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PAPER TITLE MEASUREMENTS OF THE COSMIC RADIATION FIELD IN A JET AIRCRAFT AT COMMERCIAL AVIATION ALTITUDES

AUTHOR(S) NAME(S) P. Goldhagen, A. Cavallo, W. Van Steveninck, M. Reginatto, P. Shebell, F. Hajnal (U.S. Dept. of Energy); T. Cousins, T. A. Jones, B. E. Hoffarth, J. R. Brisson (Defence Research Establishment, Ottawa); P. D. Tume, B. J. Lewis, L. G. I. Bennet (Royal Military College of Canada)

SUBMITTING AUTHOR

LAST NAME Goldhagen FIRST NAME Paul TITLE Physicist

AFFILIATION U. S. Department of Energy TEL 212-620-3645

STREET 376 Hudson Street FAX 212-620-3600

CODE CITY New York, NY 10014-3621 COUNTRY USA

PRESENTING AUTHOR (IF DIFFERENT)

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ABSTRACT (See instructions overleaf)

Crews working on jet aircraft receive one of the highest average equivalent doses of any occupationally exposed group, but because of the complex nature of the atmospheric cosmic radiation field, there are large uncertainties in aircrew exposures and associated health risks. Neutrons contribute roughly half of the equivalent dose, and the large uncertainty in the neutron spectrum makes the equivalent dose uncertain by a factor of 2.

To reduce these uncertainties and evaluate instruments for monitoring aircraft radiation, we have measured various components of the radiation field aboard a Canadian Forces Boeing 707 aircraft during 3 flights covering 5 altitudes from 10 to 12.5 km (33,000 to 41,000 ft.) and 52°-70° N geomagnetic latitude. Neutron energy spectra were measured using a high-sensitivity multisphere spectrometer. The neutron dose equivalent was measured using a remmeter, a lead-covered remmeter, and superheated-drop/bubble detectors. Gamma-ray and charged-particle energy spectra were measured using BGO, NaI(Tl), and plastic scintillators with anticoincidence shells. The dose rate from a pressurized argon ionization chamber was recorded every minute, and the dose for each flight was measured using three types of TLDs. The TLDs and bubble detectors were located within and on an anthropomorphic phantom and throughout the aircraft.

We will present results for the ionization dose rate, neutron dose equivalent and gamma-ray spectrum as a function of altitude and geomagnetic latitude, and doses in the phantom for each flight. Methods for determining the high-energy response of the neutron detectors will be discussed.