

Offered Title: Getting Crowded up There?

How much stuff needs to be in Earth orbit before it's crowded? Too late, it's already crowded with close to 1,500 operational satellites in orbit. But wait...there's more! Way more. There are clusters and clouds of debris at varying altitudes. Some of it very large, most of it very small.

The Department of Defense and NASA work together to keep track of it.

The big stuff, larger than a softball, excluding operational satellites, accounts for more than 20,000 chunks of debris. Around 1,500 pieces are over 100 kilograms (220 pounds) each. What are they? They are left over booster rockets, pieces of exploded spacecraft, dead spacecraft such as the US Vanguard I from 1958 and the Soviet RORSAT, pieces from occasional satellite collisions, US, Russian, and Chinese anti-satellite missile test debris, and garbage from the Russian MIR space station program. It's a high-speed cloud of big shrapnel.

The smaller stuff, items from one to ten centimeters in diameter (about 7/16 to 4 inches) account for over 500,000 pieces. We're talking stuff the size a marble to that of a softball. This is debris from anti-missile tests, lost equipment or supplies during space walks and from occasional satellite collisions.

Finally, there is the very small stuff, smaller than 1 centimeter. This comes in the form of paint chips, bits of fabric, insulation, fasteners, metal, glass, plastic, frozen coolant, frozen propellant etc. Estimates from NASA are as high as 170 million pieces.

All this stuff is cruising at orbital speeds (17,500 mph) and not necessarily in the same direction!

It's not only crowded, it's a big concern for anyone planning to send space craft into orbit or beyond Earth. The International Space Station (ISS) must be maneuvered from time to time to avoid objects. Satellites have been destroyed or made inoperable due to collision with other satellites or debris from other collisions. Recent examples are: In 2009 a deactivated Russian Kosmos 2251 collided with an operational Iridium (communications) satellite and both were destroyed, creating hundreds of chunks of debris. In 2013 the Russian BLITS satellite was damaged by debris from a 2007 Chinese anti-satellite missile test.

When collisions occur, because of current satellite and debris density, the result is a higher probability of future collisions and the potential for runaway chain reaction collisions. Back in 1978 a NASA scientist, Donald Kessler, proposed such a possibility and published papers identifying this risk. This scenario has been called the Kessler syndrome or effect. The 2013 blockbuster film Gravity exploits this catastrophic phenomenon in its premise and opening scenes.

Fortunately, protocols are in place to reduce production of debris and to reduce the current load. I hope it works.

What's in the Sky?

Dec 20, dawn: Jupiter and Alpha Librae rise together in the southeast. Dec 21, 10:28 am CST: Winter solstice – the first day of winter and longest night of 2017.