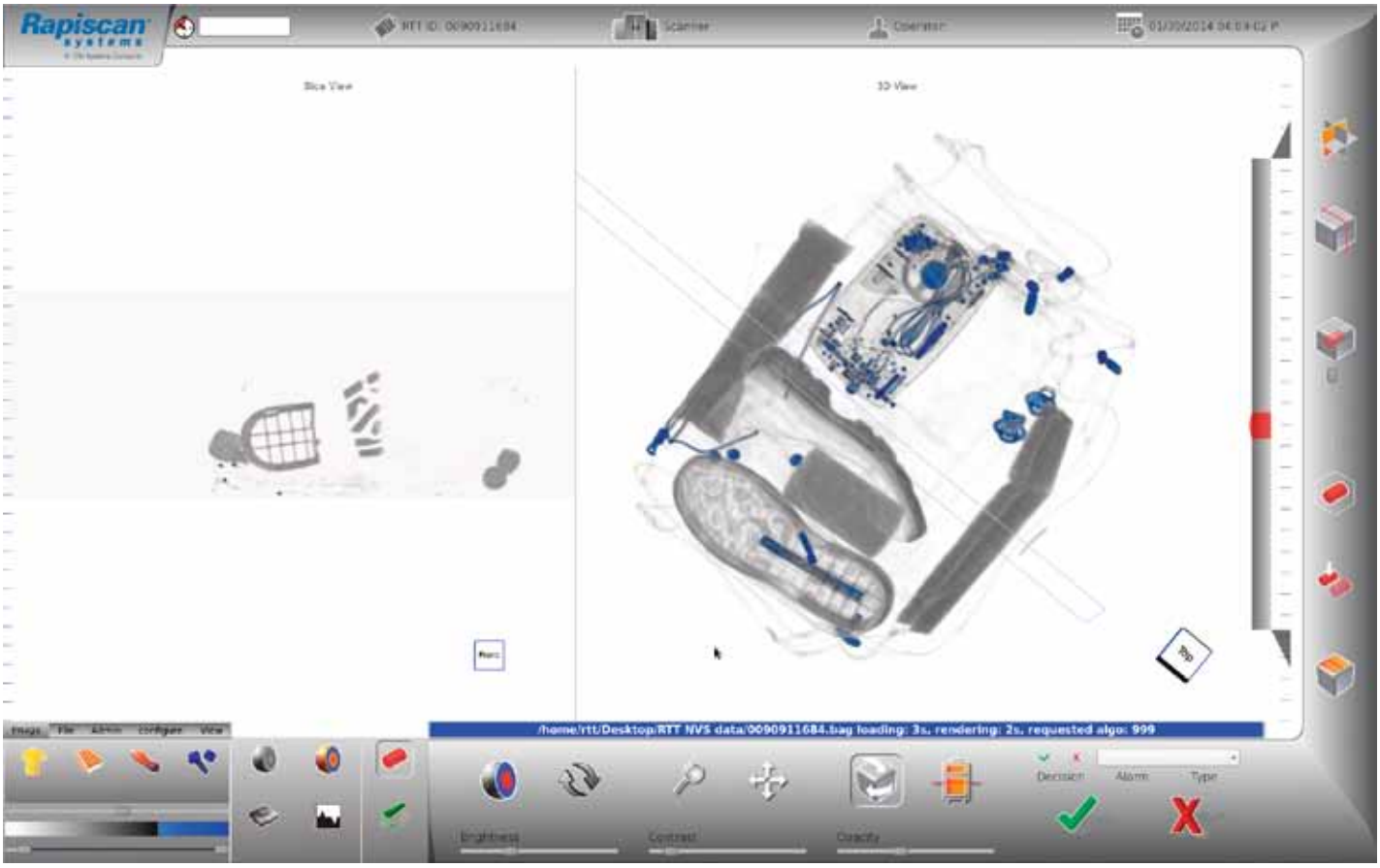
**Frederic Brouiller discusses the benefits and usage of real-time tomography technology for explosive detection in the aviation industry**

# THE FUTURE OF X-RAY?

Throughout the years there have been a number of well-documented cases of severe threats or even acts of terrorism that have jeopardised the security of airports and airliners across the globe. These dangers have originated from banned devices or substances being brought through terminals and aircrafts via hand-held or hold baggage. With each new sophisticated risk posed a new challenge has been forced upon the security industry, as they have to stay one-step ahead of terrorists and protect passengers and airport staff alike. As a result of the continuously evolving threats, the most innovative security screening solutions and technologies must be developed and deployed to airport groups in order to secure passenger safety.

Despite the increasing costs associated with air travel, the International Air Transportation Association predicts that, by 2014, 3.3 billion airline seats will be filled each year – a huge increase from 2012's 2.5 billion. More passengers mean more baggage, an issue already causing lengthy security delays and challenging airport operations. As a result, technology needs to be developed that can not only offer superior threat detection for explosive and banned substances but also have a high level of throughput so that it can provide airports with a much-needed solution to manage their ever-increasing passenger flow.

Currently, the aviation industry is witnessing a transformation in the design and development of hold baggage screening technology and solutions. In the past, standard X-ray screening and traditional, low-speed Computed Tomography (CT) screening solutions have been at the forefront of an airport's baggage screening solution. But as the threats have developed so has the technology, and today airports are now looking to the next generation of screening – Real Time Tomography (RTT). As airports with growing traffic seek to understand




***RTT technology incorporates tens of thousands of micro X-ray emitters to capture the differing views of the bag to be screened***

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> RTT technology can screen up to 1,800 bags an hour – three times faster than the current norm"

the new possibilities available to them when planning for their checked baggage inspection systems (CBIS), this technology is leading the way in threat detection capabilities. But what is it and, more importantly, what does it mean for airports across the globe?

In today's busy and modern airport environment, speed is of the essence – but that does by no means result in a compromise on security. Trying to balance the two for optimal performance can be a challenge, especially when airports are still using legacy equipment, which is not able to meet the speed needed when dealing with a today's heavy intake of passenger baggage.

The technology that is still most prevalent in many global airports is the traditional Computed Tomography (CT) X-ray systems, which scans a bag via a mechanically rotated gantry and then produces computer processed images, also known as a tomogram or "slice", showing what is contained inside without the operator needing to open the bag. It is through this tomogram that the mass and density of items held inside the baggage are calculated. If an object's mass or density falls within the pre-defined range of a dangerous substance, then the CT scanner alerts the operator so further security checks can be carried out.

Originally cited as having a low false alarm rate, and with the benefit of producing high quality 3D images, CT systems were seen to be the obvious technology choice for airports, as they were able to reliably screen for explosive materials. But with threats continuing to evolve, the volume of passenger baggage to scan increasing year-on-year and new regulations and standards coming into force, this historical approach is now being pulled into question as to whether it can really meet and keep up with the needs of today's security screening environment.

Today, for example, an average TSA-approved in-line medium-speed checked baggage equipment can inspect about 500-600 bags per hour (bph). This currently deployed Explosive Detection System (EDS) equipment incorporates technologies which are unable to cost-effectively accommodate the expected growth at many airports over the next 10 to 20 years. In fact, maintaining and servicing current systems is becoming cost prohibitive as they near the end of their life-cycle. It is clear a transition is needed in the near future to faster, more affordable and technically evolved systems in order to keep aviation's busiest airport systems efficient and secure.

The ultimate aim is to achieve the highest levels of security but in a manner that accommodates the future expansion of an airport and lowers the total cost of ownership, without impacting overall customer service. This is where Real Time Tomography (RTT) comes in. RTT represents a generational leap over historical CT designs that are currently deployed in hold baggage screening (HBS) applications. In place of the historical approach of a mechanically-rotated gantry, the RTT employs a proprietary and revolutionary stationary gantry design, producing ultra-high speed imaging and requiring lower maintenance. This means that, instead of the revolving gantry taking between 12 to 15 views of the bag, RTT

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technology incorporates tens of thousands of micro X-ray emitters to capture the differing views of the bag. The images are generated within real time and are of a greater resolution, meaning faster identification of potential explosive threats. Moreover, due to the fast reconstruction and detection algorithms used, it generates fewer false alarms. This unique design matches the speed of existing airport baggage handling systems, allowing RTT to be installed "in-line" in airports without the need to slow down the baggage handling systems, or to operate multiple parallel inspection systems.

Unlike the traditional CT scanners, which can only screen 600 bags per hour, RTT technology is able to screen baggage at speeds of up to 1,800 bags an hour, which is three times faster than the current norm. Furthermore, the RTT system's resolution and reconstruction process not only delivers optimal performance for the detection of prohibited materials but it also generates fewer false alarms.

Some airports can be concerned about investing in new technologies due to not only the capital expenditure but also the operational expenditure costs associated with any new purchase. Particularly in today's economic environment, the question of total cost of ownership (TCO) is one that comes high up in the decision process. Our research and customer base has shown that RTT technology has reduced the estimated annual maintenance costs by 35 – 50 per cent compared to legacy CT systems. This is due not only to lower maintenance costs due to the removal of a complex moving gantry, but also to the high level of throughout achieved; ultimately, fewer machines are required to handle the volume of bags.

By detecting density levels in liquids and alerting the operator to potentially concealed explosives, RTT equipment enables airports to keep ahead of the international threat of terrorism. Currently this technology meets the highest global standards for CT-based detection, such as ECAC Standard 3 threat detection standards.

While CT systems may be the technology currently deployed within airports, we are currently seeing that there are increasing requests for more efficient, faster and more innovative ways to conduct baggage screening from airports within Asia and Europe. Recently we received orders for hold baggage screening systems and related maintenance services for use at Oslo Airport, Norway's most prestigious airport, and Minsk National Airport. What we are seeing in the market is that, as European airports upgrade their screening infrastructure to handle increased passenger demand and comply with the latest regulatory requirements, RTT screening solutions are the preferred choice as they are approved to EU's standard 3 – its most demanding standard for explosives detection performance for equipment providing high throughput. No airport wants to limit themselves in the future, so operators are constantly looking for solutions that offer not only long term benefits to the airport but which also allow them to meet with regulatory standards.

As airport operators look for more ways to increase efficiency, throughput and the detection of potentially explosive materials, the tide is turning away from the historical CT-based, moving gantry designs to stationary RTT designs that can offer three times faster throughout of checked baggage and works in-line with current baggage handling systems already in place.

Staying one step ahead of technological advancements while securing the airport's investment in its infrastructure and development is a key consideration when selecting security screening equipment. By offering the capability to reduce baggage system infrastructure, have less redundancy and a smaller footprint, resulting in lower overall long-term maintenance costs, the RTT is designed to support airports longer-term goals and plans to grow over the next 10 to 20 years.

Ultimately, airports are looking for a technology that can provide superior security detection and the best return on investment while providing ample room for increased growth and give the airport a competitive advantage. With RTT they have this capability at their fingertips.


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***RTT technology offers the potential for faster screening rates as well as very high quality X-ray images***

**Frédéric Brouiller** is Vice President of Sales, EMEA for Rapiscan Systems. He has worked within the aviation industry for more than ten years for Fabricom Airport Systems, France and L3 Communications, UK. In his current position he works closely with the aviation industry to install advanced security screening solutions.