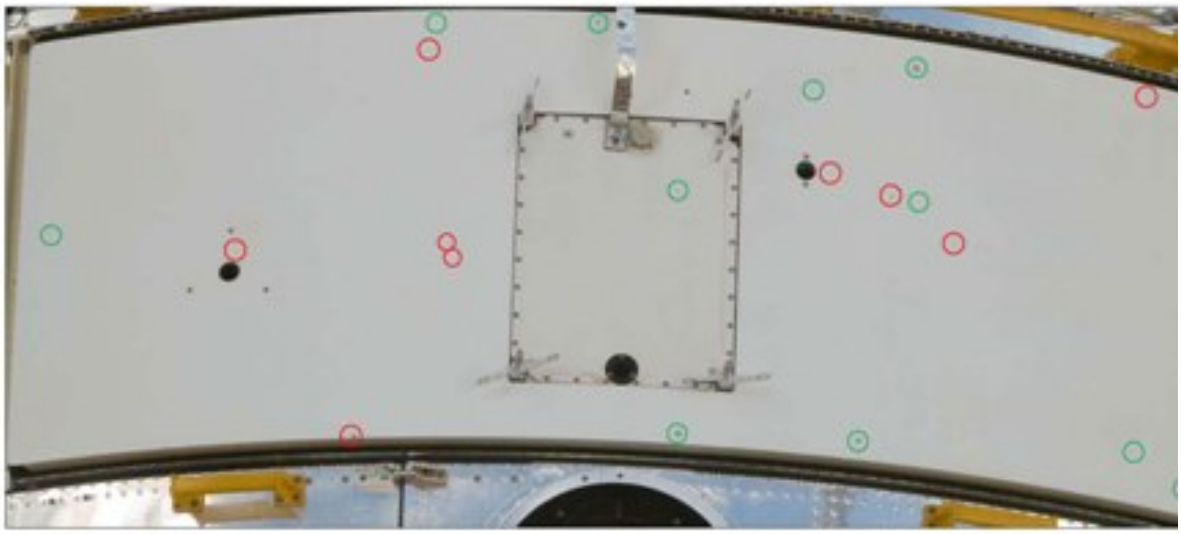

The STS-125 Atlantis astronauts retrieved the Hubble Space Telescope Wide-field Planetary Camera 2 (WFPC2) during a very successful and final servicing mission in May 2009. The radiator (above photo) attached to WFPC2 has dimensions of 2.2 meters by 0.8 meters. Its outermost layer is a 4-mm-thick aluminum, curved plate coated with white thermal paint. This radiator has been exposed to space since the deployment of WFPC2 in 1993. During this time, it received numerous impacts by micrometeoroids and man-made particles (flecks of paint, etc). The circles drawn on the radiator plate show the locations of these impacts.

Problem 1 - What is the total surface area of the WFPC2 radiator plate in square meters?

Problem 2 - How many impacts were counted over this area?

Problem 3 - What is the surface density of impacts in units of impacts per square meter?

Problem 4 - How many years was this panel in space?

Problem 5 - What is the impact rate in units of impacts per meter^2 per year?

Problem 6 - The solar panels on the International Space Station have a total surface area of 1,632 meters^2. A) How many impacts per year will these solar panels experience? B) What will be the average time, in hours, between impact?

Problem 1 - What is the total surface area of the WFPC2 radiator plate in square meters?
Answer: 2.2 meter x 0.l8 meter = 1.8 meters^2.

Problem 2 - How many impacts were counted over this area?
Answer: There are 20 circular marks, or portions along the edge, on the panel.

Problem 3 - What is the surface density of impacts in units of impacts per square meter?
Answer: 20 impacts / 1.8 meters^2 = 11.1 impacts/meter^2

Problem 4 - How many years was this panel in space?
Answer: 2009 - 1993 = 16 years.

Problem 5 - What is the impact rate in units of impacts per meter^2 per year?
Answer: (11.1 impacts/meter^2) / (16 years) = 0.7 impacts/meter^2/year

Problem 6 - The solar panels on the International Space Station have a total surface area of 1,632 meters^2. A) How many impacts per year will these solar panels experience? B) What will be the average time, in hours, between impact?
Answer: A) 1,632 meters^2 x (0.7 impacts/meter^2/year) = 1,142 impacts/year.
B) There are 1,142 impacts in a year,
so since there are 365 days/year x 24 hours/day = 8760 hours/year,
there will be about 8,760 hours/year x 1 year/ 1,142 impacts
or **7.7 hours between impacts on the average**.

The images below show some close-up images of impact craters on the Hubble Space Telescope as viewed from the Space Shuttle using a telephoto lens.

Figure 1. Five HST impact sites photographed with 400 mm lens.