

# Australian Airport Security – The Use of Full Body Scanners

Reference: Aviation Transport Security Amendment (Screening) Bill 2012

Submission to Australian Government's Senate Rural and Regional Affairs and  
Transport Legislation Committee

VIPA Committee of Management

25 March 2012

This paper was written on behalf of the VIPA Committee of Management by Captain Phillip D. Cooper, Group Leader, Flight Safety, Technical, and Regulatory Compliance Subcommittee.

## **Introduction**

Following the September 11 attacks in the United States (U.S.), and more recently attempted airline bombings, such as the 2009 Christmas Day Bomber, there has been a large increase in the use of airport full-body scanners. Early generation full-body scanners, known as 'Backscatter X-Ray' machines, bounced low-radiation X-rays off passengers which produced photo images of a naked body and any concealed items, such as knives, explosives or weapons.

Following concerns about the health effects of X-ray radiation and privacy, manufacturers developed new machines using active millimetre-wave radio frequency technology. Australia has adopted this technology and both the manufacturer and the Australian government claims these machines have no effect on health. From July 2012, it is proposed that all international passengers and airport staff will be required to pass through the millimetre-wave scanners when transiting airside. Unlike many other countries around the world, such as the U.S., there will be no opting out of this scanning procedure.

This paper will focus solely on the new millimetre-wave body scanners and examine claims by manufacturers and the Australian government that these machines are safe. VIPA's policy in relation to the use of millimetre-wave body scanners will be outlined and will consider the health, religious, and privacy concerns related to mandatory scanning of passengers, airline pilots, cabin crew and airport workers. VIPA will also question the effectiveness of these new body scanners and discuss alternative security measures.

## **Millimetre-wave Body Scanners**

VIPA understands that the L-3 Communications ProVision ATD millimetre-wave body scanner has been selected for installation at all Australian international airports. Manufacturer data states that the ProVision ATD uses safe active millimetre-wave radio frequency technology to automatically detect materials, such as liquids, gels, plastics, powders, metals and ceramics. It can also detect other objects, which include weapons, explosives, drugs, money, and papers. Once scanned the passenger or airport worker's image is presented as a generic mannequin figure, this alleviates any concerns about privacy, which was a concern with earlier backscatter X-ray machine images. If an object of interest is detected, this will be highlighted on the mannequin image (Figure 1) (L-3 Communications, 2012).

The ProVision ATD Body Scanner takes seven seconds to process a complete multidirectional scan. However, realistically the manufacturer claims a processing rate of 200-400 people per hour depending on the application (L-3 Communications, 2012). This appears to be an optimistic claim as Australian trials of body scanners during August and September 2011, produced in each case a 20 and 40 percent alarm rate which slows the scanning process (The Australian, 2012).

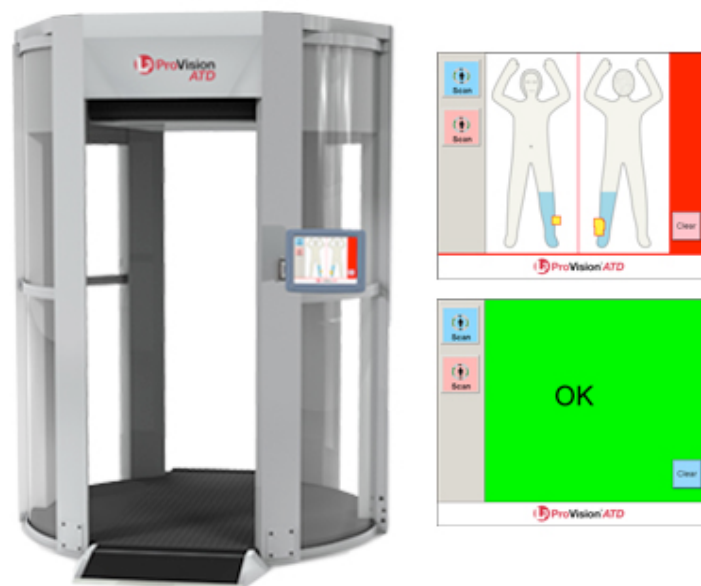


Figure 1

ProVision ATD, Millimetre-wave Body Scanner

(L-3 Communications, 2012)

At the time of the trials, the Office of Transport Security was trying to determine whether the technology was giving actual or false alarms. During a Senate hearing in late 2011, airlines expressed a concern that the machines would cause flight delays. In response, the Office of Transport Security Executive Director, Paul Retter said that the time in the scanner was only 1.5 to 2.5 seconds. This is the approximate scanning time, it does not include walking into and out of the machine, and does not include the computer processing time and the delay time caused by false alarms, which in some cases can be considerable (The Australian, 2012).

## Acceptance of Millimetre-wave Body Scanners

Use of millimetre-wave body scanners has not been universally accepted throughout the world. For example, Germany conducted a trial of the machines over a 10 month period, which resulted in false alarms 49 percent of the time. Of the 800,000 passengers scanned only 15 percent were found to be carrying prohibited items in their pockets. Electronic Privacy Information Centre's (EPIC's) John Verdi said, "...when they can't distinguish between body sweat and explosives, they aren't making anyone safer." (EPIC, 2011). Germany has not ruled out the use of body scanners at its 50 airports, however until the current generation of scanners are made more efficient, effective and safe they would not be used (DW, 2012). Italy has also found the body scanners to be inconvenient and inaccurate and has had the machines removed from airports (EPIC, 2011). Both Dubai airports do not use full-body scanners as they contradict Islam. Emirates Head of Airport Security stated the scanners would not be used, "out of respect for the privacy of individuals and their personal freedom." (Fox News, 2012). Manufacturers have attempted to address some of these concerns by the introduction of non-sex mannequin imagery and the deletion of images following inspection by the operator.

A world leading expert from Israel, Rafi Sela says that the Canadian government had wasted millions of dollars on "useless" imaging machines at airports. At a Canadian parliamentary probe into the country's aviation security, Sela said, "I don't know why everybody is running to buy these expensive and useless machines. I can overcome the body scanners with enough explosives to bring down a Boeing 747." He went on to say, "That's why we haven't put them in our airport." (Infowars, 2012). Sela also offered to describe how to get past these virtual strip downs, but only to officials with security clearances (GroupIntel, 2011). Rafi Sela was most likely referring to the fact that these new generation of body scanners cannot see into human body cavities. It is easy for a terrorist to hide explosives in a body cavity, crevice, adult diaper, or feminine protection (Flyersrights.org, 2010).

### **Non-ionizing Radiation Health Effects**

The L-3 ProVision ATD millimetre-wave body scanner transmits a beam of high frequency radio waves from two scanners. The exposure of electromagnetic radiation is short and should not exceed 2 seconds. The radio waves penetrate through the person's clothing and approximately 1 millimetre into the body before being reflected back to the receiving antenna, any intervening material, such as metal, liquids, or powder will also reflect the radio waves back to the antenna (Australian Government, 2011).

At higher levels of exposure, over 10 watts per square metre, high frequency radio waves can rapidly heat human tissue, this is sometimes referred to as the “thermal” effect. Damage can occur if the body cannot dissipate the excessive heat. Two areas of the body, eyes and testes are particularly vulnerable to damage as these areas have reduced blood circulation which cannot cope with excessive heat build up (Cleveland & Ulcek, 1999). Providing the L-3 scanner is working to specification there should be no measurable effects of thermal heating, however this doesn't mean there is not a biological hazard.

Over the years there have been reports from laboratories in North America and Europe that have shown biological effects after the exposure of animals, and animal tissues to relatively low levels of radio frequency radiation. These effects included behavioural effects, neurological effects and changes to the immune system. An effect was also found on brain tissue when combining microwave exposure and certain drugs and compounds, effects on DNA were also found (Cleveland & Ulcek, 1999). Many of these findings have not been substantiated, however a study by Boian Alexandrov and his colleagues at the Centre for Nonlinear Studies at Los Alamos National Laboratory may explain why previous studies have shown mixed results (Technology Review, 2012).

Prior to 2009, there was strong experimental data to suggest that terahertz radiation can affect biological function but only under specific conditions, such as high power, and/or extended exposure, and/or specific terahertz frequencies (Alexandrov et al, 2009, p1). The reason that evidence has been so difficult to gather is that ordinary resonant effects are not powerful enough to damage DNA. However, Alexandrov et al (2009) produced a model to show that nonlinear resonances caused by terahertz waves, can create persistent spatially localized openings (bubbles) of double-stranded molecules, these bubbles are known to functionally affect DNA (Alexandrov et al, 2009). These studies show how radio frequency radiation can affect DNA, however they have not determined what is a safe level of exposure.

Swanson (2011) produced a paper further examining the effects of terahertz wave radiation on DNA. Swanson disagreed on a number of details of the Alexandrov et al (2009) research, however he agreed with the main conclusions. Swanson (2009) further stated: “DNA had evolved in a noisy electrical and thermal environment, and it might be expected that the molecule and the processes in which it takes part will be stable with respect to external non-ionising radiation. Similarly, one would expect that all molecular level biological processes are immune to low level radiation; although, of course, this speculation needs to be confirmed with rigorous experiment.” The American Cancer Society (2012) acknowledges

these potential effects on cell structure by stating: “Non-ionizing radiation does not damage DNA directly, but it may be able to affect cells in other ways.”

The whole-body Specific Absorption Rate (SAR) of an adult absorbs maximum energy when the frequency is a range of 80 - 100 MHz (Cleveland & Uleck, 1999), which is just above the operating frequencies of the L-3 full-body scanner. Radio frequency safety standards are more restrictive in the millimetre-wave band of 30 to 300MHz due to concerns about the “resonance” phenomenon. The Australian Government (2011) states “ There is no evidence to suggest that millimetre-wave body scanners, or other devices in this frequency and at the power density used by scanners, are a health risk for the travelling public or the operators.” VIPA would argue the evidence to-date suggests there is a potential health risk. Therefore, until human health safety is assured, a precautionary approach to radiation exposure levels should be taken by governments. Additional precautions should be taken for the vulnerable, such as pilots, cabin crew, airport workers, children, pregnant women, the disabled and the ill.

### **Religious Concerns and the Right to Privacy**

Australia as a first world, multicultural society should carefully consider the religious and privacy implications associated with mandatory airport screening. In 2010 the Flight Council of North America, issued a ruling calling full-body scanners “...a violation of clear Islamic teachings that men or women be seen naked by other men and women.” A number of other faiths have spoken out, these include, Sikhs, Orthodox Jews and some Christian groups. For members of these religious faiths the alternative of an invasive physical body search is equally as bad (The News Tribune, 2012). If the Australian government is serious about addressing these issues, then advice should be obtained from religious councils in Australia. Further consultation with security services in the Middle East would also reveal how this sensitive issue is dealt with without compromising security.

Members of the travelling public and airport workers, whether religious or not may have concerns about the violation of their privacy and dignity. People throughout the world appear to have accepted rules regarding the carriage of restricted articles onboard an aircraft. In general, people seem to have accepted the requirement to remove belts and shoes for further inspection through X-ray scanning machines. White (2010) says that “...full body scanners cross the threshold from limits on how we travel to an exposure of who we are as persons. An image, even if blurred and not directly linked to an individual, is still a representation of us as individuals.” For an airport worker required to pass through full-body

scanners on a regular basis and suffering from both religious and privacy concerns, this could become a major psychological issue. There is currently little understanding among the Australian community about how these new full-body scanners will be deployed and used, the potential effect on health, and the use by governments of collected data. White (2010) states "...their deployment [full-body scanners] might violate contextual integrity of other social norms such as appreciation of cultural, religious, and social beliefs about viewing of the body; preservation of human dignity; and transparency about the collection and dissemination of personal data." The European Union has recognised concerns related to health, privacy and fundamental rights, and has adopted strict guidelines limiting the use of full-body scanners. Like the U.S., passengers in Europe have the legal right to opt-out of body scanners (EPIC, 2011).

### **Alternative Security Measures**

Given the limitations of millimetre-wave full body scanning technology, VIPA believes governments should be focusing on alternative methods of airport security. There are more sophisticated ways of increasing security, such as chemical processing, sweat terror tracing, consolidating data, competency security training, biometric cards, vigilant surveillance systems, profiling and biometric screening, and more traditional methods, such as explosive sniffer dogs which have very high detection rates (CNN, 2012). Australian government agencies will be well aware of these and other effective counter measures, however such measures will come at a cost and may not be as politically beneficial, unless of course one or more acts of terrorism are foiled.

Pilots and cabin crew undergo rigorous security background checks. Once issued with an Airport Security Identity Card (ASIC) pilots and cabin crew are then entitled to work in and around aircraft as part of their normal duties. As part of their responsibilities for security they are required to report any suspicious behaviour. They are also required to challenge a person who is acting suspiciously or who is not wearing an ASIC card. The same applies in an aircraft, both pilots and cabin crew are required to check the aircraft for suspicious items prior to departure and challenge the presence of suspicious characters. Since 9/11 the cockpit door remains locked throughout the flight to ensure that any threatening behaviour is contained in the cabin area. Airside crew play an important role in the security system, unfortunately they, like the passengers, are treated with suspicion as they pass through the security checks in full view of the public.

VIPA believes that pilots and cabin crew should not be subjected to the full-body scanning. If a pilot wishes to bring down an aircraft, they certainly do not need to smuggle explosives onboard. The government should view flight and cabin crew as dedicated professionals who should be respected and considered part of the overall security system. Two years ago in the U.S., pilot and flight attendant unions fought a hard campaign to protect their members from the indignity and potential health threats associated with full-body scanning. These groups were successful and today are not required to pass through full-body scanners. It is also noted with interest that many groups of politicians and other officials in the U.S. are also exempt from passing through full-body scanners (msnbc.com, 2012).

Members of VIPA, passing through Los Angeles airport in the U.S., report they are still required to pass through metal detectors. In the Middle East full-body scanning is not used, for example, in Abu Dhabi airport crew are directed to a separate private area where they pass through a metal detector, and should they fail this, are subjected to a pat down. VIPA members have reported this to be an organised process which is respectful of their human rights and profession.

Profiling can be either a collection of data on an individual, or making an assessment of an individual as they pass through selected areas of an airport. The American Airlines Chief Executive Officer (CEO), Gerard Arpey has expressed the need for more “behavioural profiling”. There is an increasing number of aviation officials and lawmakers arguing for more targeted scanning of passengers, where observed behaviour may be identified as a threat (Dallasnews.com, 2012). And it would seem that the American public would like to see a change. In 2010 a Washington Post and ABC Network poll revealed that 70 percent of Americans supported the introduction of an Israeli profiling system (Ynetnews, 2010).

Israel is considered to have one of the safest air travel systems in the world. This is achieved by focusing on the behaviour of passengers at airports, rather than being too worried about finding weapons, this is known as “behaviour-pattern recognition”. For example, plain clothed security forces look for behaviour, such as sweating, clenched fists, poor eye contact, stiff torso, or quavering Adam’s apple. They also note unusual behaviour, such as the case where a single pregnant women was spotted travelling alone, when questioned she was found to be carrying explosives. These methods, along with retaining data on known problematic individuals have revealed excellent results (CBS News, 2012).



## **Conclusion**

From the evidence it is clear that most governments and the travelling public believe there is a need for sound airport security. There appears, however to be some disagreement on the types of security measures to be implemented. This may be due to cost restraints, political influences and the influence of powerful business lobby groups. Over the past few years there has been a rapid increase in the number of backscatter X-ray and millimetre-wave full body scanners. This was driven mainly by a small number of high profile security breaches in the U.S. and Europe. Ionising X-ray full body scanners were viewed by many as a health risk, so manufacturers turned their attention to non-ionizing millimetre-wave technology.

The deployment of these machines, particularly in the U.S., has been so rapid that research into the health effects associated with full-body scanners has not kept up. The Australian government has publically stated that these full-body scanners are safe. This is despite concerns raised by many eminent scientists and organisations recommending further research into the effects of radio frequency radiation. Taking into account research and comments from experts like Alexandrov, Bishop, Cleveland, Gelev, Sela, Rasmussen, Swanson, Ulcek, Usheva, White, Wook Yoo and the policies of the American Cancer Society and European Union, VIPA believes there is a need for caution associated with the introduction of the L-3 Communications millimetre-wave full body scanners.

VIPA is concerned that full-body scanning machines were introduced for political reasons (seen to be acting) rather than for sound security reasons. There was little, if any consultation with user groups, such as pilot associations about the introduction of the full-body scanners. Despite this, VIPA is prepared to work with government should it wish to develop an airport security system that the nation can have confidence in and does not affect the dignity and health of its citizens.

## **Recommendations:**

Before more full-body scanners are deployed at Australian airports, VIPA recommends a full government review into the Australia airport security system. As a stop gap measure, however VIPA considers there is sufficient evidence to place restrictions on the use of full-body scanning technology. These measures include:

(1) Pilots, Cabin Crew and perhaps other regular airport workers be exempt from using full-body scanners. Instead a separate, private area should be made available for crews to pass through a metal detector and have a pat-down should the detector's alarm sound. Pat-downs must be at all times videoed and there should be another crew member present. Many people find pat-downs intrusive; to alleviate this requirement government could introduce crew card or biometric identification.

(2) In line with the U.S. and Europe, passengers should be allowed to opt-out of the full-body scanning process. This should be done discretely, and the passenger should then be required to pass through a metal detector and be subjected to a pat-down. Again biometric identification may negate this requirement. There should be an automatic opt-out for children, pregnant women, the disabled and the ill.

## References

Australian Government, (2011). *Millimetre-wave Body Scanner, Health and Safety Information Sheet*. Canberra: Australian Government, Department of Infrastructure and Transport

American Cancer Society, (2012), viewed 23 March 2012, <http://www.cancer.org/Cancer/CancerCauses/OtherCarcinogens/MedicalTreatments/radiation-exposure-and-cancer>

Alexandrov, B. S., Gelev, V., Wook Yoo, S., Bishop, A. R., Rasmussen, K., & Usheva, A., (2009). *Toward a Detailed Description of the Thermally Induced Dynamics of the Core Promoter*. New Mexico: Los Alamos National Laboratory

CBS News, (2012), viewed 24 March 2012, [http://www.cbsnews.com/2100-215\\_162-1960443.html](http://www.cbsnews.com/2100-215_162-1960443.html)

Cleveland, R. F., & Ulcek, J. L., (1999). *Questions and Answers about Biological Effects and Potential Hazards of Radio Frequency Electromagnetic Fields*, Federal Communications Commission, OET Bulletin 56, Fourth Edition, August 1999

CNN, (2012), viewed 24 March 2012, [http://articles.cnn.com/2009-12-30/travel/bomb.sniffing.dogs\\_1\\_bomb-sniffing-dogs-explosives-handler?s=PM:TRAVEL](http://articles.cnn.com/2009-12-30/travel/bomb.sniffing.dogs_1_bomb-sniffing-dogs-explosives-handler?s=PM:TRAVEL)

Dallasnews.com, (2012), viewed 24 March 2012, <http://aviationblog.dallasnews.com/archives/transportation-security-administration/>

DW, (2012), viewed 4 March 2012, <http://www.dw.de/dw/article/0,,15355386,00.html>

EPIC, (2011), viewed 4 March 2012, [http://epic.org/privacy/body\\_scanners/epic\\_v\\_dhs\\_suspension\\_of\\_body.html](http://epic.org/privacy/body_scanners/epic_v_dhs_suspension_of_body.html)

Flyersrights.org, (2010), viewed 23 March 2012, <http://strandedpassengers.blogspot.com.au/2010/01/full-body-scanners-offer-sneak-peek-at.html>

Fox News, (2012), viewed 5 March 2012, <http://www.foxnews.com/world/2010/07/06/dubai-rejects-body-scanners-contradict-islam/>

Infowars, (2012), viewed 5 March 2012, <http://www.infowars.com/full-body-scanners-useless-air-security-expert-says/>

Group Intel, (2011), viewed 5 March 2011, [http://www.groupintel.com/wp-content/uploads/2011/04/Bunker-GroupIntel\\_BodyCavityBombs.pdf](http://www.groupintel.com/wp-content/uploads/2011/04/Bunker-GroupIntel_BodyCavityBombs.pdf)

House Hansard, (2012). *Aviation Transport Security Amendment (Screening) Bill 2012*. Albanese Anthony, MP – Second Reading.

Swanson, E. S., (2011). *Modelling DNA Response to THz Radiation*. Pittsburgh: University of Pittsburgh

Technology Review, (2012), viewed 22 March 2012, <http://www.technologyreview.com/blog/arxiv/24331/>

The Australian, (2012), viewed 4 March 2012, <http://www.theaustralian.com.au/business/aviation/airport-body-scanner-trials-return-high-rate-of-errors/story-e6frg95x-1226175627857>

The News Tribune, (2012), viewed 23 March 2012, <http://www.thenewstribune.com/2010/12/26/1478527/scanners-raise-religious-issues.html>

The Parliament of the Commonwealth of Australia, House of Representatives. *Aviation Transport Security Amendment (Screening) Bill 2012* – Explanatory Memorandum

L-3 Communications, (2012), viewed 1 March 2012, <http://www.dsxray.com/advancedimaging/provision-at.htm>

msnbc.com, (2012), viewed 22 March 2012, <http://www.msnbc.msn.com/id/40341995/ns/travel-news/t/tsa-some-federal-officials-may-bypass-airport-security/>

White, R., (2010), viewed 23 March 2012, <http://www.thehastingscenter.org/Bioethicsforum/Post.aspx?id=5010&blogid=140>

Ynetnews, (2010), viewed 24 March 2012, <http://www.ynetnews.com/articles/0,7340,L-3988578,00.html>