



SCIENCE & SECURITY Issue 32

CASRA NEWSLETTER

Since 2012, we have been publishing newsletters in which we present results from our research, address trends, and provide information for security practitioners.

The first article of this issue describes a recently published study that compared screener performance in local cabin baggage screening and remote cabin baggage screening using a large dataset of threat image projection data.

The second article presents an interview with the Liaison Officer of the German Federal Police in Cairo and his assistant on a successful partnership with the Egyptian Civil Aviation Authority (ECAA) and CASRA to enhance aviation security in Egypt.

We hope you enjoy reading these new articles and as always, we are looking forward to receiving any feedback you might have as well as your input on topics you would like us to address in upcoming newsletters.

With best wishes,



Dr. Diana Hardmeier
Director



Prof. Dr. Adrian Schwaninger
Chairman

TOPICS IN THIS ISSUE:

RESEARCH PUT ACROSS

SCREENER PERFORMANCE IN REMOTE VERSUS LOCAL CABIN BAGGAGE SCREENING

Remote cabin baggage screening (RCBS) has gained traction in airports worldwide, offering advantages over traditional local screening (LCBS): RCBS allows screeners to work in quieter, office-like settings, improving staffing and resource allocation. But does it also enhance screener performance? A recently published CASRA study answers this important question by analyzing a large dataset of threat image projection (TIP) data from LCBS and RCBS.

SECURITY IN PRACTICE

ENHANCING AVIATION SECURITY: A SUCCESSFUL COLLABORATION BETWEEN THE GERMAN FEDERAL POLICE, THE EGYPTIAN CIVIL AVIATION AUTHORITY, AND CASRA

We are excited to share an interview with Thomas Seifert, Liaison Officer of the German Federal Police (BPOL) at the German Embassy in Cairo. Joined by his assistant, Tamer Saleh, Seifert provides insights on a successful partnership between BPOL, the Egyptian Civil Aviation Authority, and CASRA to enhance aviation security in Egypt, showcasing the power of expertise, effective computer-based training technology, and intercultural collaboration.

SCREENER PERFORMANCE IN REMOTE VERSUS LOCAL CABIN BAGGAGE SCREENING

Text: Marius Latscha

In recent years, remote cabin baggage screening (RCBS) has gained traction in airports worldwide. RCBS offers advantages compared to traditional local cabin baggage screening (LCBS). With RCBS, screeners can operate in a quiet, office-like environment, away from the noisy and busy checkpoints. Additionally, RCBS provides benefits for staffing and optimizing human resource allocation. But does RCBS also improve screener performance? In a recent study, researchers at CASRA addressed this important question by analyzing a large dataset of threat image projection (TIP) data from LCBS and RCBS.

While remote screening has been used for hold baggage screening (HBS) for many years, screeners in cabin baggage screening are traditionally working at the X-ray machines at the checkpoint. However, with central image processing (CIP) the one-to-one relationship between the screener and the X-ray machine is no longer required. With CIP [1,4], images from multiple machines can be pooled. In RCBS, the images are then sent to analyst stations in a remote room separated from the check-point. Thus, screeners in RCBS are no longer analyzing images at the lane but in a quieter and office-like environment.

PERFORMANCE DIFFERENCES IN RCBS VS. LCBS?

The environments in which screeners operate differ significantly between RCBS and LCBS. Screeners in LCBS work directly at the checkpoints, where they face noise, distractions, and social stress from passengers. In contrast, RCBS places screeners in quieter, remote environments, potentially leading to improved focus. This significant dif-

ference in work settings raises an important question: does RCBS improve screeners' performance compared to LCBS? To answer this question, we conducted a large-scale field study comparing screener performance in RCBS and LCBS [5].

Specifically, we explored whether the quieter, less stressful RCBS environment enhances the detection of prohibited items compared to LCBS. Additionally, we examined the impact of time on task and task load on screening performance in both work settings.

SETUP OF THE FIELD STUDY

The study was based on field data collected over two years at an international European airport that utilized both RCBS and LCBS with 2D multi-view X-ray imaging technology. To measure performance, we analyzed 669,168 decisions on threat image projection (TIP) images made by a total of 1,706 screeners. TIP technology projects pre-recorded X-ray images of prohibited items into X-ray images of bags being screened. This allows measuring screener performance at the check-point [3,7,8].

Our study focused on two crucial aspects of screener performance: the hit rate (the percentage of detected prohibited items) and processing time (the time taken to analyze each image). Additionally, we examined how time on task (time spent continuously screening) and task load (number of images analyzed per minute) influenced performance. This setup enabled a detailed comparison of screener effectiveness and efficiency in RCBS and LCBS.

HIGHER HIT RATE AND SLIGHTLY SLOWER PROCESSING TIME IN RCBS

Figure 1 shows the hit rate (top) and

processing times (bottom) dependent on the work environment, time on task and task load. The results indicate that RCBS leads to better detection of prohibited items: Screeners in RCBS showed a higher hit rate than in LCBS. However, the higher hit rate came at a cost, as screeners showed slightly slower processing times in RCBS. [Note that processing times on images not containing a threat or (target absent images) were not available in the dataset analyzed for this study but are most practically relevant because they drive the overall throughput at checkpoints. However, we were able to analyze the processing times for negative decisions on target-present images (processing times for misses; bottom right in Figure 1) as a proxy. These are expected to follow similar patterns]

COMPARABLE EFFECTS OF TIME ON TASK AND TASK LOAD

In both environments (RCBS and LCBS) we observed a slight decline in performance over time, particularly under high task loads. The decline was similar in RCBS and LCBS, although screeners in RCBS consistently performed better overall.

DIFFERENCES BETWEEN SCREENERs

While the work setting (RCBS vs. LCBS) affected the hit rate and processing times, there were larger performance differences between individual screeners. This indicates that individual differences in cognitive abilities, experience and the amount of training have a stronger influence on performance than whether the screening occurs locally or remotely. Interindividual performance differences were larger than the effects of time on task and task load.

PRACTICAL IMPLICATIONS FOR AVIATION SECURITY

The findings from this study have significant practical implications for airport security. The findings speak for RCBS offering advantages in terms of higher hit rates, which enhances overall security. However, airports may consider the trade-off between improved detection

and slightly longer processing times in RCBS compared to LCBS when balancing security and passenger throughput.

We found that the hit rate decreased with time on task, especially when task load was high. Interestingly, we found the decline in performance over time to be equally pronounced in both work settings.

However, similar to the effects of work setting which were much smaller compared to differences between individual screeners, the effects of time on task and task load were relatively small. This is aligned with findings from another study recently conducted by our group [2], showing that changes in screening performance with time on task occur-

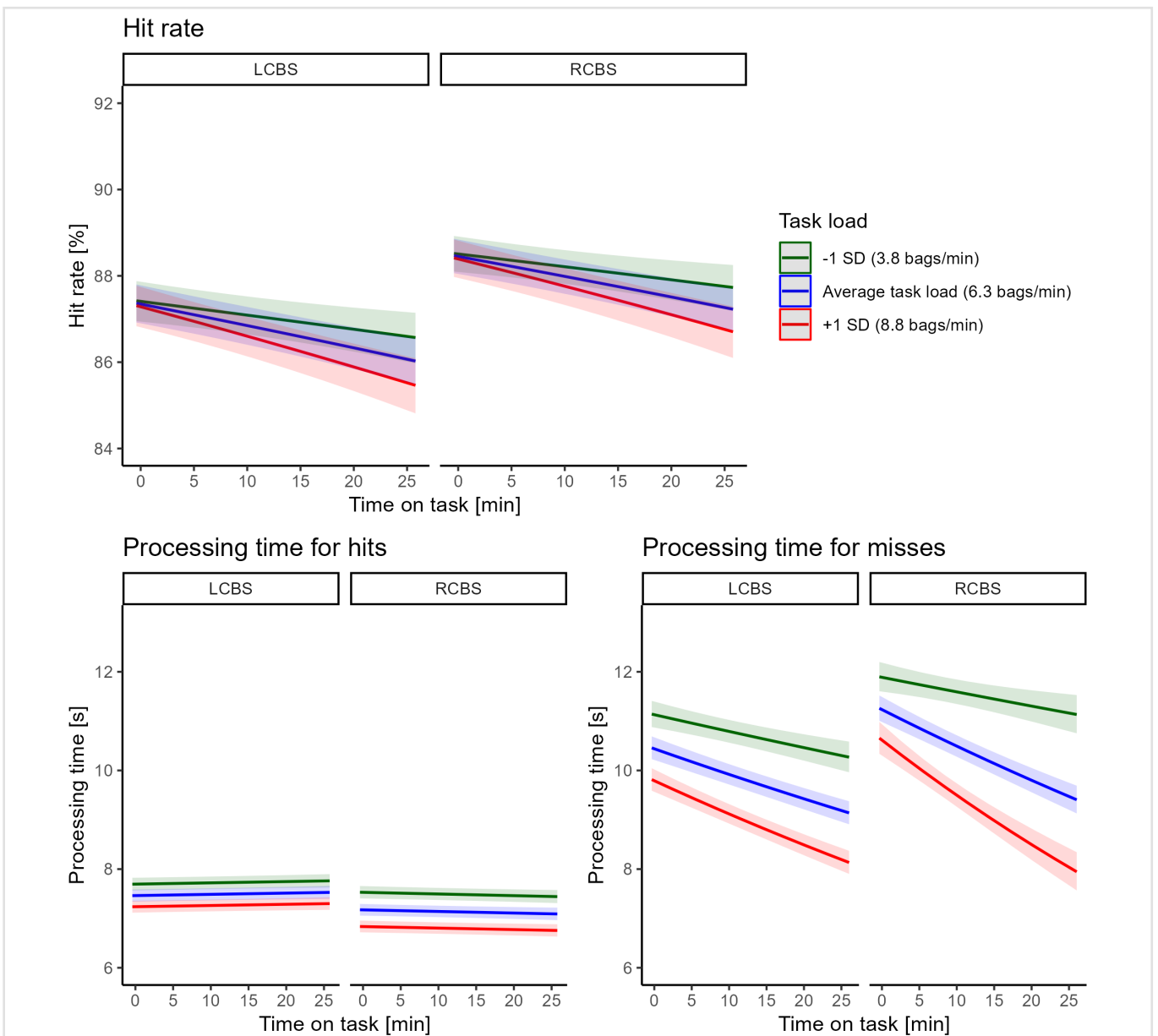


Figure 1: Hit rate (top), processing times for hits (bottom left), and misses (bottom right) for LCBS and RCBS shown over time on task at low (mean minus one standard deviation, green), mean (blue), and high (mean plus one standard deviation, red) task load

ring within typical session lengths (approximately 20 minutes) are small compared to the interindividual differences between screeners.

LIMITATIONS

It should be noted that based on the available TIP data we could not calculate the false alarm rate (i.e., the percentage of bags that were harmless but wrongly classified as containing a prohibited item). This represents a limitation often encountered when analyzing field data from TIP systems (Meuter & Lacherez, 2016; Skorupski & Uchroński, 2016). False alarm rates would have been interesting to see whether screeners in RCBS tend to decide more often that a threat is present. Moreover, our study did not capture the potential long-term effects of RCBS on performance and was conducted at a single airport. Further research at other airports using different screening systems (e.g. 3D CT machines) would be interesting.

CONCLUSION

Our study provides first evidence that RCBS offers better detection of prohibited items, although at the costs of slightly higher processing times. Furthermore, we found that the declines in hit rates with time on task are comparable in LCBS and RCBS, and that they are accelerated under high task loads. Importantly, the effects of work setting, time on task, and task load were small compared to the differences between screeners.

THREAT IMAGE PROJECTION

During X-ray baggage screening at airports, the frequency of real threat items (target prevalence) is very low, and a low frequency of targets reduces the detection. Airports counteract this by projecting prerecorded images of threat items (fictional threat items, FTIs) into randomly selected X-ray images of passenger baggage using a technology called threat image projection [3]. This way, screeners are exposed to more threats. Because TIP systems record whether a TIP was detected by the screener or not, TIP data can be used to calculate the screeners' hit rates as an indicator of their detection performance.

The published paper is available [here](#).

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ENHANCING AVIATION SECURITY: A SUCCESSFUL COLLABORATION BETWEEN THE GERMAN FEDERAL POLICE, THE EGYPTIAN CIVIL AVIATION AUTHORITY, AND CASRA

Text: Alex Kunz & Mahé Becker

In this edition, we are excited to present an insightful interview with Thomas Seifert, Liaison Officer of the German Federal Police (BPOL) at the German Embassy in Cairo. Alongside Tamer Saleh, his Egyptian assistant, Seifert shares the story of a successful partnership between The German Federal Police (BPOL), the Egyptian Civil Aviation Authority (ECAA), and CASRA to strengthen aviation security across Egyptian airports. This collaboration has highlighted the value of expertise, innovative technology, and intercultural cooperation in advancing global security standards.

WHEN DID THE PROJECT START, AND WHAT WERE THE MAIN AIMS?

The project launched in 2016, spearheaded by the German Federal Police to implement a specialized software for training X-ray screeners at Egyptian airports. Following the MetroJet incident over Egypt's Sinai in 2015, which was confirmed to be a terrorist attack, the need for heightened air security became clear. Our objectives centered on advancing air safety through consulting, raising

aviation security standards, and providing robust training programs. In 2019, CASRA was selected to provide their X-Ray Tutor system, marking the start of a great collaboration to implement and enhance security training across Egypt.

WHY DOES GERMANY SUPPORT AVIATION SECURITY IMPROVEMENTS IN OTHER COUNTRIES?

While supporting other nations is our main mission, there is also a vested interest. Egypt is one of the top holiday destinations for German tourists, with around 1 to 2 million Germans visiting annually. Ensuring that travel to and from this region is secure protects not only Egyptian citizens but also the many German travelers passing through these airports.

HOW WAS CASRA SELECTED AS A PARTNER IN THIS PROJECT?

The selection was conducted by the Procurement Office of the Federal Ministry of the Interior, ensuring an objective evaluation process. CASRA emerged as the best choice due to their leading expertise in security training and adaptive

technology solutions. BPOL offered input on technical evaluations, noting CASRA's unique training functionalities and strong market experience, particularly in Europe. The decision process, which involved assessing the software's capabilities, CASRA's aviation security experience, and the cost-performance ratio, showed that CASRA's excellent offering was the best fit for our needs.

WHAT DOES THE PROJECT INCLUDE?

The project includes the installation of CASRA's X-Ray Tutor software at four major Egyptian airports and the ECAA headquarters for training and testing. Training covers areas such as cabin and hold baggage screening, as well as air and airport supply screening. CASRA's solution offers Egyptian aviation security personnel adaptive X-ray image analysis training, tailored to the unique needs and skill levels of each participant.

WHAT FEATURE OF X-RAY TUTOR DO YOU FIND MOST BENEFICIAL?

According to ECAA's engineer Yasser Mohamed Abdelhalim and many aviation screeners, the standout feature of X-Ray Tutor is its scientifically based adaptive algorithm. This tool tailors training based on the strengths and development areas of each user, continuously challenging them with progressively complex images. Screeners have responded very positively, describing it as adaptive, motivational, and user-friendly. The X-Ray Tutor's ability to adjust to each participant's skill and pace ensures that trainees feel supported yet consistently challenged, a perfect formula for skill-building in high-stakes security.



Source: <https://egyptian-gazette.com/>

WHAT ARE THE MAIN ACHIEVEMENTS OF THE PROJECT?

The project's success is best reflected in the enthusiastic acceptance of X-Ray Tutor by ECAA and Egyptian screeners, the efficient installation of the software, and the subsequent launch of follow-up projects. Egyptian aviation security screeners reported significant improvements in detection accuracy after only a few sessions, which reinforced the system's impact and led ECAA to request an expansion of the training to additional airports. The commitment and proactive approach from the Egyptian side have been key achievements in ensuring the project's effectiveness.

WHAT CHALLENGES DID YOU ENCOUNTER ALONG THE WAY?

Projects abroad often face hurdles. Navigating cultural differences can be challenging, and even in Germany, large projects can have setbacks. Internationally, additional layers of complexity, from language to local hierarchies, often emerge. Thankfully, CASRA's local partner Comtec and our assistant Tamer helped bridge these gaps. Cultural and linguistic misunderstandings were minimized, as our team addressed questions openly, making it easier for ECAA and airport representatives to appreciate the value X-Ray Tutor could offer. The COVID-19 pandemic also temporarily delayed progress, yet we maintained communication to ensure continued momentum.

WHAT WERE THE KEYS TO OVERCOMING THESE CHALLENGES?

Success here depended on clear communication, cultural understanding and respect, and strong collaboration. CASRA's local partner and Tamer played a crucial role in overcoming language barriers and picking up on cultural subtleties. With strong local insights, we were able to engage effectively, addressing any potential concerns. In Egypt, hierarchical decision-making is standard, requiring time and

patience. The support from CASRA's skilled team, allowed us to make steady progress even when decision timelines were extended.

HOW DOES THIS PROJECT DIFFER FROM ONE THAT WAS UNSUCCESSFUL? WHAT FACTORS CONTRIBUTED TO ITS SUCCESS?

This project highlights the importance of relationship-building and cultural alignment. A top-quality product is very important but partners need to see its value and align with the project goals. In previous cases, successful implementation was hindered when the stakeholders didn't see the product's relevance. Here, all involved parties saw X-Ray Tutor's advantages early on and became enthusiastic about the project. Engaging with a local partner and effectively communicating in both English and the local language were key factors. CASRA's responsiveness to cultural differences and dedication to adapting their training software to Egyptian needs made a tangible difference.

WHAT DOES THE FUTURE HOLD FOR ECAA AND THE GERMAN FEDERAL POLICE?

This project has strengthened ties between German and Egyptian authorities in aviation security. A study visit to German airports is planned, allowing Egyptian representatives to observe

best practices in aviation security firsthand. The exchange promises valuable insights, and we anticipate it will foster further collaboration between ECAA and BPOL, perhaps even spurring additional projects in development aid and regional security.

WHAT DOES THE NEW PROJECT INCLUDE?

We're excited about the planned upgrades to X-Ray Tutor, with the upcoming version, XRT5, including enhanced training and certification modules for cabin baggage, hold baggage, and cargo screening. Additionally, the software will be a modern web-based application, extending its reach to four more Egyptian airports. CASRA's innovative training solutions have shown large positive impact, and we look forward to expanding this successful collaboration.

CLOSING REMARKS

CASRA's contribution to this project has been invaluable, providing Egypt's aviation sector with a state-of-the-art, adaptive training solution that responds to both skill and cultural needs. Through collaboration, adaptability, and a dedication to quality, BPOL, ECAA, and CASRA are setting new standards in aviation security that benefit all involved entities and underscore the importance of international partnerships in today's global security landscape.



Source: <https://egyptian-gazette.com/>

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