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RADIATION PROTECTION ASPECTS OF THE NEW WHOLE BODY-BODY RTG SCANNERS



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Introduction

This paper summarizes the recent situation regarding the design and construction of the new whole-body security rtg scanners which are being installed at some airports for passenger security control. Based on an estimated number of passengers and the data from manufacturers, a total number of additional cancer cases (besides their spontaneous occurrences) can be calculated and compared with the risk which can be avoided when this sophisticated equipment is used for the security screening of persons.

Why sophisticated security rtg screening is introduced

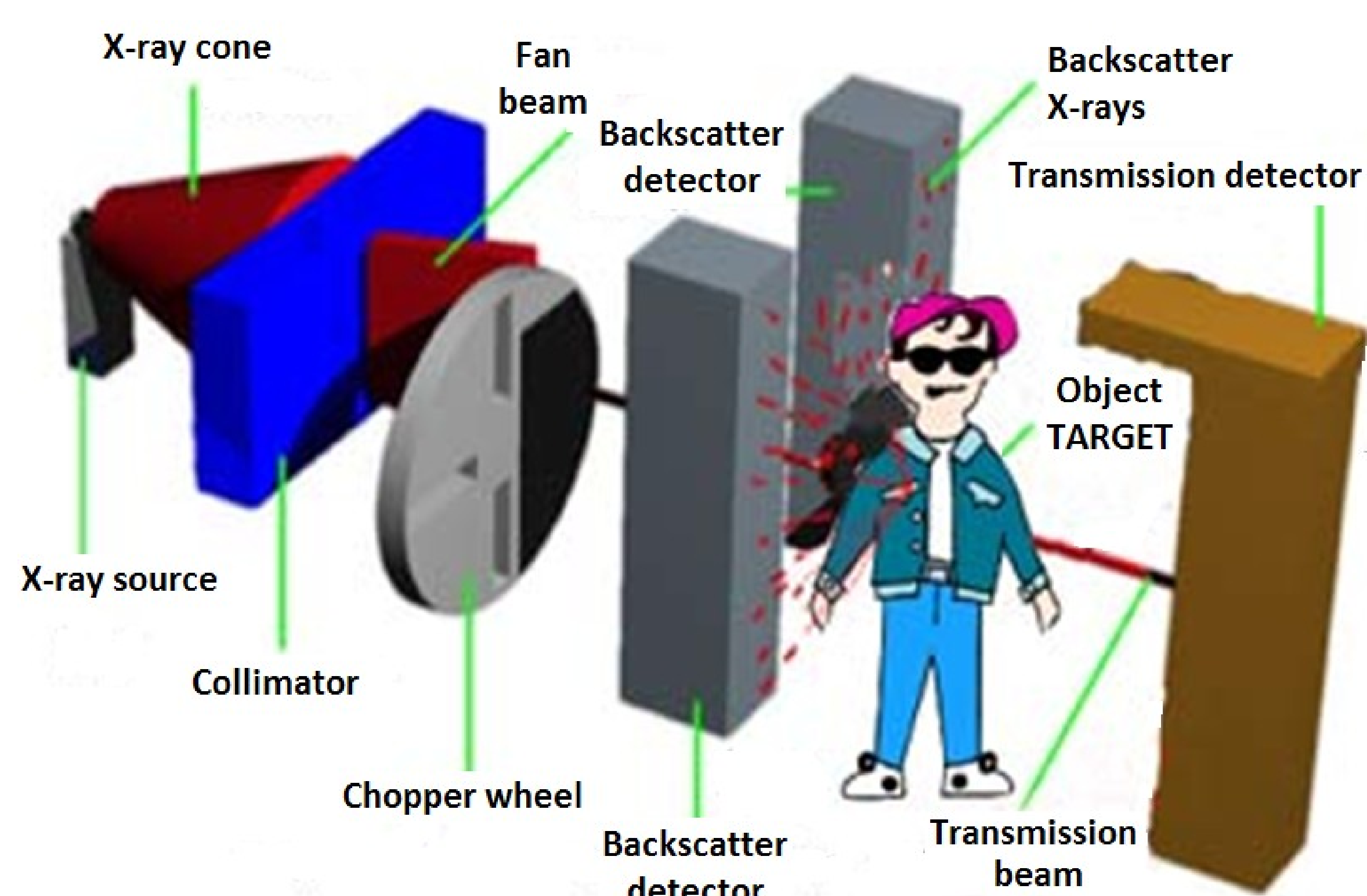
The stricter demands and requirements were introduced after the terrorist attacks on the USA on September 11 in 2001 [1]. These were so far the most tragic malevolent acts, where nearly 3000 people died, including all passengers and crew members on four hijacked aircrafts and people on the ground. New technology for security screening can be justified if it prevents terrorist attacks on a civilian airplanes using dangerous objects or material smuggled on board which otherwise could have been detected with such modern scanners.



In accordance with the latest information maintained by the IATA (International Air Transport Association) [2], despite the worldwide crises affecting economies and business, the total number of passengers has continued rising: in 2009 almost 2.3 billion and in 2010 about 2.4 billion; these figures are far higher than for 2001, when the number of passengers was 1.6 mil. The number of fatal accidents and total fatalities in these years were as follows: in 2001 - 25 fatal accidents with 749 fatalities; in 2009 - 18 fatal accidents with 685 fatalities; and in 2011 - 23 fatal accidents with 786 fatalities.

Principle of whole-body security rtg scanners

A narrow, pencil-tip-sized beam is directed toward the subject, X-rays are backscattered from the subject to detectors, which receive the backscatter signal or X-ray reflectance. In this manner, the backscatter signal of each point on the body is measured and recorded in the digital computer which produces an image on a monitor [3,4].



Health impact in terms of additional cancer cases

The measure of the health detriment at low exposures can be quantified by the effective dose from which using the relevant risk factors one may assess the impact of the exposure of a large enough group of exposed persons in order to find among them the additional number of cancer cases

Adopting a conservative value of the effective dose for a scan to be 0.1 μSv , then the screening of 200 mil passengers will result in approximately one additional person who may develop cancer sometime in his/her life because of this one-time radiation exposure. Actually, the risk for an individual will be only $5 \cdot 10^{-9}$ (or five per a billion), which is an extremely low value, compared with other risks encountered in our everyday life. This risk is the same as the risk corresponding to the exposure received from about 1-2 min on board a transatlantic or other flight at an altitude of about 10 km. Or, to put it in an even more demonstrable form, the same risk is associated with approximately 40 min of our life during which we are subjected to an equivalent natural radiation background which is anyway beyond our control..

Probable future compromise

The IATA seems to be right in predicting the future passenger control with a specific approach to be applied to at least three categories of passengers. This arrangement will reduce the number of passengers requiring the rtg screening [2].



Conclusion

The results have indicated that this technique can be considered justified under the assumption that there is still a real potential threat of radiological terrorism. This conclusion relies on the data about the effective doses given by manufacturers which, however, may not always be accurate. Additional efforts have to be aimed at reliable testing and QC of new scanners in order to establish more precisely their radiation protection characteristics.

The health risk resulting from the use of current sophisticated rtg whole-body scanners seems to be trivial, almost negligible compared to other risks people are facing in everyday life or at work. In order for their massive application to be justified, the aforementioned aspects have to be considered taking into account the probability of terrorists committing an attack on a civilian aircraft using smuggled tools/materials for its destruction.

References

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- [4] Airport Back-scatter Scanner Dose Explained; <http://www.rockyflatsgear.com/Airport-Back-scatter-Scanner-Dose-Explained.html>.