Health Physics Society
Specialists in Radiation Safety

Fact Sheet
Adopted: May 2011

Airport Screening

Photo courtesy of Dan Paluska/Flickr

Denver Airport Security Screening

Introduction

With air travel regaining popularity and increased security measures, airport security screening has become an area of interest for many people. Travelers are required to go through metal detectors and/or x-ray systems and their personal belongings are x rayed. Even with all of the screening, radiation exposure, both to the traveler and the screener, is minimal and far below any level that would be of concern. This document will introduce and explain airport screening equipment and its potential for exposing travelers to radiation. As with any use of radiation, the overarching concept is one of risk versus benefit. In the case of air travel, the tiny incremental amount of risk posed by radiation exposure is far outweighed by society's need for safe air travel.

Metal Detectors

Metal detectors use low-intensity magnetic fields to detect metallic objects. When metal passes through these fields, sensors detect a change in the fields and an alarm goes off. Even though magnetic fields are a form of radiation, the radiation the machine emits is *nonionizing*.* Essentially, this means that exposure to these low-intensity magnetic fields does not cause biological damage. Therefore, even repeated exposure to metal detectors has no associated radiation risk.

Luggage Screening

Self-contained machines are used to screen baggage (both checked and carry on) by using x rays to analyze the contents. The amount of radiation used is higher

*Words in italics are defined in the Glossary on page 2.

than in other screening technologies (like backscatter x-ray systems described below), but this is contained within the x-ray machine. Passengers and workers are exposed to very little radiation.

These x-ray machines are designed with built-in shielding to help prevent radiation from exiting the device. However, a small amount of radiation may come out of this shielding—this is termed "leakage radiation." There are federal limits placed by the U.S. Food and Drug Administration on acceptable leakage rates for all types of x-ray producing equipment. These limits are established to keep people safe.

Any item that goes through an x-ray screening machine will receive ionizing radiation exposure; however, it is too low to damage your personal belongings and they cannot become radioactive from this procedure. However, some photographic film may need to be hand-screened because the x rays can damage the film (just like a plain film x ray at the doctor's office).

Backscatter/Soft X-Ray Systems

Some of the newest traveler screening systems use x rays for full-body scanning of travelers. In these systems, low-energy x rays bounce off of the skin and back to detectors to show an image. That image will show hard objects (such as weapons) as well as soft objects (like a packet of gel or powder, which would not be caught by metal detectors).

Unlike metal detectors, these systems use *ionizing radiation*. Ionizing radiation, like x rays, has the potential for damaging human DNA. Because the public is being exposed to this radiation, exposure must be limited to a safe level. An American National Standards Institute/Health Physics Society industry standard states that the maximum allowable effective radiation *dose* for an individual from one screening (which generally consists of two scans) is limited to 0.025 *mrem* (ANSI 2009). Actual doses are on the order of 0.001 to 0.005 mrem per scan.[1] This amount of exposure is well below any level of concern and, in fact, is less than 1 percent of the radiation you receive from natural sources in a single day or less than two minutes of airplane flight. This means the risk from the exposure is very small (TSA 2010).

One alternative to backscatter x-ray systems, millimeter wave scanners, can also be found in use at security checkpoints. These systems do not emit ionizing radiation.

Conclusion

Air travel is a part of modern living and the need for safe travel continues, especially given the ongoing threat of terrorism. The technology used in screening people and their belongings exposes the travelers to minimal amounts of radiation.

[1]Rapiscan Systems. Rapiscan Secure 1000 Single Pose. Available at http://www.rapiscansystems.com/rapiscan-secure-1000-single-pose.html. Accessed 7 January 2011.

Glossary

This fact sheet may use nuclear terms that are unfamiliar. Many of these are denoted in italics in the text and are defined in this glossary. More can be found on the Radiation Terms and Definitions page on the Health Physics Society website at http://hps.org/publicinformation/radterms.

Dose
The amount of energy deposited in your body by radiation. Controls are in place to limit public exposure to 100 mrem per year. Occupational radiation workers are allowed to safely receive 5,000 mrem per year.

Ionizing Radiation
Radiation that has the potential to damage DNA.

mrem
An abbreviation for "millirem," a unit of dose that measures the effects of ionizing radiation on humans. The average person in the United States receives about 600 mrem annually.

Nonionizing Radiation
Radiation that does not directly damage DNA.

References

American National Standards Institute/Health Physics Society. Radiation safety for personnel security screening systems using x-ray or gamma radiation [online]. McLean, VA: Health Physics Society; ANSI/HPS N43.17-2009; 2009. Available at: http://hps.org/hpssc/N43Status.html. Accessed 7 January 2011.

Transportation Security Administration. Implementation of Johns Hopkins University Applied Physics Laboratory recommendations for Rapiscan Secure 1000 single pose advanced imaging technology. Memorandum. TSA; 2010. Available at http://www.tsa.gov/assets/pdf/tsa_safety_study_ait_info_memo.pdf. Accessed 7 January 2011.

Resources for More Information

American College of Radiology. ACR statement on airport full-body scanners and radiation [online]. Reston, VA: American College of Radiology; 2010. Available at http://www.acr.org/MainMenuCategories/media_room/FeaturedCategories/PressReleases/StatementonAirportFullbodyScanners.aspx. Accessed 7 January 2011.

Health Physics Society. Airport x-ray scanners [online]. McLean, VA: Health Physics Society. Available at http://www.radiationanswers.org/radiation-blog/Airport_xray_scanners.html. Accessed 7 January 2011.

Health Physics Society. Use of ionizing radiation for security screening individuals [online]. Health Physics Society Position Statement. 2009. Available at http://hps.org/documents/securityscreening_ps017-1.pdf. Accessed 7 January 2011.

Interagency Steering Committee on Radiation Standards. Guidance for security screening of humans utilizing ionizing radiation [online]. Washington, D.C.: ISCORS Technical Report 2008-1; 2008. Available at http://www.iscors.org/doc/GSSHUIR%20July%202008.pdf. Accessed 7 January 2011.

Mehta P, Smith-Bindman R. Airport full-body screening. Arch Intern Med 171(12): 1112-1115; 2011.

National Council on Radiation Protection and Measurements. Screening of humans for security purposes using ionizing radiation scanning systems [online]. Bethesda, MD: NCRP; Commentary No. 16; 2003. Available at http://www.ncrppublications.org/Commentaries/16. Accessed 7 January 2011.

U.S. Food and Drug Administration. Products for security screening of people [online]. 2010. Available at http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/SecuritySystems/ucm227201.htm. Accessed 7 January 2011.

The Health Physics Society is a nonprofit scientific professional organization whose mission is excellence in the science and practice of radiation safety. Formed in 1956, the Society has nearly 5,000 scientists, physicians, engineers, lawyers, and other professionals. Activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information. The Society may be contacted at 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101; phone: 703-790-1745; fax: 703-790-2672; email: HPS@BurkInc.com.