Alarming Results of the Spatial Attention on Pilot's Aptitude Testing

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ABSTRACT

Among safety policies and protocols, which the civil aviation authorities anticipate in order to achieve and maintain prior involvement in monitoring and/or observing behavioral construction, there is a fundamental action. The authority requires to know whether a candidate has the base line capability of bearing and fulfilling the requirements of the physical and mental pressures of the job on student pilot candidate election programs. IATA's pilot aptitude testing need and guidance declares that the student pilot candidate election programs should contain such parameters that a student pilot candidate must succeed through (IATA,2019). We operated a test protocol which was compatible with IATA's demand of competence on a student pilot candidate. With the predetermined success rates of every test protocol battery, we provided results of the tests of spatial attention, with regarding to the feedback from personality test, spatial attention, spatial disorientation, perceptional focusing & memory, spatial aptitude, decision making under stress, team work & leadership. We analyzed the results of the tests and the spatial attention sufficiency requirement has the least success rate in the midst of basic abilities and sophisticated skills which a student pilot candidate has to have. Among the 78 student pilot candidates, 38 pilot candidates have failed from the pilot aptitude testing's spatial attention sufficiency parameter.

INTRODUCTION

Aviation authorities and reference books state that the safety policies and accident prevention have critical value. The fact is that, an airline's safety policies and financial health are directly bounded with the actions of being a professional pilot (IATA, 2019). Being aware of the pilot's aptitude in any necessary parameter needs a tender approach.

On the Pilot's Aptitude Testing guidance and needs of IATA which has been effective since April 2019, it is declared that in order to increase operational safety, civil aviation training organizations have shifted from the traditional task-based training to competency-based training and assessment (IATA, 2019). The mentioned publishing also remarks pilot's aptitude testing is the very first step to start professional career of a pilot. Thus, the test needs to be able to indicate a student pilot candidate's ability/capacity of maintaining performance for further considerations. The competencies a student pilot candidate should develop during training and deploy throughout his professional career are;

- Application of procedures and compliance with regulations
- Communication
- Airplane flight path management, automation
- Airplane flight path management, manual control
- Leadership and teamwork
- Problem solving and decision making
- Situation awareness and management of information
- Workload management (IATA, 2019).

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The needs for a pilot to have can easily be seen as an aptitude test has to have a large scale of competency for analysing these criterias. Creating the test itself requires a certain amount of work on it so that it can be enough to project needed cognitive abilities and behavioural attitude (reactions) of a pilot. The minimum required cognitive abilities and behavioural attitudes of a pilot, if known beforehand, are unique advantage in civil and military aviation where 70 to 80 percent of accidents have reasoned referring human factor (O'Hare, Wiggins, Batt, & Morrison, 1994; Wiegmann and Shappell, 1999; Yacavone, 1993).

Wiegmann and Shappell have suggested, constituting pilot's aptitude test has decreased the ratio of failures efficiently. Especially if the test's election parameters are lack of variation or the election monitoring process was executed rapidly or shallow (Wiegmann, D. & Shappell, S., 2001).The pilot's aptitude test is essential for the test is constituted to measure whether a student pilot candidate's abilities and capabilities are qualified enough for the minimum requirements. The result of the test should expose if a student pilot candidate has competence on,

- English language proficiency
- Basic mental abilities
- Composite mental abilities
- Operational abilities
- Social-interpersonal abilities
- Personality traits

We believe the factors that lead to behaviours and actions in a pilot, depend on the decision-making process. The testing protocol we used was constructed to measure this process with the necessities that were given by IATA in order to understand any relevant decision characteristics. We analysed the test progress results of the student pilot candidate's as regarding which candidate is more likely to adopt for the given circumstances. The test results are to be referred in any further data of a pilot's future impulses.

Critical Roles of Pilot's Aptitude Testing Procedure

The most significant reason for an accident and/or a crash to occur is the human factor (O'Hare, Wiggins, Batt, & Morrison, 1994; Wiegmann and Shappell, 1999; Yacavone, 1993). That knowledge we have over aviation actions, led us to monitor the effective parameters better comprehensively. We operated the testing procedures along with the IATA's criteria to achieve an educated guess over a pilot-to be, for the test we used has a spatial attention battery and designed to measure the required data on attention competency.

It should not be forgotten that when a student pilot candidate is tested, the necessity is to find out how the selective, divided and integrated attention work on in a distressed time. The route for the conclusion of O'Hare comes from the exponentially increasing knowledge of the technology. The more we become able to surround ourselves with the brand-new software in the brand-new machines, the more we are to catch up with that improvement. It is seen that any failure or lack of speed in the integration between the human biology and the ever-growing technological development, generates an incident. Therefore, the authorities have started to make investment on human performance (Jaiwon Shin, 2000).

The other important fact is human himself, with his anatomy, morphology and the physiology, he has limits in where he is expected to work, like the drastic effects of being in a 3D condition which the human biology is not accustomed to. In order to annihilate these unpredictable effects, we tested the candidates to be informed about how they are going to act when the data processing stops. That is exactly what is going to be in a place where is not suitable for human physiology.

With the loss of the perception, as the human perception is accustomed to work ideally on the Earth's surface not on the 3-dimensional aerospace environment of the atmosphere, the actions of a pilot becomes critical, since it is related to the pilot's aptitude on dealing against the stressed positions. A pilot has to have a considerably durable competence on withstanding massive physical and mental pressures. The test which is used in understanding pilot's aptitude, needs to have qualification on measuring this data processing in a pilot especially in distressed conditions.

METHOD

Performed Test Batteries

- **Personality Test**

On the very first step of testing procedure, the student pilot candidates are subjected to the MMPI (Minnesota Multiphasic Personality Inventory). The test requires to answer 566 questions (Fulkerson, Freud, & Raynor, 1958). The answers and their standard errors are customized to fit the Turkish norms by authorized flight psychologist. The authorized flight psychologist evaluates the results and with the successful results, the candidate is allowed for following test batteries.

- **Spatial Aptitude**

In this testing battery, candidate is expected to fulfil basic numeric, arithmetic, linguistic and logical interactions on a computer-based platform. Every section of the test has a limited period until it moves to the following part, .

- **Spatial Disorientation**

The spatial disorientation is performed in a specially designed room where the candidate is fastened sitting on a platform which rotates 360 degrees on it's horizontal plane. The candidate is asked to read out loud every number and sentence that he sees on a VR mask while the platform is rotating. The main purpose of the test is to indicate whether the candidate generates an acute disorientation such as vertigo, nausea and sickness and if he does, the severity of it. The result of this test is reserved to refer decision making under stress, focusing and memory competencies.

- **Teamwork & Leadership**

This test battery is organized to understand how a candidate is acting in a group scenario to accomplish a given work. Configuration of the team is to observe leading behaviours and/or affinity to work together as a group. The test battery expects candidate to construct an environment and overcome the task. An attended communication specialist with a psychologist play an important part in this test battery for the cadets usually need a verbal support at the beginning. The result of this test is reserved to refer decision making under stress and interview.

- **Perceptional Focusing & Memory**

In this testing battery, a candidate is asked to answer basic numeric, arithmetic, linguistic and logical question along with the perceiving 3-d forms and hand-eye coordination and this coordination's speed on a computer-based platform. The is formed with question types to fit the requirements of understanding cross-control mechanism.

- **Decision Making Under Stress**

Along with the relevant competency tests, observed and concluded by an authorized flight psychologist and an authorized flight physician, the head of training and a communication specialist, the candidate's competence in decision making under stress is decided.

- **PALPEX - Divided Attention, Reaction & Focusing**

The Palpex test battery is performed in isolated room where the candidates are to answer basic general knowledge questions on a computer-based platform. The test battery expects the candidate to realise and react against to the flashing lights with reaching and touching the buttons around the screen platform.

- **Spatial Attention**

The test battery expects candidate to become able to process the percepted data accurately. To achieve that is through training is an important basic especially for the air condition is not suitable for a pilot and any problem that occurs in the air is likely to cause abnormal physiological output. Although it can be taught in the operation process, a candidate's tendency for winning this ability of maintaining spatial attention needs to be seen forewords. On the other hand, the environment's physiologic-pathologic activities over a pilot's behaviour may arise above some certain acts expected from a pilot. Thus, the test should observe how long this physiologic-pathologic activity last and their severity because of the fact that it can be eliminated by an aptitude testing (Fleishman, E. A. 1956).

To indicate the reasons that caused motion sickness, for the air is unsuitable for human biology, the vestibular system may create abnormal outputs such as vertigo, as it needs to be searched if it is a pathological condition or motion sickness (Stern &Koch, 1996). If there is no observable pathology but there is a coordination loss caused by 3 dimensional movements, the test needs to be repeated with different scenarios and different stress values.

The test is performed to indicate if the candidate is able to maintain data processing when reflective behaviours (panic or evasion and escape) occurs in disorientated conditions.
In this test battery, the selective, divided and integrated attention is measured by a dynamic psychometric aptitude testing called human-gyro. The test results of the human gyro are the only parameter which was used when considering selective, divided and integrated attention in this paper.
The dynamic psychometric aptitude testing is held on a three-gimbal gyro, driven by an electric motor (Beköz, Beköz, & Çetinkaya, 2001).

The expected action from a candidate is, while adjusted and fastened securely in the gyro, to track a simple simulation via the tracker. Meanwhile the candidate needs to rephrase the voices and images that was given from a display monitor and a headset. The test's feedback is the only parameter to measure spatial attention competency, yet the data about perceptional focusing and memory is stored in order to take in consideration for relevant tests.

- **Interview**

After screening and analysing every test result, the competence and compliance needs are decided by the human resources department and communication specialist for the candidate's profile and its relation with the flight performance.

DATA AND ANALYSIS

Parameters and Success Rates

Below is the list for the batteries for their minimum expected rates to be accepted successful.
Spatial Attention Test; minimum 40%,
Spatial Aptitude Test; minimum 60%,
Perceptional Focusing & Memory Test; minimum 70%,
Spatial Disorientation Test; minimum 50%,
Personality Test, Decision Making Under Stress, Teamwork and Leadership and Interview parameters have results that cannot be accurately measured and therefore, relevant authorized personnel executes a result as successful or not successful withal their suggestions and remarks.

Spatial Attention Parameter's Success Rate

Among 78 candidates (57 men and 21 women) between 18-35 years of age, participated in the testing procedure, the number of cadets that have failed in Spatial Attention Test Battery is shown in the Table1.

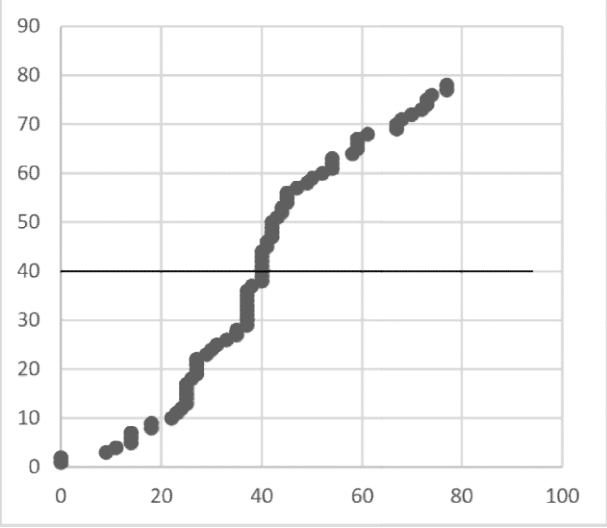

Table 1: Attention parameter success of 78 candidates on student pilot aptitude testing. 40% success value is shown in the table as minimum expected rate on the y-coordinate as the x-coordinate shows the number of the candidates who have been tested. Among 78 student pilot candidates, 38 have failed in attention parameter of the pilot aptitude testing where 40% is the minimum success expected.

As it is seen in the Table 1, among 78 candidates, 38 tested participant have failed in Spatial Attention Test Battery.
It is calculated, the mass variance is in the acceptable limits of confidence interval at the level of 99%.
We observed that the Spatial Attention Testing Battery has the largest number of failures among the batteries of the test protocol.

DISCUSSION AND RESULTS

Attention Parameter
We believe especially in the test battery of the spatial disorientation, the candidate's and/or the human physiology's reaction to the distinct nature of the overall test can be the reason behind the failure rates of measured selective, divided and integrated attention. On the other hand, for the age range of the candidate's to state, we adapted the anticipatory outputs of the tests without referring the volume of the alerter. Still, the results of the candidates are, as shown, below the anticipatory level and we believe it occurs according to all the electronic-mechanic factors that caused the candidate's processing of percepted data.
We regarded the results of the human-gyro only, in spatial attention test battery, in order to measure the attention necessities. Authorized flight psychologist, authorized flight physician, manager of human resources, manager of training department and the head of flight operations have made the final considerations about the candidate's result with referring his/her results of all the components of the test protocol.
While setting up the minimum success rate as 40% for spatial attention test, we consulted to the general attention behaviour if observed or measured in personality test, perceptional focusing & memory. We also gave a briefing to the candidates and asked them to recall the headlines of the lecture to address the attention parameter's limits.

Sufficiency-concerning Parts
To lead an improvement on aptitude testing mechanism, we should expect the testing procedures and the quality system organs of the company should work concentrically. Ideally, this quality system that works together as one, is supposed to be able to collect the data of a pilot in a life-long progress. We believe that in order to sustain this aim, Human Resources, Training Department, Flight Operations and for the most, IT Department should be working together.
Pilots Aptitude Test's major profit that is used as a pioneer advantage providing instrument is its efficiency to achieve improvement in competency. The usage of this competency on limited training sources is the best way possible to improve systemic progress.
Surely the level of importance of the test is not only to create data for airline companies but also to form a figure to understand and improve safety priorities.
This study shows needs and reasons of pilot student election programs, to maintain the safety behaviour as a priority among all other preventative elements for accident and incident concerning systemic components. The notion is to practice and improve the pilot aptitude testing needs of IATA. The value of a pilot's compliance necessities needs to be preserved and improved from the beginning of the pilot's training to keep the safety doctrine as it is ought to be.

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