

京大過去問 1991年 第1問

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There are about three hundred operating satellites orbiting Earth right now, but there are many more satellites that, though they have ceased operation, are still whirling about up there. Nor are the satellites themselves all there is. These satellites were hurled into space by rockets, and there are pieces of rocketry that are still in space as a result.

(1)Some satellites have exploded or have collided, one with another, and each time this happens, they fragment into small pieces, all of which continue to orbit the Earth.

There are, as a result, six thousand man-made pieces of debris large enough to be tracked by radar, and they are being tracked. There are, however, many more bits of matter that are too small to be tracked. According to some estimates, there are sixty thousand pieces of debris about an inch in size. There may also be uncounted millions of flecks of paint.

We may smile at the thought of engineers becoming upset over a fleck of paint, but even such an inconsiderable object becomes something to worry about when it is traveling at a rate of several miles per second. (2)In June 1983, a fleck of paint that was only one one-hundred-twenty-fifth of an inch across — too small to see — struck a window of the space shuttle Challenger. The collision managed to gouge out a bit of glass, leaving a tiny crater, one-tenth of an inch across, in that window. This may not seem like much, but it weakened the window sufficiently to make it necessary to replace it, at a cost of \$50,000, before the shuttle flew again. That was an expensive fleck of paint, then, and if something a little more massive had struck, there might have been a disaster on the Challenger two and one-half years earlier than the explosion that killed seven crew members.

And the situation is growing worse. The United States, the Soviet Union, and other nations are continuing to launch objects into space. Explosions and collisions continue. The amount of debris continues to mount, so that some people estimate that the number of pieces in space will quadruple every ten years.

(3)This means that it is quite possible that, by the year 2000, we can expect that any working satellite in any given year has one chance in two hundred of being hit by a piece of debris about one inch across. If there are four hundred working satellites in space at that time, then we can expect, on average, that each year two working satellites will be struck. The damage is quite likely

to be serious; if the debris happens to strike a particularly vital part, the satellite may be put out of action altogether.