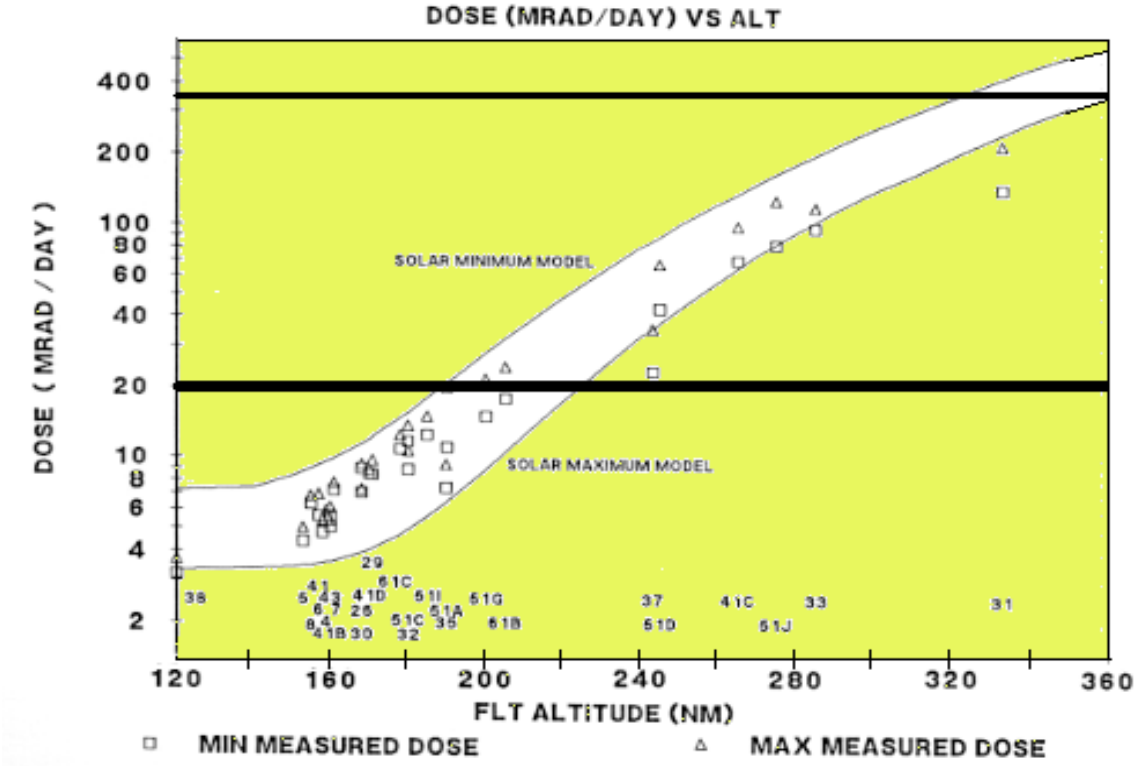
A Study of Astronaut Radiation Dosages



The typical radiation dosage on the ground is about 1.0 milliRad/day or 360 milliRad/year. This dosage is considered safe, and it is an unavoidable part of the natural background that we live and work within. In space, however, this normal background dosage is significantly exceeded. The figure above shows the radiation dosages encountered by Space Shuttle astronauts during various missions indicated by the numbers near the bottom of the graph. For example, at the far right, astronauts onboard Shuttle Mission STS-31 at an orbital altitude of 335 Nautical Miles (NM), experienced dosages between 150 to 200 milliRads per day.

Problem 1 - At about what altitude do most Space Shuttles orbit?

Problem 2 - What is the average daily dose at this altitude in milliRads/day?

Problem 3 - For a typical Shuttle mission of 10 days, what will be the astronaut's average dose?

Problem 4 - If the astronaut remained on the ground during this mission, how much of a dosage would he have acquired?

Problem 5 - How much radiation dosage did the STS-31 astronauts accumulate during their 118-hour mission to place the Hubble Space Telescope in orbit?

Answer Key:

The typical radiation dosage on the ground is about 1.0 milliRad/day or 360 milliRad/year. These dosages are considered safe, and part of the natural background that we live and work within. In space, however, this normal background dosage is significantly exceeded. The figure above shows the radiation dosages encountered by Space Shuttle astronauts during various missions indicated by the numbers near the bottom of the graph. For example, at the far right, astronauts onboard Shuttle Mission STS-31 at an orbital altitude of 335 Nautical Miles (NM), experienced dosages between 150 to 200 milliRads per day.

Problem 1 - At about what altitude do most Space Shuttles orbit?

Answer - The average of the cluster of points is near about 170 Nautical Miles.

Problem 2 - What is the average daily dose at this altitude in milliRads/day?

Answer - At 170 NM, the average dosage is about 9 milliRad/day

Problem 3 - For a typical Shuttle mission of 10 days, what will be the astronaut's average dose?

Answer - 10 days x 9 milliRad/day = 90 milliRads.

Problem 4 - If the astronaut remained on the ground during this mission, how much of a dosage would he have acquired?

Answer - 9 days x 1 milliRad/day = 9 milliRads.

Problem 5 - How much radiation dosage did the STS-31 astronauts accumulate during their 118-hour mission to place the Hubble Space Telescope in orbit? About how many years of ground dosage does this equal?

Answer - The radiation dosage at the orbit of STS-31 was about 200 milliRads/day.
The total dosage was
118 hours x (1 day / 24 hours) x 200 milliRads/day = 983 milliRads.

This equals about 983 milliRads/365 milliRads = 2.7 years of ground-level dosage