



Impact of TGF for aircrew dosimetry: analysis of continuous onboard measurements

Francois TROMPIER (1), Nicolas FULLER (2), Frank BONNOTTE (3), Gérard DESMARIS (3), Angelica MUSSO (1), Eric CALE (1), and Jean-François BOTTOLLIER-DEPOIS (1)

(1) Institute of Radiation Protection and Nuclear Safety, Fontenay-aux-roses, France (francois.trompier@irsn.fr), (2) Air France Air France, Air Crew Safety Department, Roissy Charles De Gaulle, France, (3) Paris-Meudon observatory, Meudon, France

The actual assessment of the occupational exposure of aircrew to cosmic radiation is performed in routine by software based on the crossing of route flight data with dose rate maps of the atmosphere obtained by simulation or elaborated with model based on measured data. In addition of the galactic component, some of these softwares take into account also the possible increase of dose from solar flares. In several publications, terrestrial gamma-rays flashes (TGF) are also investigated as a possible source of exposure of aircrew. Up to now, the evaluation of the impact of TGF in terms of dose onboard aircraft has been performed only by calculation. According to these publications, if the airplane is located in or near the high-field region during the lightning discharge, doses could reach the order of 100 of mSv, which far exceed the annual dose limit for workers (1). To our knowledge, no measured data has been yet reported for such phenomena that could confirm or not the order of magnitude of dose from TGF or the frequency or the probability of occurrence of such phenomena. To investigate further the TGF effect, it is recommended to perform measurements onboard airplanes.

Since the beginning of 2013, the Institute of Radiation Protection and nuclear Safety (IRSN) in cooperation with Air France is running a campaign of continuous measurements with active devices aiming to measure effect on dose rate of solar flare. These measurements are used to improve models used to estimate the doses from Ground Level Event (GLE). In addition, passive dosimeters were historically installed in Air France airplanes and read out every three months constituting a very large database of dose measurements. All these data will be analyzed to better characterize the possible influence on dose from TGF. The statistical analysis of these data offers the possibility to estimate the order of magnitude of possible additional doses to aircrew due to TGF and/or to evaluate the probability of occurrence of TGF events impacting significantly the exposure of aircrew.

(1) J. R. Dwyer et al. Estimation of the fluence of high-energy electron bursts produced by thunderclouds and the resulting radiation doses received in aircraft JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 115, D09206, 10 PP., 2010, doi:10.1029/2009JD012039