

Redacted Standoff / Imaging Trial Reports

1. CAST body scanners trial at Exchem pub no 38/09

The Explosives and Weapons Programme at CAST has a central role in the evaluation and comparison of technologies and systems used to detect the presence of explosives and weapons concealed beneath people's clothing.

<REDACTED>

This report details the results and findings from an evaluation of eight millimetre-wave body scanning systems in a non-operational trial held <REDACTED>. The trial consisted of the side-by-side evaluation of portal and standoff (camera like) imaging systems as well as one anomaly detector. All systems work in the millimetre-wave regime, operating between about <REDACTED>

This report is intended for UK government use by those with a scientific and technical interest in explosives and weapons detection.

The trial examined the following systems:

<REDACTED>

The trial was conducted in accordance with the CAST Body Imaging Systems Trial Protocol which divided the trial into a sequence of distinct phases. Each phase addressed different operational scenarios and applications such as aviation security, counter-suicide bomber, crowd screening and angle of presentation. During the trial, test subjects presented themselves according to predefined concepts of operation, with or without concealed threat items, including bulk and liquid (simulant) explosives, handguns and knives. Imagery was recorded for post-trial assessment from all systems apart from <REDACTED>, which had live operator assessments. The recorded imagery was assessed offline by trained CAST operators. Operators made subjective assessments based on the imagery and provided verdicts. In this way, detection metrics such as the false alarm rate and the probability of detection are calculated. In addition, imagery was assessed at different presentation angles to the target for four of the standoff systems.

<REDACTED>

For the future, protocol refinement is underway to address issues that presented themselves during the trial <REDACTED> as well as considerations surrounding the concept of operations(ConOps), allowing fair comparisons between systems and tests.

Future work will also include elements to address the increasingly important issues surrounding privacy and the <REDACTED>

2. CAST outdoor standoff body screening trial

Publication No. 5/10

The Explosives and Weapons Programme at the Home Office Scientific Development Branch (CAST) has a central role in the evaluation and comparison of technologies and systems used to detect the presence of explosives and weapons (E&W) concealed beneath people's clothing. These body scanning systems are increasingly being considered for use at checkpoints, airports, stadiums and other critical national infrastructure, as well as by law enforcement agencies. This trial is one of a series <REDACTED>

This report details the results and findings from an evaluation of [millimetre wave](#) (mmW), terahertz (THz) and IR body scanning systems using a series of <REDACTED>, in October 2009. <REDACTED>

Systems evaluated in this trial were chosen by means of customer and stakeholder requests, and via open invitations to manufacturers of standoff E&W body screening equipment. Systems submitted for testing broadly represented the potential technologies applicable to this type of trial. The following systems underwent testing:

<REDACTED>

The trial was conducted in accordance with the [CAST Body Imaging Systems Trial Protocol v0.3](#)^[1], which divided the trial into a series of distinct phases, and with the specific outdoor screening test plan^[2], which was created in conjunction with members of the SOTD committee <REDACTED>

Operators made subjective assessments based on the imagery and provided verdicts live during the screening process.

1.2 Results and conclusions

The following results summarise the testing and report only averaged figures for the main scenarios A and B. For further detailed breakdown and other scenarios the main results and appendices should be consulted. Scenario A represented what might be termed ideal conditions for each of the systems under test. Each test subject presented themselves according to the manufacturer concept of operations with or without threat items concealed upon their person. By contrast, Scenario B was designed to conduct screening upon small groups of subjects walking an optimised route of 80 m at close to normal walking speeds. This was the first time this has been attempted for an extended period in the United Kingdom.

Overall the trials were conducted successfully and valuable information was gained. Amongst the most useful information was the current technical limitations of the equipment under test, and a greater insight into how one might optimally configure / utilize the equipment given these limitations. Furthermore, using data from these trials it will be possible in future to calculate for given threats and locations, or similar concepts of operations, the number of runs, n , needed to quantify system performance to the desired level of accuracy. This could also prove important for future potential deployments of such equipment.

RESULTS DELETED HERE

1.2.2 Further testing

Several further tests were carried out which looked at gun and knife screening, Person-Borne Improvised Explosive Device (PBIED), angle

screening, and bag screening.

RESULTS DELETED HERE

Some key observations from these tests are detailed below:

1.2.3 General observations

Some general observations made during the trial are detailed below:

<REDACTED>

Pan-tilt mechanisms

<REDACTED>

Multiple persons in field of view

<REDACTED>

Movement

<REDACTED>

Environment

<REDACTED>

<REDACTED>

<REDACTED>

False alarm analysis

<REDACTED>

3. Comparative evaluation of people screening systems indoor trial publication 51/10

The Explosives and Weapons Programme at the Home Office Scientific Development Branch (CAST) has a central role in the evaluation and comparison of technologies and systems used to detect the presence of explosives and weapons (E&W) concealed beneath people's clothing. Portal and checkpoint style body scanning systems are increasingly being considered for use at checkpoints, airports, stadiums and other critical national infrastructure, as well as by law enforcement agencies however body scanning systems which work at a distance, known as standoff systems, are currently not as widespread. This trial is one of a series conducted under the auspices of the cross-government Standoff Threat Detection (SOTD) programme within the CONTEST S&T portfolio of work.

This report details the results and findings from an evaluation of <REDACTED> <REDACTED> in July 2010. The trials generally consisted of controlled, blind and randomised side-by-side evaluations of standoff (camera-like) imaging systems.

Systems evaluated in this trial were chosen by means of customer and stakeholder requests, and via open invitations to manufacturers of standoff E&W body screening equipment. Systems submitted for testing broadly represented the potential technologies applicable to this type of trial. The following systems underwent testing:

<REDACTED>

The trial was conducted in accordance with the CAST Body Imaging Systems Trial Protocol v0.3[3], which divided the trial into a series of distinct phases, and with the specific indoor screening test plan[4], which was created in conjunction with <REDACTED>. Each phase addressed different operational scenarios and applications such as crowd screening, counter-suicide bomber and bag screening. In total there were three scenarios, A–C, and some additional specific informative scoping exercises. During the trial, test subjects presented

themselves according to predefined concepts of operation, with or without concealed threat items, including bulk explosives, handguns and knives. Operators made subjective assessments based on the imagery and provided verdicts live during the screening process.

1.2 Results and conclusions

The following results summarise the testing and report only averaged figures for the main scenarios A, B and C. For further detailed breakdown and other scenarios the main results and appendices should be consulted. Scenario A represented what might be termed ideal conditions for each of the systems under test. Each test subject presented themselves according to the manufacturers' concept of operations with or without threat items concealed upon their person. By contrast, Scenarios B & C were designed to conduct non-compliant standoff screening upon groups of subjects entering a facility (such as a football stadium, a train station or a shopping centre) through a gateway.

Overall the trials were conducted successfully and valuable information was gained. Amongst the most useful information were the current technical limitations of the equipment under test, and how these systems could be usefully deployed to yield optimal detection capability.

A wide range of threat types was included in this scenario and found <REDACTED>

1.2.2 Scenario B – Non-compliant crowd screening

This scenario was designed to assess screening with groups of eight individuals entering and exiting through a gateway in a non-compliant fashion at moderate throughput rates. The gateway was designed to accommodate a number of different requirements<REDACTED>

Scenario C – Person Borne Improvised Explosive Device (PBIED) detection

This scenario was a further evolution of Scenario B with continuous throughput of individuals (>30 people per minute through two gates) and low threat insertion rates (approx 1 threat every 75 blank entries) of PBIED type threats.

<REDACTED>

1.3 Operational relevance

The capability to screen people to determine if they are carrying explosives or weapons is a key security requirement for maintaining venue integrity and protecting the public and our critical national infrastructure. This project seeks to inform our ability to extend and enhance the currently established static checkpoint screening regime used for people, by utilising systems that are able to detect and identify potential threats from a distance both with and without the knowledge and/or full cooperation of the subject/individual.

This capability would be of particular value in detecting (or confirming as benign) the potential presence of a person borne IED without conveying that detection to the subject

<REDACTED>

<REDACTED>

1.4 Conclusions and recommendations

In the context of the tests performed during this trial it is proposed that if careful thought is given to concept of operations and resolution of false alarms, these systems can exhibit
<REDACTED>

<REDACTED>

<REDACTED>

Further work into <REDACTED> crowd screening is recommended to fully understand the factors affecting detection. A work package beginning to address these issues will follow this report in early 2011 but results obtained in this trial highlight the importance of systematic studies into placement of systems for optimum detection probability.