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- ***Trends:*** Increasing traffic, higher altitudes, near polar routes, tighter legislation for crew exposure (EU directive, May 2000), increasing dependence on electronics (More Electric Aircraft), increasing susceptibility of electronics to single event effects.
- ***Parameters:*** Equivalent dose, linear energy transfer spectra, neutron fluxes.
- ***Long term variations:***
  - cosmic-ray modulation significant but less (30%) than free space;
- ***Short term variations:***
  - solar particle events with hard spectra can give significant enhancements over hours to days (2 or 3 per solar cycle);
  - these are all seen as ground level events;
  - September 1989 was factor 4 on ground, factor 10 at 55000 feet;
  - February 1956 event was factor 50 on ground, not measured at high altitude. Some extrapolations of this environment suggest annual dose limits could be exceeded in single flight, while modern Gbit memories would upset every 10 seconds.

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- ***Retrospective assessment:***
  - the general approach adopted by airlines is to calculate doses in advance using predicted level of modulation;
  - this needs retrospective correction by the actual level of modulation;
  - solar particle events are a problem and use of one or two ground-level neutron monitors is inadequate due to spectral variations and anisotropies;
  - unlike manned spacecraft there is very little inflight monitoring and only aircraft flying above 49000 feet are compelled to carry a monitor;
  - there is a need for both active and passive monitors to be distributed amongst the large numbers of aircraft flying;
  - in addition there is a need for a wider range of ground level neutron monitors to be kept open with provision of real-time data, plus provision of high energy proton channels on spaceborne monitors.
  - Rapid reassessment is required if crew are near their limits (particularly if pregnant).
- ***Economics:*** Possibility of lawsuits if crew or passengers are overdosed or accident occurs. Costs of retrofit of hardened equipment is high.

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