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ORIGINAL ARTICLE

# Computer-aided assessment of aviation pilots attention: Design of an integrated test and its empirical validation

**Rosario Cannavò [a], Daniela Conti [b], Alessandro Di Nuovo [c,d,*]**

[a] *Flight Simulation and Training Devices Unit, Cognitive Technologies and Services SRL, Catania, Italy*
[b] *Doctorate School of Neuroscience, University of Catania, Catania, Italy*
[c] *Faculty of Engineering and Architecture, Kore University of Enna, Enna, Italy*
[d] *School of Computing and Mathematics, Plymouth University, Plymouth, United Kingdom*

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**Abstract** Attention has a key role in the flight performance of the aviation pilot, therefore it is among human factors commonly used in the evaluation of candidate pilots. In this context, our work aims to define a single integrated instrument able to measure all the distinctive attention factors and to assist the assessment and the training of aviation pilots.

In this paper, we present a battery of seven computerized tests, encompassing classical and innovative solutions inspired by the literature in the field, for the integrated measurement of the attention factors of aviation pilots. The computer software is validated by means of an experimental trial with 50 experienced aviation pilots and 50 untrained people as controls. Statistical analyzes confirm that

* Corresponding author at: B109 Portland Square Building, Plymouth University Campus, Plymouth PL4 8AA, United Kingdom. Tel.: +44 1752586320.
E-mail address: alessandro.dinuovo@plymouth.ac.uk (A. Di Nuovo).
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the instrument can effectively classify aviation pilots, and identify a subset of distinctive attention factors that could be used for monitoring their duty.

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## 1. Introduction

In the typical routine, an aviation pilot has to switch rapidly between different sources of information to construct a mental situation model of what the airplane is doing and how to get it to go where he wants it to go. At the same time, he has to listen to Air Traffic Control (ATC) instructions, often delivered at sustained speed. Then, there is the requirement to interpret the instructions from ATC through the use of paper or electronic charts and to fly, or program the autopilot to fly, the desired route. At the same time, the pilot has to keep track of the weather at his current location, along his route and at his destination.

In this context, it is too crucial that the pilot develops Situation Awareness (SA) that is not specific to a particular type of aircraft and mission, but generalizes across many types of aircraft systems [9]. Many researchers recognize the essential role of attention in SA [8,16,18], as an example Schriver et al. [14] investigated the behavior of pilots with different experience levels and presented results that support the link between greater attention and more effective decision making of aviation pilots. Recently, Carretta [4] confirmed that attention is among factors that have consistently shown a relation to flying performance in a study of the Pilot Candidate Selection Method (PCSM), while King et al. [11] proved that tests of cognitive functioning, that include attention, can predict the training outcomes.

Previous work demonstrated that computerized tests are ideal to assess pilot aptitude [2] and, in particular, to measure attention factors [3]. In fact, many different computerized instruments to measure attention factors are available, but to the best of our knowledge none of these instruments was designed and tested specifically for aviation pilots with validation results published in the scientific literature. Moreover, commercially available computerized tests for aviation pilots usually measure attention indirectly, e.g. via simplified flight maneuver simulations, which involve several factors at the same time, and cannot give a specific attentional profile that can highlight strengths and weaknesses of the candidate pilot. Indeed, the attentional profile can be useful for ad-hoc training as theoretical and empirical evidence exists in support of the argument that both the control of attention and the ability to establish better attention management can be developed with training [10].

We also underline that the training of an aviation pilot is particularly difficult and expensive (the full process for a commercial license can cost up to a hundred thousand of US dollars) and flight schools have a limited number of seats available

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