Benefits of Non-Cognitive Air Traffic Control Skills Training

Reducing "Time to Certification"

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Advanced ATC, Inc. (AATC), a private air traffic control academy located at Wiregrass Georgia Technical College in Valdosta, GA, offers an accelerated Control Tower Operator's Certificate Program. This program consists of intensive academic curriculum and live traffic with a major focus on advanced tower simulation training.

Applying the "REST Rule"

AATC applies what is called the Recommended Effective Simulator Training (REST) Rule. Through application of the REST Rule, AATC has found that, on average, students with little or no experience can work ATC level 12 traffic during the four-month mark in advanced simulation training while continuing to hone their skills for the remaining two months. Experiential learning in a simulator environment for an extended amount of time can increase the student's mastery of skill sets by as much as four times.

Monthly Measurement of Non-Cognitive Skill Sets

Monthly measurement of non-cognitive skill sets is important, and AATC identifies nine specific areas of measurement. Non-cognitive skills are developed both through repetitive deliberate learning and through constant practice or experience.

Just as specific simulation scenarios can be developed for a student to work on a certain job task – for example, issuing traffic alerts – instructors can modify those scenarios in a way that will require the student to display certain non-cognitive skills such as adapting to changing conditions.

Human Factors in Air Traffic Control

The National Academy of Sciences discusses human factors in air traffic control (Flight to the Future: Human Factors in Air Traffic Control, 1997). A study conducted by Ackerman et al. examined the power of a broad set of ability and personality traits to predict skill acquisition during different stages of training in a simulator.

Their results show that whereas cognitive and perceptual ability scales provided the strongest predictions, overall predictive power could be enhanced by pooling ability measures with measures of personality and self-concept.

Personality assessments measuring cognitive ability have been a common practice in air traffic selection processes. The traditional point of view equates skill with intelligence or aptitude. Intellectual ability usually is measured through written tests. A result is received and a person's cognitive skill level is determined on the basis of the test score.

These results typically are used to conclude how successful someone will be in a specific area of work. Yet, this does not fully describe how well someone will perform their job. Emotional intelligence and personality factors are just as – if not more – significant demonstrations of performance.

Applying Both Cognitive and Non-Cognitive Skills Simultaneously

These non-cognitive skills are learned by repetitive practice and experience in real-life situations. In order to produce a positive change in emotional intelligence, one must engage in ways that connect them socially. When a person is under a higher than average level of stress, rational thinking and decision making, along with many other non-cognitive skills, become more difficult to execute.

Sometimes this stress can get in the way of successfully performing cognitively as well. It becomes necessary – especially in the field of air traffic control – to be able to simultaneously carry out cognitive and non-cognitive skills in any and all situations.

Unlike cognitive ability, personality measures in personnel selection have not been as prevalent. In any case, those who are in or around an air traffic control facility would likely agree that there are some common personality traits among controllers.

Personality as a Performance Predictor

Studies show a favorable verdict for personality as a performance predictor. Different jobs require different attributes for success. This is especially true for air traffic control specialists. For controllers, some essential non-cognitive skills for successful job performance include:

- Decisiveness,
- Self confidence,
- Willingness to work as a team,
- Adaptability to changing situations, and
- Thinking clearly in stressful situations.

Job performance, however, is not a single unified construct. It can most generally be divided into two dimensions: task performance and contextual performance. Task performance includes the behaviors associated with the execution of a specific task such as using correct phraseology, providing separation, and scanning the control environment.

Contextual performance includes the behaviors that contribute to the organizational effectiveness through its impact on the psychological, social, and organizational context of work such as composure, self-confidence, and working cooperatively. Enhancing contextual performance while simultaneously carrying out job tasks will enhance a student's success as a controller and improve overall job performance.

The Sixteen Personality Factor Questionnaire

The Sixteen Personality Factor Questionnaire (16PF) developed by Raymond B. Cattell is widely used in personnel selection and development. This assessment identifies personal qualities that influence behaviors in work settings such as problem-solving and interpersonal style.

A study examining the 16PF scores of FAA Academy trainees found that air traffic students exhibited less anxiety, higher self discipline and emotional stability, and were more assertive and self-reliant than normative samples.

Advanced ATC students in the simulator at Wiregrass Georgia Technical College in Valdosta, GA.

The State-Trait Personality Inventory

The State-Trait Personality Inventory (STPI), a questionnaire developed by Charles D. Spielberger, is used mostly for research and clinical purposes. It is comprised of eight 10-item scales which measure anxiety, anger, depression, and curiosity. This includes 40 state items and 40 trait items. A state item aims to assess one's current emotional state while a trait item aims to assess ones emotional disposition.
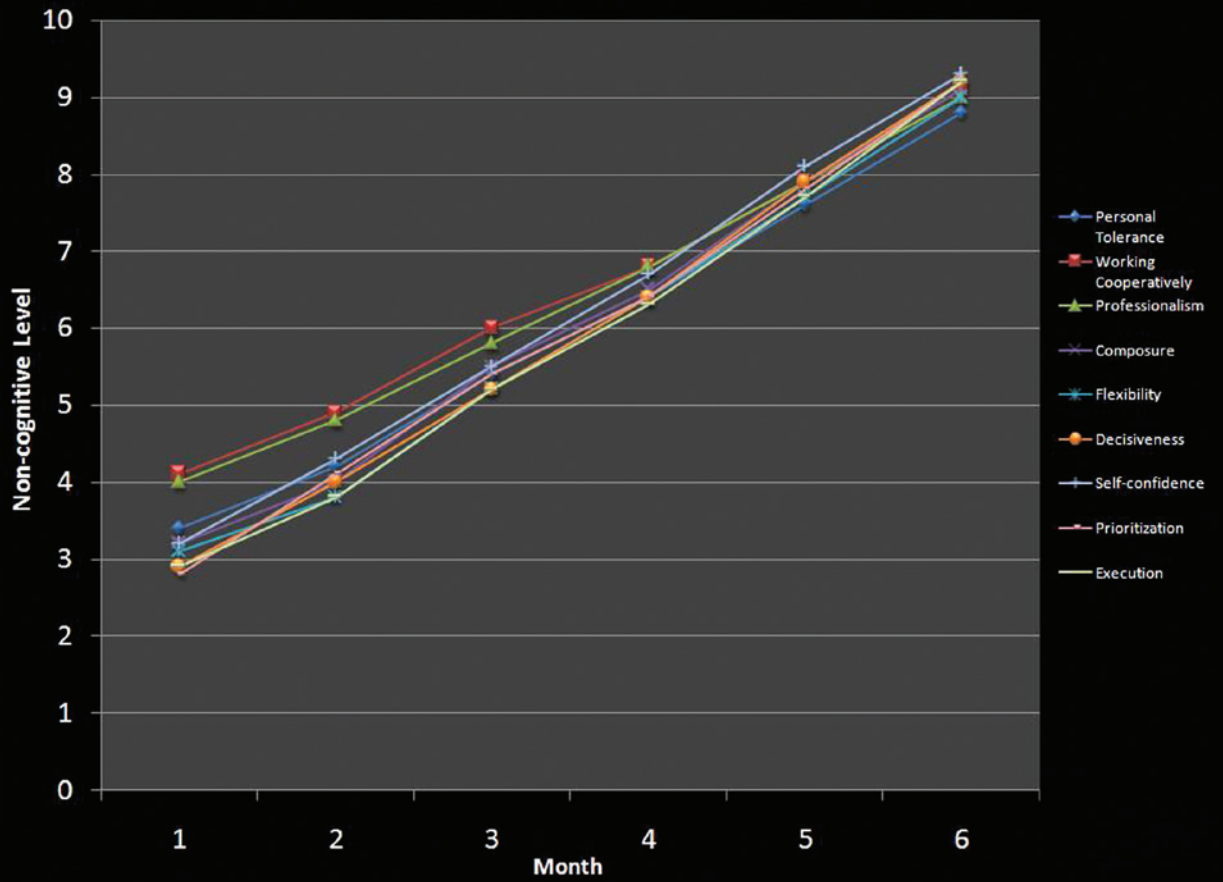
Using the STPI, a study testing air traffic control trainees found that the students exhibited less anxiety and anger than normative groups. It also was discovered that students who had higher than average anxiety and anger scores were more likely to fail at the FAA Academy. It is evident that air traffic controllers must possess certain work related characteristics to perform their job well.
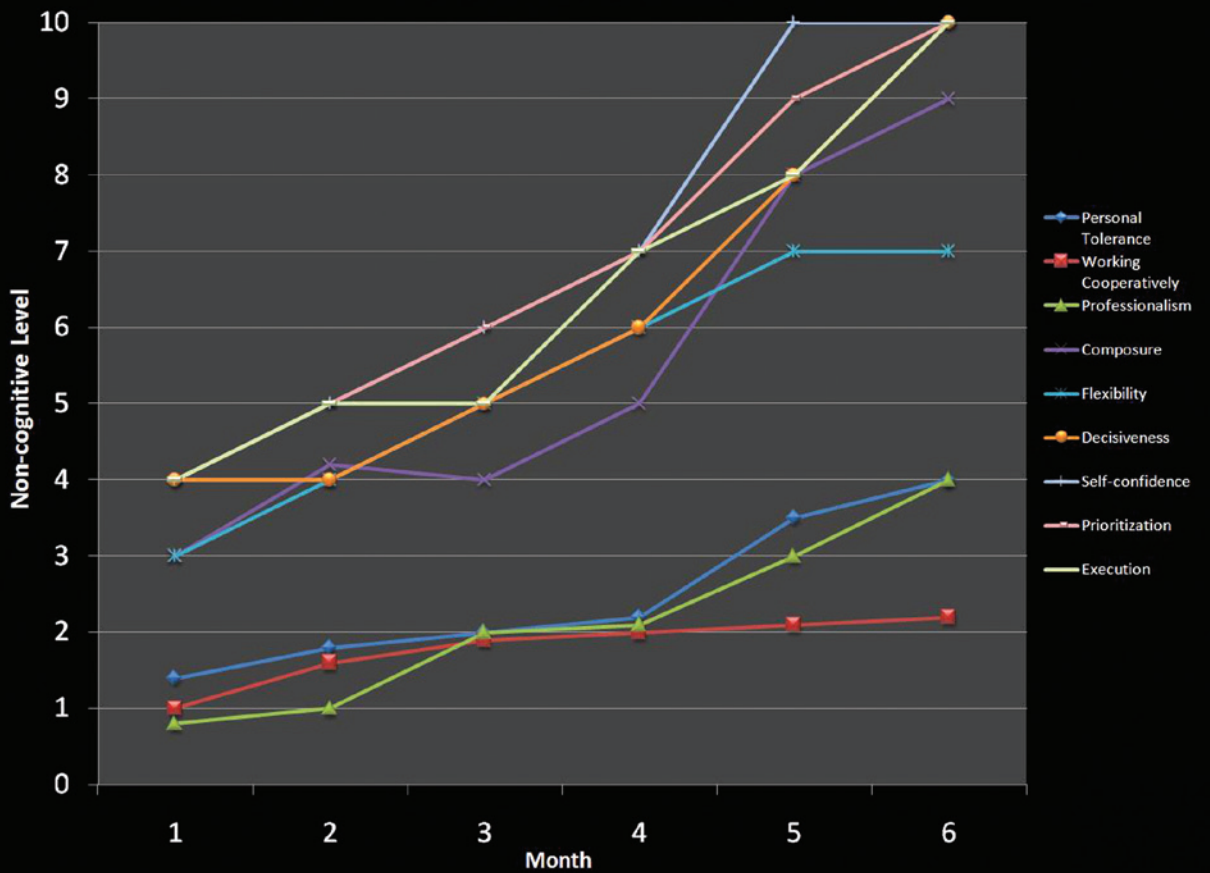
GRADUATE CUMULATIVE AVERAGE
TABLE 1-1

Legend:
- Personal Tolerance
- Working Cooperatively
- Professionalism
- Composure
- Flexibility
- Decisiveness
- Self-confidence
- Prioritization
- Execution

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TABLE 1-2

Legend:
- Personal Tolerance
- Working Cooperatively
- Professionalism
- Composure
- Flexibility
- Decisiveness
- Self-confidence
- Prioritization
- Execution

Work Environment and Personal Characteristics

People bring certain qualities to work while other qualities are generated by the work environment. A job specific task may elicit a certain characteristic, and a certain characteristic the person possesses may determine the way the job task is carried out; therefore, there is room for growth within these qualities.

In order for someone to grow within their traits and continue to develop desired traits, initial assessment and continual tracking must take place. Developmental controllers are assessed in two ways prior to entering the air traffic control profession: (1) aptitude and (2) personality.

When the developmental is in the training process, specific job tasks and subtasks are continuously tracked and developed. The trainee is building upon and expanding their cognitive skills. Just as this is a crucial part of the training process, constant tracking and developing of certain non-cognitive traits is equally important. This can be accomplished by advanced simulation training.

Tracking and Training "Traits" and "States"

In order to develop non-cognitive skill sets, it is important to understand that each student has "traits", or habitual patterns of behavior and emotion. Additionally, each student has "states," or immediate, transitory, current behaviors and emotions. During a simulation scenario, job tasks must be carried out under a multitude of circumstances which may elicit a certain state for an individual.

Now they must perform a non-cognitive skill they are not used to performing; one that is not a trait that they possess. When circumstances draw out necessary behaviors or responses in a frequent manner, states tend to become more stable over time. The key factor is consistency. Through constant simulation scenarios, students can develop their states into the necessary traits required of a successful air traffic controller.

Advanced Simulation Training Develops the Non-Cognitive Skill Set

Over the last two and a half years, AATC has been tracking and developing the non-cognitive skill sets of its students during the advanced simulation phase of training. This phase lasts six months in total and includes 400 to 600 hours of simulation. Once each month, students are individually assessed on their non-cognitive skills performance.

The evaluation scale ranges from zero to ten; zero equates to an entry level skill set and ten meaning having mastered the skill set. Students are rated in nine areas of non-cognitive skill sets as identified by subject matter experts:

1. Personal Tolerance,
2. Working Cooperatively,
3. Professionalism,
4. Composure,
5. Flexibility,
6. Decisiveness,
7. Self-Confidence,
8. Prioritization, and
9. Execution.

Data from AATC graduates provides evidence that students who have completed six months of advanced simulation training will develop non-cognitive skill sets beginning at an entry level performance and increasing to near or reaching a mastered level (See Table 1-1).

Most people are familiar with the "Top Gun Maverick Syndrome." This character demonstrates a mastery of skills as a pilot; however his non-cognitive interpersonal skill set diminishes the effectiveness of the Team or Unit.

Table 1-2 demonstrates an example of this type of behavior in our simulation training. Data from current students is continually charted and evaluated to ensure continued development in all nine areas. Students have consistently demonstrated enhancing contextual performance while simultaneously enhancing task performance.

Successful Controllers Possess Specific Non-Cognitive and Cognitive Skills

Examining historical studies in the selection and developing of air traffic control specialists results in a continual theme. Air traffic controllers who possess certain non-cognitive and cognitive skills perform at a higher level than others. Being able to evaluate these skill sets in a simulative environment and making proper facility placement or termination based on those skills should reduce the OJT attrition rate to zero.

The important factor in facility placement is to understand the REST Rule. Based on our experiences in a full time simulation training environment, AATC feels very comfortable in saying that six months of ATC simulation is the most effective time period for this achievable goal. This is based upon students mastering the application and execution of FAA Order 7110.65, Air Traffic Control.

Ninety Percent Simulation Training Ratio Delivers Best Performance

In conclusion, AATC believes that simulation training time should be performed at least 90 percent of the time compared to just 10 percent OJT time. For example, a facility that averages two years time to certification (TTC) can reduce its certification time to two or three months. Projected outcomes are zero OJT attrition and significantly reduced TTC. ⊙

REFERENCES

1. Dean, M. A., Russell, C. J., & Farmer, W. L. *Non-Cognitive Predictors of Air Traffic Controller Performance.* 24-25.
2. Fiske, D.W. (1971). *Managing Personality.* Piscataway, NJ: Transaction Publishers.
3. Hilsenroth, M. J., Segal, D. L., & Hersen, M. (Eds.). (2004). *Comprehensive Handbook of Psychological Assessment: Personality Assessment, Vol. 2.* Hoboken, NJ: John Wiley & Sons, Inc.
4. Impelman, K. (2007). *How Does Personality Relate to Contextual Performance, Turnover, and Customer Service?.* (Doctoral dissertation). Retrieved from ProQuest Information and Learning Company (UMI Microform 3300955)
5. King, R. E., Retzlaff, P. D., Detwiler, C. A., Schroeder, D. J., & Broach, D. FAA Civil Aerospace Medical Institute & University of Northern Colorado Psychology Department. (2003). *Use of Personality Measures in the Selection of Air Traffic Control Specialists.* (Report No. DOT/FAA/AM-03/20).
6. Wickens, C. D., Mavor, A. S., & McGee, J. P. (Eds.). (1997). *Flight to the Future: human Factors in air Traffic Control.* Washington, DC: National Academy Press.