Humans Are Still the Critical Factor in Aviation Security

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INTRODUCTION: In Germany, the German Federal Police assess the performance of aviation security screeners on a regular basis. These so-called "reality tests" are unannounced examinations which aim to investigate whether airport screeners can detect forbidden items in hand luggage or attached to the body. Recent alarming results of such inspections showed clearly that the overall detection rate is in need of improvement. To achieve this, it is important to identify specific factors that influence general screening performance. This especially includes basic cognitive functions like visual screening, alertness, and divided attention, which have come more and more into focus in current fundamental research projects. This brief commentary points out critical factors, contributes background conditions in aviation security screening, and shows possible approaches for enhancement and optimization. Finally, the human aspect is discussed as not only being the weakest factor in security screening, but also one of major importance.

KEYWORDS: basic cognitive functions, aviation security screening, personnel selection and training.

For years, aviation has been the transportation area with the largest growth. The prediction is that IFR (instrumental flight rules) flights in Europe will increase about 1.8 times from 2009 to 16.9 million flights in the year 2030.[1] To accommodate this demand, it is crucial that each and every airport procedure is timely and free of distraction. To assure a smooth process, aviation schedules, cargo handling, client check-in, and security inspection are essential.[12]

Examinations of performance of security screeners by the European Commission at the passenger security checkpoints at the Airport Frankfurt/Main demonstrated striking results. Nearly every second bag containing a forbidden item (e.g., an improvised explosive device or IED) was transferred through the security check without any difficulties.[1,2] One could ask why and how this was possible. What are the potential issues of security screening? Under what conditions are screeners working and how are they trained? The answers to these questions should clarify the challenging aspects of the on-the-job qualification for "aviation security assistant" and thus provide insights on the background to the results demonstrated by the commission.

Aviation security refers to the prevention of external endangerment and is realized by the critical interaction of humans and technology. Security screeners, who are responsible for controlling carry-on luggage and customers, perform, among other tasks, analyses of X-ray images to detect prohibited objects.[10] X-ray screening means that security assistants have to search for very rare and infrequent items[11] and work under highly noisy circumstances with time pressure and high distractibility.[4] Screeners have to be very focused and concentrate while visually scanning the image, recognizing and categorizing the items shown, and deciding quickly whether there are any suspicious objects.[5] This short analysis focuses on basic cognitive functions like visual screening, alertness, divided attention, vigilance, and long-term memory matching processes. Additionally, security screeners have to deal with challenges from shift work such as fatigue in the early morning shift, sleep disorders after shift changeover, and impairment of productivity during night shift.[3] As a consequence of daily varying air traffic (e.g., traffic increases, especially in the morning), work hours are determined by airline timetables and are announced on a short-term basis. Hence, the different aspects of security screening within these challenging influences shows that humans are

still one of the two essential factors in aviation security in addition to new technologies.

Because the required skills are broad-ranging and diverse, security assistants should be carefully selected and well trained.[8] One could postulate that candidates for aviation security screening are chosen by predefined parameters, for example, specific basic cognitive skills, such as the ability to mentally rotate objects, which is important for fast and veridical X-ray reading, and basic attentional resources (alertness, divided attention, or vigilance[7]). However, current practice suggests that almost every applicant is accepted, which should be discussed critically. The choice of candidates is restricted by several reasons.

First, most airports are built in a rural area away from the center of the nearest city. Therefore, people who want to work at the airport cannot rely on the public transportation system on a daily basis. These aspects significantly restrict the pool of candidates to those who live nearby and/or have the possibility to go by car, whether their own or via a carpool, to their workplace. Secondly, every candidate has to participate in the offered training, which is often sponsored by the job center. This implies that the person is not engaged in an ongoing employment, or is willing to quit actual employment in order to get involved in the specific security training without a signed contract with the security company. Under these circumstances, the available group of talented and promising applicants is further reduced. The third factor may be one of the most crucial aspects. To date there is no written guideline to indicate predefined parameters for selecting eligible candidates. The background for this deficiency is these parameters seem to be unclear and fundamental research is required to answer this question. To define appropriate parameters it is important to identify the cognitive variables that moderate the performance of security assistants such as detection ability.

To our current knowledge, none of the acting aviation security companies perform an assessment of whether potential employees fulfill specific requirements with respect to specific cognitive basic functions which could be essential for security screening. Until now, not only have assessments of such cognitive functions been lacking, there is also no specific training on these basic functions incorporated into the training software packages available for the initial training. To become an employee of a security company, each applicant has to pass the exam for security assistant after approximately 10 wk of training. In addition to the education with respect to law, weaponry, and explosives, training is conducted to build specific competencies in passenger control and analyzing X-ray images of carry-on luggage. One would expect that the best training to achieve high performance, practice with genuine X-ray images of real-world luggage with and without various types of prohibited items, would be standard. Therefore, it is very surprising that not all computerized X-ray training systems use this kind of imaging.[6] The highest relevance of computerized training approaches to everyday life should be guaranteed. In addition to the investigation and development of modern and cutting-edge technology, the human operator and his/her professional abilities cannot be neglected. New technologies should be associated with specific training in order to enhance operational performance on new machines.

Nonetheless, it is always the human that makes the last decision of whether a carry-on bag contains a forbidden item and requires further inspection. Thus, we have to focus on the human factor: the skills, behavior, and capabilities, as well as the limitations of humans, to get the best result for aviation security. In line with this problem and other related questions, the German Federal Ministry of Education and Research has conducted a call to "Aviation Security" under the Program of the German Federal Government "Research for the Civilian Security," which provides funding as well for research projects that focus on the human factor. The results to be achieved by those scientific projects could lead to development of targeted personnel assessment tools for cognitive basic functions and corresponding training for working security assistants, thus enhancing the quality of aviation security performance.

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