Canadian Air Transport Security Authority
Administration canadienne de la sûreté du transport aérien

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Christian Pearce
C/o Canadian Civil Liberties Association
360 Bloor St West, Suite 506
Toronto, Ontario, M5S 1X1

November 23, 2009
Our file:A-2009-00039

Dear Mr. Pearce:

This is further to the request you submitted under the *Access to Information Act,* received by this office on November 10th, 2009, for the following:

> ***"The report of CATSA on the pilot project at the Kelowna Airport in British Columbia regarding the use of whole body imaging (x-ray see-through) screening technology"***

Attached is a copy of the requested record. You will note that some information has been excluded under s. 16 (2), 19(1) and 24 (1) of the *Act,* which you can view at the following website: http://laws.justice.gc.ca/en/showtdm/cs/A-1.

You have the right to file a complaint with the Information Commissioner of Canada about this matter within 60 days of receipt of this letter. The address is 112 Kent Street, 22nd Floor, Ottawa, Ontario, K1A 1H3.

If we can be of further assistance to you, please do not hesitate to contact Marc Gagné, at 613-954-4054 or marc.gagne@catsa.gc.ca

Regards,

Véronique de Passillé
CATSA ATIP Coordinator

Canada

CATSA ACSTA

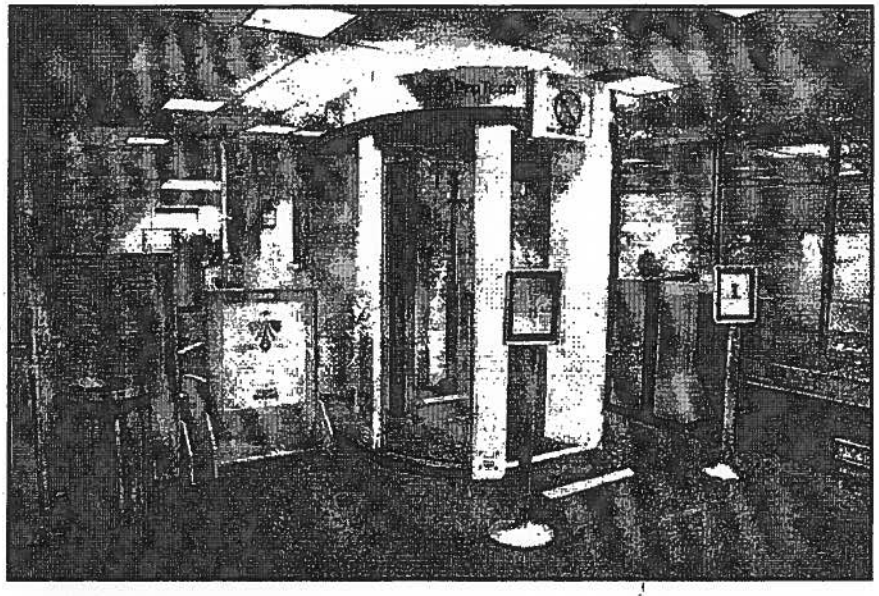
Canadian Air Transport Security Authority | Administration canadienne de la sûreté du transport aérien

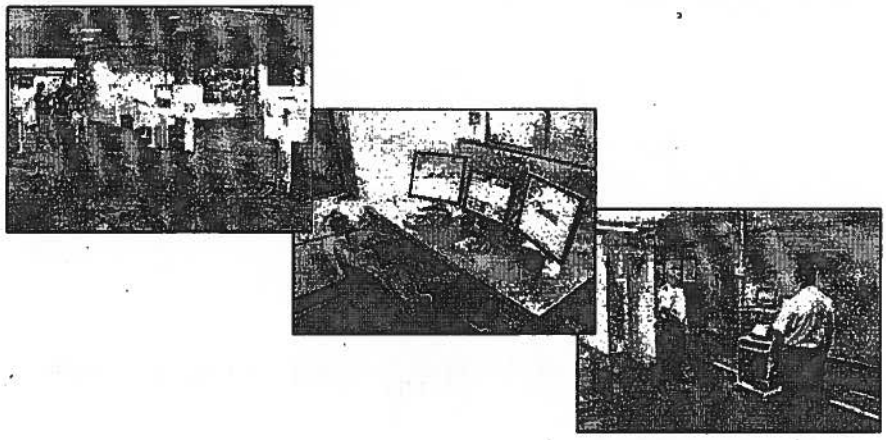
CATSA ACSTA

Final Report

The ProTech Integrated Checkpoint Trial

Kelowna Airport





April 15, 2009

1 Introduction

Passenger body-worn threats have been identified as a major threat to aviation security according to risk assessment studies carried out by Transport Canada. Currently there are no technology regulations or performance standards for mitigating this risk. CATSA has developed a threat-based approach in order to evaluate the security value of technologies.

The ProTech Integrated Checkpoint Trial implemented the threat-based approach as part of the CATSA's technology strategy to evaluate new or improved security technologies. Transport Canada and CATSA work in partnership in these trial initiatives under the CATSA-TC Memorandum of Understanding for Screening Equipment and the CATSA Change Management Process. This report summarizes the results of the technology trial data and operational trial data on the ProTech Integrated Checkpoint and provides conclusions and recommendations regarding the technology and the evaluation process.

The ProTech Checkpoint trial operated from June 23 2008 to January 18 2009 at the Kelowna international airport (YLW) in British Columbia.

1.1 Trial objectives

The ProTech Integrated Checkpoint trial included the following objectives:

- **Improve security**

  Develop a detection performance standard for body-worn threats and measure the ProTech Checkpoint ProVision millimeter wave portal's capability to increase security by detecting additional threats.

- **Assess how technology integration can improve security**

  Develop a technology integration evaluation protocol and measure the security value of the ProTech Integrated Checkpoint.

- **Increase efficiency**

  Develop an evaluation protocol and measure the increased efficiency relating to capital cost, airport space, throughput, operational costs, and performance standards.

- **Improve passenger convenience**

  Measure the improvements to passenger convenience due to whole body imaging technology offered as an alternative to physical pat-down.

- **Identify privacy issues**

  Identify any privacy issues, especially in regards to millimeter wave technology, how to resolve them and how to communicate details of the new technology to the public
  - Engage the Office of the Privacy Commissioner of Canada in order to identify and resolve privacy issues
  - Develop a trial communication plan

- **Learn from the trial**

  Lessons learned from the trial can be applied during this trial and to future technology trials.
  - Develop a CATSA's concept of operations and standard operating procedures
  - Develop a CATSA's training program and measure the increase in operator efficiency before, during, and after the trial
  - Develop a methodology to measure operational data including passenger processing times, throughput, alarm rates, and alarm types
  - Determine the operational impact of introducing this technology
  - Provide recommendations on the deployment of the technology

1.2 Major factors of influence on the trial

- **Detection performance standards**

  The first requirement for the evaluation of new technologies is to measure the threat detection capability against a regulated performance standard. A regulated detection performance standard for body-worn threats was not available for this trial. As a result, CATSA developed a threat-based performance standard and measured the ProVision millimeter wave capabilities against this standard.

- **Passenger privacy**

  The technology used in the ProVision millimeter wave portal raised privacy issues that needed to be addressed before the start of the operational trial. Many of the steps taken in the trial were to directly address by the importance of assuring passenger privacy.

- **Availability of L3 ProTech Integrated Checkpoint components**

  Various components of the L3 ProTech Integrated Checkpoint were not available for the trial or did not meet CATSA requirements. The PassPort passenger trace detector was not available. The ACX multi-view x-ray was not available for use in the trial. The result was that the trial included only the ProVision Whole Body Imager (WBI) and the Protocol PD6500i Walk Through Metal Detector (WTMD).

1.3 L3 ProTech Integrated Checkpoint

The ProTech™ Integrated Checkpoint was the first system available that integrated a number of detection and automation technologies. The integration of the components in the ProTech Checkpoint made it a potentially robust screening solution, with a passenger throughput of 300 to 600 passengers per hour. This solution also promised to increase detection efficiency and reduce secondary checks due to alarms. Another feature of the system was that no divesting was necessary by the passengers.

The ProTech system manufactured by L-3 Security & Detection Systems (SDS) is an assembly of five components. i) The ProVision millimeter wave portal with ii) an integrated walk through metal detector provides detection for body worn threats including metallic and non-metallic items such as guns, knifes, and explosives of all kinds. iii) The PassPort provides explosive trace detection. iv) The ACX x-ray is used for baggage screening.

Finally, v) a bin return system automates the process of returning the bins used to hold the belongings of a passenger back to the head of the bin queue. The bin return system reduces the requirement for screening officers to physically carry bins from the end of the screening line to the front of the screening line.

1.4 Kelowna International Airport

The Kelowna International Airport (YLW) provided a separate secure space to install the ProTech Integrated Checkpoint. The area was located away from the standard four line pre-board screening checkpoint and included two separate closed rooms. One room was used for private searches for passengers who requested this. The second room was used for the screening officer who reviewed the ProVision millimeter wave images. This room was separate and remained closed off to the passengers during screening (a key requirement for passenger privacy protection). Another area, separated from the public, provided for training, testing, demos and maintenance. Finally, the ProTech Integrated checkpoint was an additional screening line that was not essential to airport screening operations. The checkpoint could be taken off service without affecting normal passenger throughput. This meant minimal disruption and increased flexibility for the trial.

Kelowna is the 10th busiest airport in Canada in terms of passenger volume; in 2006 1,226,442 passengers traveled through the airport. Kelowna is situated in the interior of southern British Columbia in the Okanagan Valley. Within the city, the airport is located approximately 15 kilometres north and east of downtown Kelowna.

Kelowna International Airport

2 Overview of the ProTech Integrated Checkpoint Technology

This chapter provides an overview of the ProTech technologies and components.

2.1 ProTech integrated checkpoint system

The initial plan was to conduct a trial for the complete ProTech Integrated Checkpoint system as defined and pictured below in the OEM brochure. However, due to the following reasons the PassPort, ACX 6.4 and BRS were omitted from the trial. The PassPort Walk-through Explosives Trace Detection component was not ready for deployment due to technology development delays at L3. The ACX 6.4 AT x-ray unit is a single view x-ray because the multi-view version was under development and was not ready in time for the trial. Since CATSA is moving towards multi-view platforms the single-view technology was also omitted from the trial. Technology testing of the BRS Automated Bin Return System revealed safety concerns that could not be corrected in time for the trial. The final trial configuration consisted of the ProVision Whole Body Imager Integrated with the Protocol PD 6500i Zoned walk through metal detector. This was the first operational trial of its kind using an integrated configuration.

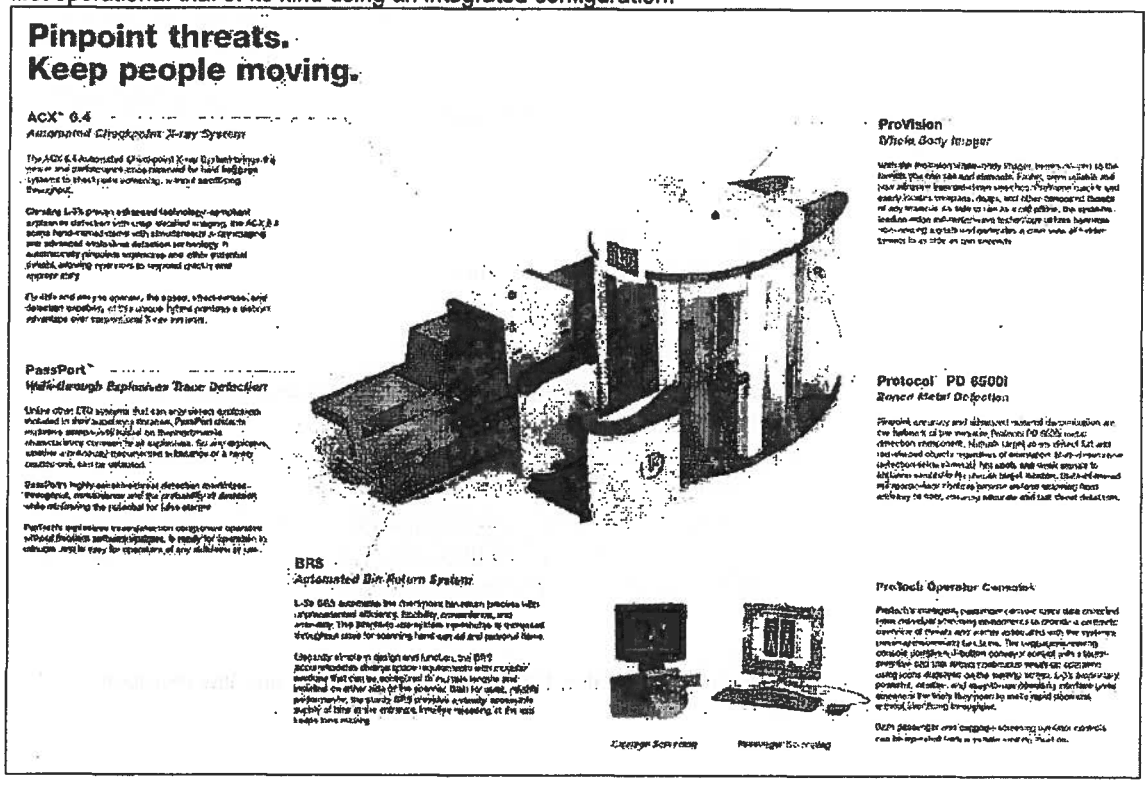
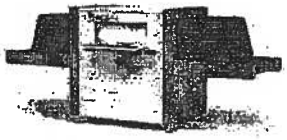


Figure 1: L3 ProTech Integrated Checkpoint

2.2 ProTech Screening Components & Technology

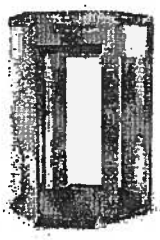
The ProTech Integrated Checkpoint System (ProTech ICP) manufactured by L3 Communications consists of the following components:

- **ACX 6.4 X-ray** – is an automated checkpoint x-ray system. This is a standard single view x-ray with Advanced Technology imaging for explosives detection used to scan passenger baggage for hidden threat objects including bulk explosives. The x-ray image of the baggage is presented to a screening operator for identifying suspicious objects. Scanning takes only a few seconds. CATSA is moving towards multi-view platforms. The multiview ACX 6.4 AT x-ray was under development and not available in time for the trial. For this reason the single view ACX 6.4 x-ray was omitted from the trial.



- **Protocol PD6500i** – is a zoned walkthrough metal detector (WTMD). If the WTMD detects metal as the passenger walks through the arch a remote display sounds an alarm and indicates the height and the side (left or right) at which the metal was detected. This display is positioned just outside the exit of the WTMD. The ProTech system also transmits the WTMD data to the screener consoles and integrates the data with the ProVision image. The WTMD is limited to detecting metallic objects only.

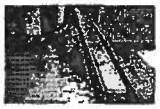
- **ProVision** –is a whole body imager (WBI) using harmless non-ionizing radio frequency (RF) energy in the millimeter wave spectrum. The millimeter waves can penetrate layers of clothing to reveal threats without physical contact and is as safe to use as a cell phone. For comparison, the energy radiated by the system is 10,000 times less than in a cell phone transmission. The passenger stands motionless in a portal for the scan which takes a few seconds to complete. Before the scan is initiated the feet and arms are held in a predetermined position (sometimes referred to as ballerina stance). This system also has an auto detect mode to highlight objects and a privacy feature that blurs the face and private areas.



- **Passport** – is a walkthrough explosives trace detector that can sample and analyze for explosives and other energetic materials. It looks for spectral and temporal patterns when particulates are ignited and discriminates energetic materials from ordinary materials that burn relatively slowly. The process is quick and non-specific towards

individual explosives. A scan is done in a few seconds, and there is no need to calibrate for individual explosives. This component was not ready for the trial.

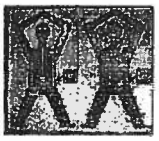
- **BRS** – The Bin Return System is a conveyor system designed to transport bins back to the start of the X-ray process for incoming passengers. This reduces the need for screening officers to handle the bins. Technology testing of the BRS revealed safety concerns that could not be corrected in time for the trial and therefore the BRS was not part of the trial.



- **Integration** – This involves merging stand-alone detection technologies into a single integrated system. The complete system consists of two separate hardware components and four different technologies. For the Kelowna trial, integration consisted of only two technologies; the ProVision millimeter wave portal and the Protocol PD6500i walk through metal detector. The data collected from these two components were fused together by the System Integration Server (SIS) and displayed on the operator console.

Components developed and selected by CATSA:

- **Stickman** – CATSA developed this component for the trial, it is not part of the ProTech hardware or system. Since the millimeter wave image cannot be viewed in public, the Stickman touch screen computer system allows the Image Screening Officer (ISO) to communicate a visual location to the Metal Screening Officer (MSO) who is with the passenger in the public screening area. The ISO highlights sections on the stickman (outline of a person front and back) via touch screen where any questionable items on the passenger may be seen. When necessary, the Stickman information is then sent to the MSO and a partial pat-down is conducted on appropriate locations to resolve the alarm.



- **Communication Radios** – The radio communication equipment provided communication between the MSO, who resolved the alarms, and the ISO, who reviewed the millimeter wave image in a separate room. The radio communication is crucial to ensure the items found by the MSO match in size, shape and location to what the ISO sees on the scan. The communication system consisted of a base station a headset and a hands-free foot switch for the ISO. There were three portable radios with headsets and spare batteries for the MSO and the supervisor. The third set was a spare which could also be used for monitoring by the supervisor.

3 Protecting Passenger Privacy

The ProVision millimeter wave portal provides "hands-off" screening to search for body-worn threats. The technology effectively automates the full physical pat-down currently being applied at PBS checkpoints. The question of privacy results from the image of the passenger that is created by the technology rather than personal physical or information privacy.

The approaches completed in order to protect passenger privacy are described below.

3.1 Office of the Privacy Commissioner

The Office of the Privacy Commissioner (OPC) of Canada was informed of the millimeter wave technology and the objectives of the trial. Advice and direction on addressing privacy concerns were also solicited resulting in the submission of a Preliminary Privacy Impact Assessment (PIA).

Based on the discussions with the OPC, CATSA designed a screening layout and operational procedures for screening. CATSA undertook a preliminary Privacy Impact Assessment (PIA) as laid out in Section 4 of the *Privacy Impact Assessment Guidelines*. This preliminary PIA was submitted to the Office of the Privacy Commissioner to ascertain if a full PIA was necessary or if the Commission agreed with the view of CATSA that a preliminary PIA was sufficient for the trial. The preliminary PIA report assessed the privacy risk, arising from the correlation of the millimeter wave image to personal information and the risk from the release of the image, as low.

In its response to the preliminary PIA, the Office of the Privacy Commissioner agreed with CATSA that a full PIA was not necessary under the conditions proposed for the trials. The result of the preliminary PIA was an action plan by CATSA for implementing the following steps to protect passenger privacy.

3.2 Preliminary Privacy Impact Assessment

Upon review of Section 4 of the *Privacy Impact Assessment Guidelines,* CATSA submitted a preliminary Privacy Impact Assessment to the Office of the Privacy Commissioner of Canada on January 11, 2008. The PPIA requested the OPC to consider the project to be a low privacy risk for the following reasons:

- The passengers will be informed, via signage, of the nature of the images being taken, and will have the choice to volunteer for this line or to use the regular screening line;
- The images being captured are not being correlated to a passenger name or passenger identifier in any way;
- The images are transmitted in a secure method and to a single point; the Remote Viewing Room;
- The Remote Viewing Room is not visible to the screening officer who is with the passenger or to any member of the public, including the passenger;

- The images are reviewed by a screening officer who is remote from the screening location. The screening officer is not able to correlate the millimeter wave image with the image of the passenger; and
- During operations, the images will not be retained for longer than is necessary to review the image and to make a screening decision.

The Office of the Privacy Commissioner concurred with CATSA's conclusion that a full PIA was not required and itemized pre-determined understandings that would occur throughout the trial:

- The trial will not be collecting personal information from the passengers it screens;
- The integrated checkpoint (ICP) will be deployed for an operational trial period of six months to a year;
- It will be deployed on one of the 4 passenger screening lanes
- Participation by the travelling public will be on an anonymous and purely voluntary basis;
- The image is not correlated in any way with the name of the passenger or any other identifying information;
- The millimeter wave screening officer will review the images in a separate room, and will not be able to view the passenger;
- The screening officer who is in control of the passenger will not be able to view the millimeter wave images;
- The images are to be deleted from the system as soon as the review is complete.

The OPC requested CATSA to provide a copy of the final report and to identify any privacy issues that arose during the trial.

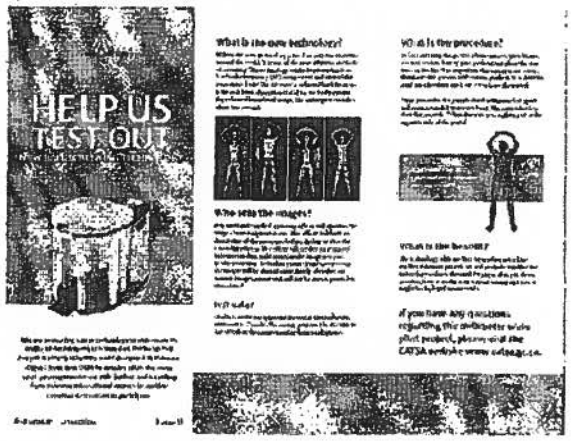
There were no additional privacy issues or concerns that arose during the trial.

CATSA maintained the discussions with the OPC during the trial and also met with a representative from the OPC at the Kelowna International Airport on October 2, 2008. The representative was provided a tour of the trial site in order to observe the operation and steps taken to protect passenger privacy first hand.

3.3 Passenger communications plan

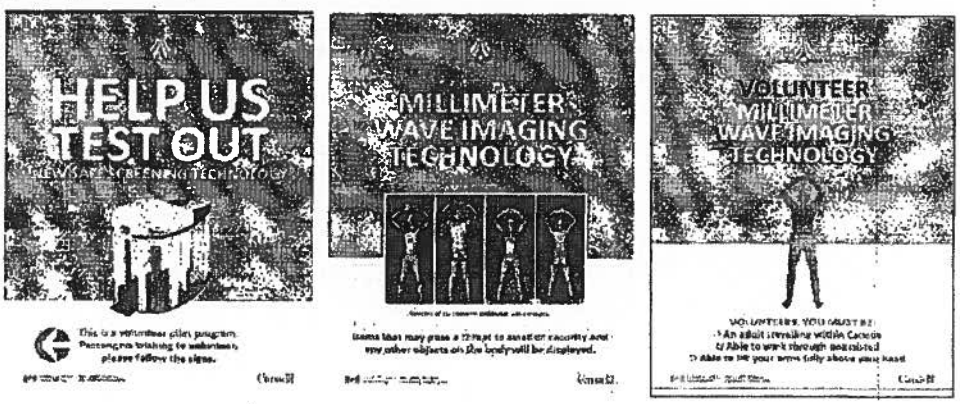
CATSA developed a communications plan including a news release, brochures, signs, and training for screening officers. The objective of the plan was to ensure passengers were fully informed of the trial and technology and volunteered to be screened.

- **Brochure** – available at the trial checkpoint



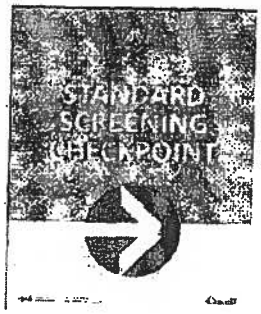
- **Signage** – located throughout the trial checkpoint

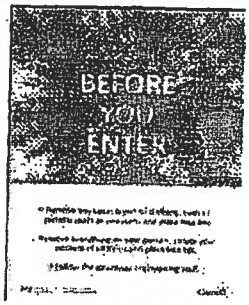
Overhead sign (approx 2'x10')

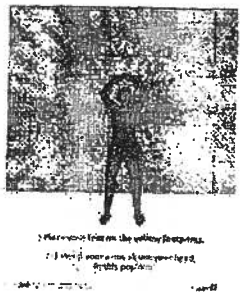


Posters

Posters continued:







3.4 Passenger Enquiries

Four passenger enquiries were received. The following are excerpts that relate to the trial processes and/or technologies:

1. Passenger not aware trial was an *"option"* after being screened and believed this was *"...deliberately misleading so that they can test the technology with few objections/refusals from the public".. "Last Wednesday my wife and I were late for a flight due to ticketing problems at Air Canada in Kelowna and the AC ground staff there held a flight so we could get on board"*

- The passengers did not read the overhead sign, posters and information from the screening officer indicating this was a voluntary trial.

2. Female passenger was asked to remove sweater after WTMD alarmed. Passenger explained she was only wearing a lacy camisole under the sweater. Screening officer said this did not matter and told her to remove her sweater. Passenger complied and was *"mortified"* by this experience

- CATSA operations followed up on the incident for compliance to CATSA standard operating procedures.

3. Passenger(?) stated *"I'm asking for equality with the European citizen not to be screened and seen like a naked dummy" "I call it Airport Strip and the guy behind the screen could be a Peeping Tom" "Simply, you violate my privacy – I don't like to be*

screened, I don't like to put my fingerprints in a passport (therefore I will never visit the USA again), I don't like to be treated like a suspect or criminal".

- It is unclear if this passenger went through the ProTech Integrated Checkpoint or was a passenger at all.

4. Passenger stated *"The sales pitch delivered by the security person outside the screening area was obviously biased in favour of this technology. In his sales pitch he failed to mention the fact that several EU countries have already, or plan to, ban the use of these devices on the grounds that they offend basic human dignity. The time to undress to prepare for the scan will result in longer lines, and the potential return is minimal"*

3.5 Passenger Survey

CATSA commissioned an independent passenger satisfaction survey to assess the reaction of the public to the screening technology and process at the Kelowna airport during the trials. The survey was also voluntary. The volunteers and the decliners were asked the reason for either accepting or declining the whole body screening process. The results of the survey are discussed below:

- **Key findings from the customer satisfaction survey include:**

Q: Given the choice, would you prefer the new ProTech millimeter wave technology over a full – physical pat down?

- **95%** of ProTech Integrated Checkpoint users **prefer the millimeter wave technology** over a physical pat down.

Q: Would you use the ProTech millimeter wave checkpoint again?

- **93%** of ProTech Integrated Checkpoint users **would use** the millimeter wave screening **process again.**

Q: Given the level of detail of the image, are you comfortable with a certified screening officer examining the image from a separate room with no direct view of the passenger?

- **93%** of **female** and **89%** of **male** ProTech Integrated Checkpoint users were comfortable with the level of detail of the image.

Q: Do you have any privacy concerns related to this technology?

- **90%** of passengers that used the ProTech Integrated Checkpoint screening process indicated **no privacy concerns** with the millimeter wave technology.

Q: Do you think the ProTech millimeter wave technology improves security?

- **75%** of ProTech Integrated Checkpoint users thought the millimeter wave technology **improved security.**

Q: What screening method do you prefer?

- 64% of ProTech Integrated Checkpoint users **preferred** the millimeter wave process over the standard process.

Q: Have you seen or heard of the ProTech millimeter wave technology before your trip today?

- 46% of all passengers had **seen or heard** of ProTech Integrated Checkpoint technology prior to their trip.

Q: Did you purposely opt out of the of the trial checkpoint? If yes, why?

Those who opted out had the following reasons for doing so:

- 24% Privacy concerns
- 20% X-ray concerns
- 14% Level of screening unnecessary
- 14% Unaware of technology
- 14% Too slow a process
- 5% Did not understand trial
- 4% Unable due to health problems
- 13% Other
- 9% No reason provided

- **Privacy concerns with technology**
  - Only 10% of ProTech Integrated Checkpoint users reported having any privacy concerns with the millimeter wave technology.
  - The greatest concerns were related to being seen naked by the screening officer (29%), followed by a lack of information about the millimeter wave technology (17%), and fears concerning the effects of the scan and medical issues (14%).
  - 17% of ProTech Integrated Checkpoint users who indicated a privacy concern did not provide specific feedback regarding the nature of the concern.

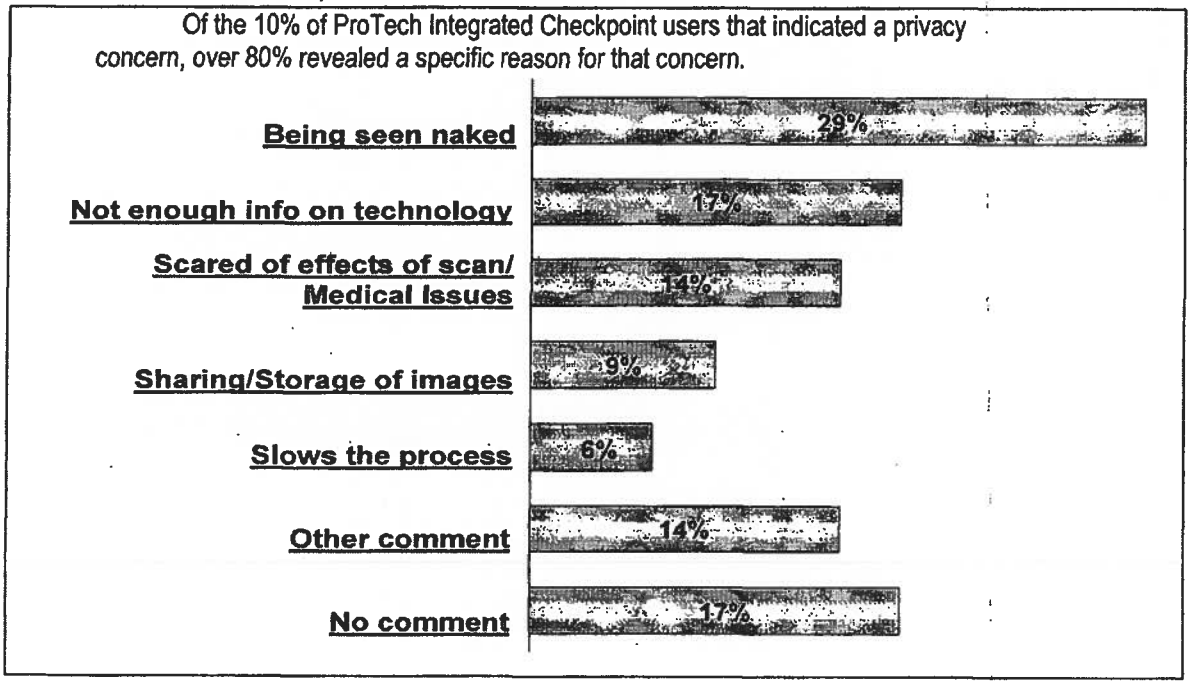


Table 1: Passenger's Privacy Concerns

4 Trial screening process

4.1 Concept of operation

4.2 Passenger screening process

5 Trial data

This section includes data and information collected during the technology evaluation trial and the operational trial.

5.1 Technology trial evaluation data

The technology evaluation determined the detection and operational capabilities of the ProTech Integrated Checkpoint.

5.1.1 Detection performance

Detection performance evaluations were conducted on the ProVision millimeter wave portal and on the Protocol PD 6500i Walk Through Metal Detector (WTMD).

- **ProVision millimeter wave detection**

A threat based approach was used to evaluate the security value of the millimeter wave technology. The threat items selected included items that could and could not be detected by current screening technology. These threat items were placed on key areas of the body of the test subject. The ProVision detected the threat items and was accepted for use in the operational trial.

- **ProVision auto detection algorithm**

The detection performance testing also evaluated the ProVision millimeter wave Auto Detection algorithm. This software algorithm automatically marks with a red box the location of an anomaly on the scanned image. The test results indicated that the detection algorithm was not accurate to all body worn threats. L3 is updating the algorithm and, as a result, it was not included in the operational trial.

- **ProVision image blurring**

The ProVision has a feature that allows image blurring of private areas of the body including the face. Tests were conducted to verify the effectiveness and accuracy of this feature. The results indicated that the feature was not precise in the image blurring placement on the passenger and could, at times, blur areas that must be reviewed by the screening officer. This could allow for items to be concealed in these areas defeating the benefits of this technology.

The CATSA concept of operations ensures passenger privacy is protected by the procedures described previously in this report. From a security detection point-of-view, the technology provides sufficient detail to detect threat items. From a privacy point-of-view, the technology does not provide an image that can be easily used to identify a passenger. It is for these reasons that CATSA does not recommend the use of the image blurring software feature due to the difficulty in identifying a passenger from the image and impediment to the security detection of the technology.

- **Walk through metal detector**

The Protocol WTMD detection performance was conducted using the Transport Canada "Walk Through Metal Detector Test & Evaluation Procedures" document dated May 2005. The unit passed the detection requirements and was accepted for use in the operational trial.

The walk through metal detector has a performance standard and is a regulated security system. Transport Canada provided an exemption for the use of the Protocol WTMD integrated with the ProVision millimeter wave portal (not as a stand alone) for the operational trial period and up to March 1 2009.

5.1.2 Performance standard

Body-worn threat technologies including the ProVision millimeter wave portal currently have no performance standard regulated by Transport Canada (TC). Since the technology is not regulated no exemption was required from TC to use this technology in the Kelowna operational trial. Transport Canada will commence the process of developing a performance standard.

5.1.3 Alarm resolution protocol

Alarm resolution protocols were developed and were included in the standard operating procedures used for the trial. In addition to the steps required to protect passenger privacy, CATSA developed a touch screen computer system called Stickman to transfer data between the ISO and MSO. The primary function of the Stickman allowed the alarms seen on the millimeter wave image to be manually transferred on a stickman outline showing the front and back of a person. The stickman information could then be sent to the public screening area since it contained no personal information. The stickman provided information to the screening officer allowing him/her to conduct accurate directed searches including visual and/or partial pat down searches.

5.1.4 Training program

L3 provided the image analysis training and equipment operating procedures to CATSA and Transport Canada representatives. A training program was developed with the CATSA Learning and Development group and was delivered to the screening officers participating in the trial. The screening officers were certified to operate the ProVision millimeter wave portal. The screening officers were retested at the end of the trial by L3. The results show the detection rates were maintained.

5.1.5 Security efficacy

5.1.6 Equipment reliability

The ProVision millimeter wave portal was reliable throughout the trial. Several failures occurred at the beginning of the trial that were due to the integration of the ProVision with the walk through metal detector. Once these issues were resolved, the ProVision unit did not require corrective maintenance for the remaining months of the trial.

The Stickman touch screen communication system was reliable and provided invaluable operational data.

The Motorola radio communication system proved to be reliable with no equipment failures. Initial headsets for the MSO's were replaced with others for better fit and comfort. The system included a base station, foot activation switch for hands free operation and headset for the ISO. There were three portable radios with headsets and spare batteries for the MSO's and supervisor. The third set was a spare which could also be used for monitoring by the supervisor.

5.2 Operational trial data

The following data was based on monthly averages from July to November 2008. Data from December and January were skewed as a result of daily infiltration testing which reduced normal operational performance significantly. Throughput, process times, alarm type and rate data was collected from September to November as a timing issue with the stickman tool invalidated data for July and August.

5.2.1 Passengers screened: over 32,000

Over 32,000 passengers passed through the ProTech Integrated Checkpoint during the trial. An average of 180 passengers was screened everyday. The passenger traffic through the checkpoint in relation to the total passenger departures from the Kelowna airport is outlined in the table below.

Type of passenger traffic	Daily Average
All passenger departures (passengers passing through four standard lanes and one ProTech)	1677
All passenger departures during ProTech Checkpoint hours of operation	1072
Passengers processed at ProTech Checkpoint	180
Percentage of passengers processed by ProTech Checkpoint	18%

Percentage of passengers processed at the four standard lanes	82%

Table 2: Passenger Traffic Averages

The ProTech Integrated Checkpoint accounted for 18% of daily passenger departure loads at Kelowna during the eight hours of operation through the day. There were, on the average, 3.25 regular PBS lines also open during these same hours.

5.2.2 Throughput: 61 passengers every hour

The average throughput for the ProTech Integrated Checkpoint was 61 passengers per hour. This was the average total number of passengers that entered the Provision millimeter wave portal and were cleared by the MSO within one hour. This data was based on the stickman tool from September to November inclusively.

The maximum throughput reached was 90 passengers per hour. Other items that may impact the throughput included additional trial data collected using the stickman software which would normally not be captured in standard checkpoint operations. The trial also required alarms to be resolved for all watches and necklaces. These accounted for 49% of alarms and the resulting search and resolution time. Also, an additional 41% of alarms generated by non-metal items were detected by the ProVision millimetre wave portal. These alarms do not occur on current walk through metal detectors.

The L3 throughput advertised for the equipment ranged from 300 to 600 passengers per hour.

5.2.3 Average search times

The following table includes the search times recorded from the stickman tool that measures the individual time required by either the image screening officer (ISO) or metal screening officer (MSO) to search a passenger, with the millimeter wave image or local physical pat-down, respectively.

Search type	Average search time (min)
Image analysis search	0:14
Metal search	0:45

Table 3: Average Search Times

- The average image analysis search time required by the ISO to screen a passenger was 14 seconds.
- The average search time required by the MSO to perform a local physical pat-down search based on the millimeter wave image alarm was 45 seconds.

- The ProVision millimeter wave image analysis search time was on average one/third that of a typical metal search.

5.2.4 Alarm types and rates

Throughout the operational trial, data was collected to measure the alarm rate and alarm objects detected by the ProVision millimeter wave portal and the walk through metal detector.

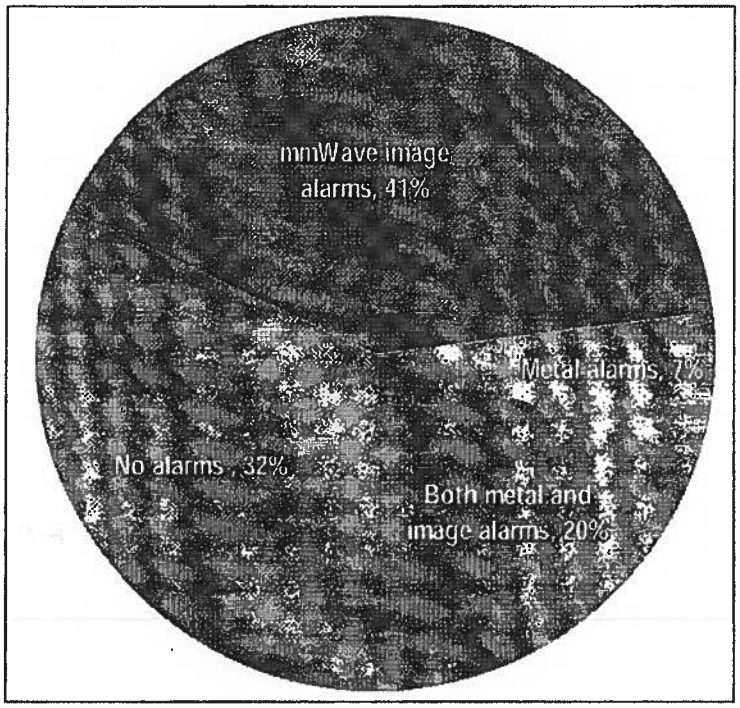


Figure 5: Alarm Types and Rates

Process times for passengers that alarmed on the ProVision millimeter wave portal, WTMD only, both metal (WTMD) and the millimeter wave image alarms or that did not alarm are also described below. The following processing times were recorded from the stickman tool that measures the process time beginning from when the passenger entered the ProVison and ends when once they were cleared by the MSO.

Process type	Rate	Time (min)
Millimeter wave image alarms	41%	01:08
No alarms	32%	00:38
Both metal and image alarms	20%	01:21
Metal alarms	7%	00:59
Average Processing Time (<3min)	**100%**	**01:01**

Table 4: Processing Time

- The average time required to process a passenger who alarmed on the ProVision millimeter wave portal and not in the walk through metal detector was 1:08 minutes. This type of alarm occurred 41% of the time.
- The average time required to process a passenger who did not raise an alarm on either the ProVision millimeter wave portal or the walkthrough metal detector was 0:38 minutes. This occurred 32% of the time.
- The average time required to process a passenger who raised an alarm on both the ProVision millimeter wave portal and the walkthrough metal detector was 1:21 minutes. This type of alarm occurred 20% of the time.
- The average time required to process a passenger who raised an alarm in the walkthrough metal detector alone was 0:59 minutes. This alarm scenario occurred only 7% of the time.
- The overall average process time required to screen a passenger using the ProTech checkpoint was 1:01 minutes on average.

5.2.5 Areas searched per passenger on the average: 1.1

The average number of areas searched on the passenger by the MSO was 1.1. In total there were 33 separate search areas segmented by the stickman tool for the MSO to perform a local physical pat-down. These segments were selected based on areas currently designated in the SOPs for conducting a localized pat-down.

The majority of items found on passengers were watches, bracelets and necklaces. These were highlighted by the ISO on the stickman tool at the front of the hands and the front neck. These areas alarmed accounted for a total of 49% of all ProVision millimeter wave portal alarms. The remaining alarms were distributed as given in the table below. Passengers were asked to remove their belts before entering the ProVision millimeter wave portal.

Search Areas	Average	
Front hands	37%	49%
Front neck	12%	
Back head	7%	
Front right waist	7%	
Front belt	7%	
Front left waist	6%	
Other (27 remaining locations)	24%	

Table 5: Passenger Alarm Distribution

Image Screening Officers were asked to highlight all anomalies including those found at the hands and neck even if they were identified simply as watches, bracelets and necklaces (which accounted for 49% of the alarms). This data was compared to the detection capabilities of the ProVision millimeter wave portal to that of the WTMD. As a result only 7% of all alarms were detected by the WTMD only and could not be detected by the ProVision millimeter wave system.

5.2.6 Screening officer staffing requirements

6 Conclusions

This section provides a brief overview of the trial statistics along with conclusions for each of the trial objectives.

6.1 Quick-look results

The table below summarizes the results of the trial and the passenger survey that took place during the trial. The information presented gives a birds-eye view of the trials.

Item	Value
Number of passengers who participated in the trial	>32,000
Average processing time per passenger (minutes)	1:01
Number of body-worn threat items detected	0
Average number of alarms for 100 passengers	68
Availability of the technology throughout the trial	>99%
Percentage of passengers who:	
Preferred the ProTech millimeter wave over a physical pat-down	95%
Would use the ProTech millimeter wave again	93%
Indicated no privacy concerns with the ProTech millimeter wave technology	90%
Believed the ProTech millimeter wave technology improves security	75%
Preferred the ProTech millimeter wave process over the standard process	64%
Had seen or heard of millimeter wave technology before their trip	46%

Table 7: Passenger Statistics

6.2 Security increases

Objective: Improve security

Develop a detection performance standard for body-worn threats and measure the ProVision millimeter wave portal's capability to increase security by detecting the additional threats.

Conclusions:

- **Body-worn threat detection confirmed**

  The ProVision millimeter wave portal detects metal and non-metal body-worn threats. The threats, hidden under clothing, have been identified as a leading threat to aviation by Transport Canada. This technology provides a faster alternative to passenger physical pat-downs. The coverage of the detection is limited in the extremities including the extended overhead hand position and the feet. L3 has been requested to improve the detection coverage of the portal in these areas.

- **Increased detection of non-metallic threats**

  This technology is a significant improvement to the level of security provided by walk through metal detectors primarily due to its capability to detect all metals and non-metals down to small sizes such as coins.

- **Automating the full physical pat-down**

  The currently implemented operational procedure for body-worn threats is a full physical pat-down of the passenger. The ProVision millimeter wave portal offers an alternative by effectively automating the "pat-down".

- **100% of passengers screened**

  During the trial, over 32,000 passengers were screened for body-worn threat items. The technology automated the current procedure of physical pat-downs at Pre-Board Screening and sped up the passenger search times.

  No body-worn threats were identified during the trial.

- **Complete divestiture improved ProVision millimeter wave screening**

  The screening officer in charge of divestiture is critical to assist with the reduction of image scanning times by helping the passengers to divest. Every object detected by the ISO had to be resolved. As a result, this significantly delayed the screening process. The importance of complete and proper divesting to efficient operations cannot be over-emphasized.

6.3 ProTech technology integration not recommended

Objective: Assess how technology integration can improve security

Develop a technology integration evaluation protocol and measure the security value of ProTech Checkpoint.

Conclusions:

L3 presented the ProTech Integrated Checkpoint as the integration of a number of detection technologies. However, several technologies were not developed in time to be included in the operational trial.

As a result, the trial evaluated two integrated technologies; the ProVision millimeter wave portal and a walk through metal detector. The acceptance for use of these two integrated technologies is not recommended due to the following findings:

- Alarm locations differed on the ProVision and the WTMD

  There were differences in the perceived location of the alarm object as detected by the WTMD and the ProVision millimeter wave portal. For example, the passenger would raise his/her arms at the ProVision and lower his/her arms at the WTMD. This resulted in conflicting alarm location information for the screening officers. L3 confirmed that this issue cannot be resolved without a significant change in design of the technology.

- The metal indicators on the ISO millimeter wave screen were often very large and some cases did not display on all frames of the scan.
- The location indicators on the WTMD were not visible due to the customized shrouding connecting the WTMD to the ProVision millimeter wave portal.
- Multiple scans/positions are not possible with the integration.

6.4 Security increased at the cost of efficiency

Objective: Increase efficiency

Develop an evaluation protocol and measure the increase efficiency relating to capital cost, airport space, throughput, operational costs, and performance standards.

Conclusions:

- **Increased capital cost**

  The integrated ProVision millimeter wave portal and WTMD price is $212,000 USD. The stand-alone ProVision millimeter wave portal price is $180,000 USD. A WTMD price is approximately $15,000 CDN.

  This objective was developed to measure the increase in capital cost efficiency due to throughput rates of 300 to 600 passengers per hour. The premise being throughput increases of this scale would require less

equipment to process passengers. These throughput rates were not possible with the technology following CATSA's standard operating procedures.

- **Airport space requirements increased**

  If the ProTech Integrated Checkpoint had been capable of the L3 throughputs then it would be possible to deploy a single ProVision millimeter wave portal for each pair of x-rays. In such a configuration it would be possible to minimize changes to the screening checkpoints at an airport. As indicated, the throughputs do not support a reduction in the overall space requirements.

  The approximate space requirements were:

Configuration	ProTech	Standard
Single Line (1 X-ray, 1 WTMD)	~ 5m	~ 5m
Dual Line (2 X-ray, 2 WTMD)	~ 9.5m	~ 8m

Table 8: Airport Space Requirements

- **Throughput peaked at 90 passengers per hour**

  The average throughput was 61 passengers per hour with a peak reaching 90 passengers per hour. This was due to a number of reasons including:

  - the voluntary nature of the trial. It proved difficult to request a constant stream of passengers due to the availability of passengers and a perceived delay due to a line-up.
  - Originally L3 indicated divesting would not be required and throughput would increase significantly. Early technology trial tests verified the ProVision was relatively accurate in determining the location and size of items. Unfortunately it could not, in most cases, resolve or determine what these items were. As a result, divesting became a critical requirement as any items found on a passenger had to be resolved by the MSO. The throughput average was 61 passengers per hour; far below the L3 300-600 passenger per hour expectation.

- **Operational costs**

  Operational costs include equipment maintenance costs and screening officer labour costs.

  On the maintenance costs, the ProVision millimeter wave portal proved to be a reliable technology requiring minimal corrective and preventive maintenance. The equipment failures were due primarily to the integration of the ProVision millimeter wave portal to the WTMD.

  Regarding the screening officer labour costs, a high-level view of the automation of the physical pat-down indicates more passengers can be

searched faster using the technology as opposed to the current physical pat-down procedure. This was achieved with two additional screening officers supporting the trial than is typically required on a standard screening line.

- **Performance standards**

  This relates to the original objective of increasing security and developing detection performance standards. Based on the threat and risk profile from Transport Canada, body-worn threats remain a concern for aviation security. Next steps include discussions with Transport Canada to define a deployment strategy to meet the regulated performance standard including deployment in a primary or secondary configuration.

6.5 Passenger convenience improved

Objective: Improve passenger convenience

Measure the improvement to passenger convenience due to whole body imaging technology offered as an alternative to physical pat-down.

Conclusions:

- **An independent survey confirmed 95% of passengers preferred the ProVision over a physical pat-down**

  With reference to chapter 3, an independent passenger survey confirmed passenger acceptance of 95% for the ProVision millimeter wave portal.

6.6 Passenger privacy was protected

Objective: Identify privacy issues

Identify any privacy issues, especially in regards to millimeter wave technology, how to resolve the issues and how to communicate the new technology to the public

- Engage the Office of the Privacy Commissioner of Canada in order to identify and resolve privacy issues
- Develop a trial communication plan

Conclusions:

- Engage the Office of the Privacy Commissioner of Canada in order to identify and resolve privacy issues

  CATSA identified privacy issues and risk mitigations in the Preliminary Privacy Impact Assessment dated January 11, 2008. The Office of the Privacy Commissioner of Canada agreed with CATSA's assessment and confirmed the understanding in a letter to CATSA on March 7, 2008.

  Passenger privacy was protected and maintained throughout the trial based on the understandings noted above. CATSA also commissioned an independent passenger survey to measure passenger acceptance or concerns with the technology as discussed in chapter 3.

Although the trial results indicate a larger percentage of passengers support the technology, not all passengers did. Issues and concerns were raised due to the nature of the technology (some believed it is x-ray based), some passengers were unaware of the trial, while others thought the process may be slow. These issues can be addressed through enhanced communications and passenger awareness.

- Develop a trial communication plan

  The trial communication plan combined press releases, brochures, signs, and a screening officer available at all times to answer questions regarding the trial. The plan was a success due to the 32,000 plus passengers (18% of Kelowna passengers) who voluntarily participated in the trial.

6.7 Trial best practices developed

Objective: Improve passenger convenience

Learn from the trial such that learning's can be applied to this trial, this technology, and future technologies

- Develop CATSA concept of operations and standard operating procedures
- Develop CATSA training program and measure the increase in operator efficiency before, during, and after the trial
- Develop a methodology to measure operational data including passenger processing times, throughput, alarm rates, alarm types
- Determine operational impact of introducing technology
- Provide recommendations on the deployment of the technology

Conclusions:

- Develop CATSA concept of operations and standard operating procedures
  The concept of operations along with supporting technology to satisfy the security and privacy concerns were developed for the trial. Standard operating procedures were also developed and implemented throughout the trial.
- Develop CATSA training program and measure the increase in operator efficiency before, during, and after the trial
  A training program was developed to meet the CATSA Learning and Development screening officer certification requirements. The screening officer's performance was measured at the beginning and end of the trial. Screening officer performance increased by 35% with throughputs increasing from approximately 45 passengers per hour to 61 passengers per hour
- Develop a methodology to measure operational data including passenger processing times, throughput, alarm rates, alarm types
  Operational trial data mechanisms were designed and implemented during the trial using real-time data collection by the stickman tool. The screening officers entered the required data in real time throughout the trial. Operational trial reports were developed using the collected data.
- Determine operational impact of introducing technology
  Based on the primary screening configuration in Kelowna, the throughput measurements indicate the ProVision millimeter wave portal would reduce

passenger throughputs. However, overall, there is an increase to the number of passengers who are screened for body-worn threats.

- Provide recommendations on the deployment of the technology
  As indicated above, CATSA recommends the use of the technology.

7 Recommendations

1. Develop the Privacy Impact Assessment and submit to the Officer of the Privacy Commissioner of Canada

Upon review of this final report with the Office of the Privacy Commissioner of Canada, the Privacy Impact Assessment for Millimeter wave technology use in Canada should be developed and submitted to the Commissioner for review. CATSA also recommends that the protocols developed and used throughout the trial to ensure passenger privacy be followed if the Government of Canada supports the deployment of the technology. The voluntary aspect of the trial will be reviewed in the context of the Transport Canada regulations.

2. L3 to improve detection at the extremities

CATSA recommends L3 increase the ProVision millimeter wave portal detection coverage at the extremities including the extended overhead hand position and the feet.

3. Transport Canada to consider the ProVision millimeter wave portal for use in Canada

Based on the results on the technology evaluation and the operational trial, CATSA recommends Transport Canada accept the ProVision millimeter wave portal for use in Canada.

4. Transport Canada to develop a detection performance standard for body-worn threats

Based on the results on the technology evaluation and the operational trial, CATSA recommends Transport Canada develop a detection performance standard for body-worn threats. This will enable technology evaluations for alternative products.

5. Recommendation for primary or secondary screening

The Kelowna trial deployed the ProVision millimeter wave portal in a primary screening configuration. The trial results included equipment reliability, operational throughputs, alarm rates, and staffing requirements. CATSA will review the trial results and determine the concept of operations for the ProVision millimeter wave portal.