



## Statement on Occupational Exposure to Cosmic Radiation from Airflight December 2004

The Radiation Health Committee has considered issues arising from cosmic radiation exposure of commercial air crews and other employees who fly frequently.

The Earth's atmosphere offers considerable protection from cosmic radiation, such that at ground level only small exposures occur. Airflight involves a change in the exposure to ionising radiation. With increasing altitude there is a reduction of exposure from terrestrial (earth-based) sources and an increase in exposure to cosmic radiation. In addition to altitude, latitude – the distance from the equator – also has an influence on the exposure level. Exposures increase the further the flight path is away from the equator.

As altitude increases during flight, there is an initial lowering of the exposure due to the reduction of the terrestrial component of background radiation. However, as altitude increases further, the cosmic radiation component increases and can exceed the initial radiation exposure at ground level. The important part of a flight from an overall cosmic radiation exposure perspective is the cruising phase of jet airflight. This typically involves altitudes between 7000 and 12000 metres.

ARPANSA Radiation Protection Series No. 1 (2002) describes Australia's system for radiation protection and includes an occupational exposure Standard (see [http://www.arpansa.gov.au/rps\\_pubs.htm](http://www.arpansa.gov.au/rps_pubs.htm)). In general, an occupational dose limit of 20 mSv per year applies, and for members of the public a 1mSv per year dose limit applies. However, radiation risk varies with age and the most significant radiation risk is likely to be to an unborn child. Thus, when a pregnancy is declared by an employee, the embryo or fetus must be protected to the same level as the public.

The groups with the most significant occupational exposure to cosmic radiation are pilots, flight engineers and cabin crew. Measurements and modelling of Australian aircrew exposures have indicated an additional dose from commercial airflight of around 1.8 mSv per year for those involved in domestic routes, and around 4 mSv per year for those involved in international flight routes. These figures are similar to those experienced by pilots and aircrew in other countries. It is also possible for people who fly very frequently, for example 10-20 hours a week on long haul flights, to approach and exceed a 1 mSv per year dose. For those occupationally exposed it should be noted that the dose is a fraction of the occupational limit. Large studies involving the health of pilots and aircrew have generally shown no significant association with an increased risk of cancer and, in particular, with the types of cancer that might be expected to arise from exposure to ionising radiation.

The Radiation Health Committee noted that implementation of the current occupational Standard is based on controlling facilities and practices using radiation sources whereas in the case of cosmic radiation the emphasis is not on engineering controls but on education and management.

In relation to protecting the unborn child, when a pregnancy is declared by an employee, active measures are required where doses may exceed 1 mSv for the remainder of the pregnancy. It will take a considerable number of flights for a person to receive a 1 mSv dose. This is most likely to occur in circumstances of occupational exposure and possibly, but rarely, for people who fly very frequently. These flyers need to be aware of their doses and take appropriate actions to reduce the possibility of exceeding 1mSv.

### ***Conclusion***

The Radiation Health Committee draws employers' attention to provisions of Australian and international radiation Standards applicable to the occupational exposure of their employees to cosmic radiation from airflight.

Employers are urged to consider implementing a process of estimating or assessing employee exposure; providing information to employees about exposures and health risks, including information for women of child bearing age about risk to the fetus; and taking exposures into account when organising rosters.

For an employee who has declared her pregnancy, employers need to ensure that exposure is controlled while the employee is at work so that the fetus is afforded the same level of protection as for a member of the public during the remainder of the pregnancy.

### ***References***

ARPANSA, *Recommendations for Limiting Exposure to Ionizing Radiation (1995) (Guidance Note [NOHSC:3022(1995)]) and National Standard for Limiting Occupational Exposure to Ionizing Radiation [NOHSC:1013(1995)], Republished March 2002*, Radiation Protection Series No. 1, CEO of ARPANSA.

European Commission, *Recommendations for the Implementation of Title VII of the European Basic Safety Standards Directive (BSS) Concerning Significant Increase in Exposure Due to Natural Radiation Sources*, Radiation Protection 88, 1997.