Aviation's ACID Test

Air travel has grown exponentially, with 100 million passengers in 1960, compared to 3.7 billion today[1]. With such large numbers of travellers, security is paramount. STFC supported researchers are developing two disruptive technologies to produce the fastest and most reliable automatic contraband identification security scanner.

Aviation security has historically used technology that only estimates if a material is a threat. This leads to false alarms, long delays through checkpoints and frustrated passengers. Supported by STFC, the Accelerated Contraband Identification by Diffraction (ACID) project will deliver a scanner to automatically identify contraband in postal and personal items such as phones and laptops.

The technologies utilised and developed as part of the ACID project make use of x-ray diffraction; this is the analysis of how x-rays scatter from when they interact with a material. Every material has a unique x-ray diffraction pattern and therefore can be identified by this, much like a fingerprint.

Researchers Professor Paul Evans from Nottingham Tent University (NTU), Professor Keith Rogers from Cranfield University and Matt Wilson from STFC form the ACID collaboration.

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They have been able to overcome slow speed limits that hinder common x-ray diffraction by using a patented technique that amplifies the signal. Coupled with novel detectors developed by STFC, this unique combination of technique and technology is able to provide an accurate, fast, cost-effective and automatic security scanner that can identify contraband and threat materials.

The ACID team are compiling a database of diffraction signatures for common laptop/tablets and other materials that could be hidden inside a battery or used to identify suspicious modifications to the laptops. This will help identify suspicious materials when hidden inside the electronic equipment.

Support for the project was provided by STFC via the Challenge Led Applied Systems Programme (CLASP), this fund supports the application and commercialisation of STFC research in the key global research challenge areas of energy, environment, healthcare and security[2].

Halo X-ray Technologies Ltd, a spin out company formed in partnership between NTU and Cranfield University[3], are looking to utilise the technology to create prototypes with the hope of producing a product that can be taken to market in the near future.

The ACID technology could be used directly in a number of other markets such as screening for fake pharmaceuticals. It also has the potential to be used to screen for bone fracture risk, replacing traditional scans[4]. This is currently being explored by the ACID team and the NHS with funding provided by EPSRC[5]. The technology was recently recognised by the US Administration by becoming one of eight finalists in the Opioid Detection Challenge, a world wide competition to assess new technologies capable of detecting synthetic opioids trafficked through postal systems. In contrast, the technology platform was successfully employed within an AWE sponsored programme seeking new approaches for nuclear weapon disarmament.

1. http://www.boeing.com/resources/boeingdotcom/commercial/market/current-market-outlook-2017/assets/downloads/2017-cmo-6-19.pdf
2. https://stfc.ukri.org/funding/working-with-industry/challenge-led-applied-systems-programme/
3. https://www.ntu.ac.uk/research/impact-case-studies/x-ray-imaging-security-screening
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5. http://gtr.ukri.org/projects?ref=EP%2FR024316%2F1