

EUROPEAN COMMISSION
Radiation Protection 140
Cosmic Radiation Exposure of Aircraft Crew
Compilation of Measured and Calculated Data

Chapter V Uncertainties in aircraft crew dose assessments

V.6 Conclusions

The descriptions of methods given in the Appendix show that many different kind of detectors have been used to produce the results included in this report, with some instruments calibrated using independent methods. It is therefore concluded that the data bank includes results from independent measurement methods. Two of the calculation methods (CARI/FREE and EPCARD) are based on almost completely independent models and thus relatively independent calculated results are also included in the report.

The measurement uncertainty of the experimentally determined ambient dose equivalent rates evaluated in Chapter III is about 25% (coverage factor of 2). The agreement between measured and calculated values of ambient dose equivalent route doses is generally within a range of a factor of 1.3 (see Chapter IV). The mean ratio of measured route doses to values calculated using EPCARD is 1.03 with an uncertainty of 0.26 (coverage factor of 2). The uncertainty in the values of ambient dose equivalent and effective dose calculated for routes are estimated to be about 25% and 30% respectively (coverage factor of 2) when calculated for the actual flight path, but the analysis of van Dijk indicates that for calculations using planned flight profiles (as opposed to the actual flight paths), the uncertainty can extend up to about 50%. The information on experimentally determined uncertainties in Appendix A is not always sufficiently detailed for it to be easy to compare or summarize. However, for the TEPCs the Type B uncertainty is reported to be 30% (coverage factor of 2). The corresponding statistical uncertainty is typically 18% (coverage factor of 2) after one hour of measurement. For several other instruments, which do not require a determination of the LET, the statistical uncertainty is smaller. The combined uncertainty for a TEPC is about 35% (coverage factor of 2), which is larger than the uncertainty (25%) reported in Chapter III. However, for both calculated results and measured results the uncertainty is within the requirement set by the ICRP for radiation protection ($\pm 42\%$ at the 95% confidence level). Further analyses are needed to better understand the uncertainties in aircraft crew dosimetry. The databank compiled during this project, together with the appendices, will be useful for such investigations.