sd = 12.2111
<b>ESTP</b>  m = 67.5121 sd = 12.1916	<b>ESFP</b>  m = 74.9200 sd = 13.8393	<b>ENFP</b>  m = 76.4677 sd = 8.2739	<b>ENTP</b>  m = 69.5225 sd = 10.684
<b>ESTJ</b>  m = 69.5674 sd = 10.6158	<b>ESFJ</b>  m = 68.8988 sd = 9.2448	<b>ENFJ</b>  m = 71.6867 sd = 4.4397	<b>ENTJ</b>  m = 71.0856 sd = 13.3836

As the means in Table 5 indicate, the ENFP, INFP and ESFP scored the highest. The lowest scores belonged to the ISFJ, ESTP and ESFJ.

An Analysis of Variance (ANOVA) with the sixteen (16) Nonradar Laboratory composite scores as dependent variables and MBTI types as independent variables was computed. No significant differences were found in the scores among the MBTI types.

#### Evaluation of Scores Among Preference Scales and Function Pairs

T-tests were conducted on the three (3) composite scores with each of the preference scales (EI, JP, SN, and TF) with no significant differences being found.

Analyses of Variance (ANOVAs) were then performed to compare the four (4) function pairs (ST, NT, SF, and NF) with the three (3) composite scores. No significant differences were found among the four pairs and the Phase II and Nonradar Laboratory composite scores. There was, however, a significant difference discovered for the Transmuted composite score ( $F_{(3,316)} = 3.48, p < .0163$ ). Post Hoc Tukey t-tests were computed for the means of each of the function pairs. (See Table 8)

**Table 8. Number of Trainees and Mean Transmuted Composite Scores of Preference Pairs**

Preference Pair	Number of Trainees	Mean Score
SF	23	90.1478
NT	97	90.5103
ST	170	91.0876
NF	30	93.4233

As the means indicate, the NF preference pair scored significantly higher than the SF, NT and ST pairs. This was a somewhat surprising result and contrary to the hypothesis that ISTJs would score significantly higher.

### Discussion

The results of this research supported the hypothesis that the ISTJ would be the most common MBTI type to initially enter the ATCS occupational group. However, the study found no significant differences between the three (3) independent variables (composite test scores)



based on MBTI type and was unable to support the hypothesis that the ISTJ would score significantly higher. The study was also unable to support the hypothesis that the ISTJ was more likely be successful based upon the training program performance scores.

As supported by the findings of Deloney and Schroeder (1984), the highest percentages of type within the sample were the STJs (ISTJ and ESTJ). An evaluation of what is required of the ATCS with the ISTJ preferences seemed to indicate that the ISTJ would possess the ability to outperform the remaining types, including those STJs with a preference for extraversion (E). Results showed, however, that the preferences of the ISTJ are no indication of that person's superior ability to perform academically or apply actual job performance-related skills.

No statistical significance was found among the three (3) composite test scores for any of the types. This may have been due to either an inadequate sample size or an uneven distribution of types. Because no significant differences were found among types, additional analyses did find that NF function pair produced significantly higher Transmuted composite scores than the remaining three (3) pairs (SF, NT and ST). While this finding does not support the hypothesis that the



ISTJ, which contains the ST function pair, would outperform the remaining types, the consideration of Isabel Myers that the four (4) function pairs are the most important of the groupings (Myers & McCaulley, 1985) may be evident. Although the NFs may not have been represented in the sample as the STs, the higher Transmuted composite scores may be based upon the NFs' preferences for mental activity. They may as an N, for example, recognize the necessity of quick decisions and simply speed up the processes of information gathering, pursuing the possibilities, and taking action. As an F, their preference for personal relationships may involve the desire to maintain the safety of those who are placing their trust in the ATCS.

Possible limitations of the study may have hindered the researcher from being able to support the remaining two hypotheses. One possible limitation may have been the small sample size. A larger sample may have provided a wider or more balanced distribution of types to compare, perhaps producing more accurate results. Another limitation, however, may have been that more ISTJs and ESTJs are represented in the general population. This possibility would only

produce a larger imbalance of types, regardless of the sample size and the results would most likely remain the same.

An additional possible limitation to the study was the existence of a large number of underrepresented types such as the ISFPs, INFJs, and ENFJs within the sample. With additional representation among the types just listed, additional scores among the four (4) function pairs (SF, NT, ST and NF) may have more closely matched the remaining preference scales (EI, JP, SN and TF) than with the sample used. The possibility remains, however, that the representation of types may never reach a balanced state due to the large number of STJs in the general population.

Another limitation to the study was the very low quantity of Radar Training Facility (RTF) composite scores (as described in the Introduction) available within the sample. The number of RTF scores was so insignificant that the researcher was unable to effectively incorporate them into the study. Also unavailable were the ATCS performance ratings which were administered once the trainee entered the workplace.

Additional research could include a comparison of the three (3) composite scores with types among a larger sample of ATCSs to discover whether the same, additional, or even no differences exist. The researcher may find that, as the number of NFs increase, their performance scores decrease or that, providing further support for this study, their scores continue to exceed those scores among the remaining function pairs.

Another possibility for future research would be to evaluate trainee performance beyond the Nonradar Laboratory testing phase. RTF composite scores, as well as performance evaluations once the ATCSs are assigned to a facility, could be compared in addition to the three (3) scores used in this study. An extended pattern concerning the performance of certain types, especially the NFs, might be observed by tracking their levels of performance into the workplace and successfully predicting their success.

As this study indicates, it is possible that the NF types (INFJ, ENFJ, INFP, and ENFP) more closely “fit” the ATCS occupational group in terms of performance and success. It is also important to keep in mind that, although ISTJs and ESTJs seem to be the most common

types to enter the ATCS occupational group, they are not necessarily the types which produce higher levels of performance. Additional post-Academy research may find that the NF types may or may not continue to perform as well. Even without the conducting of further research concerning the relationship between type and performance, however, the MBTI may continue to be a useful tool for employees to better understand the preferred methods of thinking, acting, reacting and communicating within the workplace.



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## Appendix

## Written Request Submitted to FAA For Research Data

December 13, 1994

Dana Broach, Personnel Research Psychologist  
Civil Aeromedical Institute, AAM-523  
P.O. Box 25082  
Oklahoma City, OK 73125

Dear Mr. Broach,

I am conducting a study of the relationship of Personality and the Air Traffic Control Specialist and would like to use data accessible by you to conduct the research. This study will complete my requirements for obtaining a Masters Degree in Human Resource Management from Ottawa University Kansas City.

I have attached a draft of my introduction & method sections of the research project for your initial review. I understand that the data being furnished belongs to the Federal Aviation Administration and I will provide a copy of the final project to you upon completion for your review. I will also take all necessary actions to safeguard all data and maintain anonymity of all subjects.

The data may be sent me at the address indicated below. Thank you for your assistance in my completing this requirement. If you need any additional information, feel free to contact me at (816) 426-2586 or (913) 268-7150.

John F. Fields  
6225 Rene  
Shawnee, KS 66216

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