Re: Protection against Van Allen Radiation

Source: http://sci.tech−archive.net/Archive/sci.space.policy/2006−10/msg00183.html

- *From*: "Vince Cate" <vincecate@xxxxxxxxx>
- *Date*: 9 Oct 2006 04:24:03 −0700

If by "transit through the van Allen belts" you mean going from orbits below them to orbits above them, then it is possible to do this in such a way that you avoid most of the radiation (see old post below).

If what you mean is what sort of shielding would it take so a human could orbit say 50 times through the high radiation part of the belts and lose less than 1 year of life expectancy, it is really large (my wild ass guess is well over 5 feet of water). While it is true that the Earth's magnetic field can not trap the highest energy level radiation, it can trap so much radiation that it is a really really a bad place to be.

I have a simulator that can show you how trapped particles move at http://spacetethers.com/

I also collected some radiation info at http://spacetethers.com/radiation.html

There is also a proposal to clean out the van Allen belts and reduce the radiation level by maybe as much as a factor of 100 (link in previous page).

−− Vince

From: Vincent Cate (vince@xxxxxxxxxxx)
Subject: Apollo and the van Allen belts
Newsgroups: sci.space.policy (very similar to sci.space.science also)
Date: 2003−11−18 10:53:25 PST

In "The Space Environment" by N. H. Langton (1969) they say the Apollo plan was to avoid most of the van Allen belt radiation by going through near the edge. Cape Canaveral is 28.5 degrees North, which is about right for going toward the Moon. The radiation belts are inclined about 11 degrees (as is the Earth's magnetic field) and are about +− 40 degrees wide. If you time your departure for the Moon so you are at the Northern part of your

orbit while over the longitude where the radiation belts are South,
you can miss most of the radiation. From pages 134−136 I quote:

> The problem of making a suitable exit through the trapped radiation is not in fact particularly difficult. The lunar missions at present proposed will leave from a parking orbit below the van Allen region and the most opportune instant to leave this orbit will of course be chosen. The radiation intensity is quite low at and above magnetic latitude 40 degrees North or 40 degrees South and the geomagnetic dipole is at an angle of 11 degrees to the Earth's rotational axis. The rotational axis is at an angle of 66.5 degrees to the plane of the ecliptic at the equinoxes and the plane of the lunar orbit is inclined at 5 degrees to that of the ecliptic, around which it rotates with a period of just over 18 years. Accordingly, once every 18 years, at the equinox, there is an instant each day when a straight line from Earth to the Moon is the normal at magnetic latitude 39.5 degrees. The situation is shown in Fig. 4.10. While this ideal path may not be followed (it imposes considerable restrictions on dates and times of lunar missions, and takes no account of solar flare incidence) the general principles involved are clear, and a lunar mission is unlikely to incur a high dose burden from the van Allen belts on its way from and to the Earth.

−− Vince

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