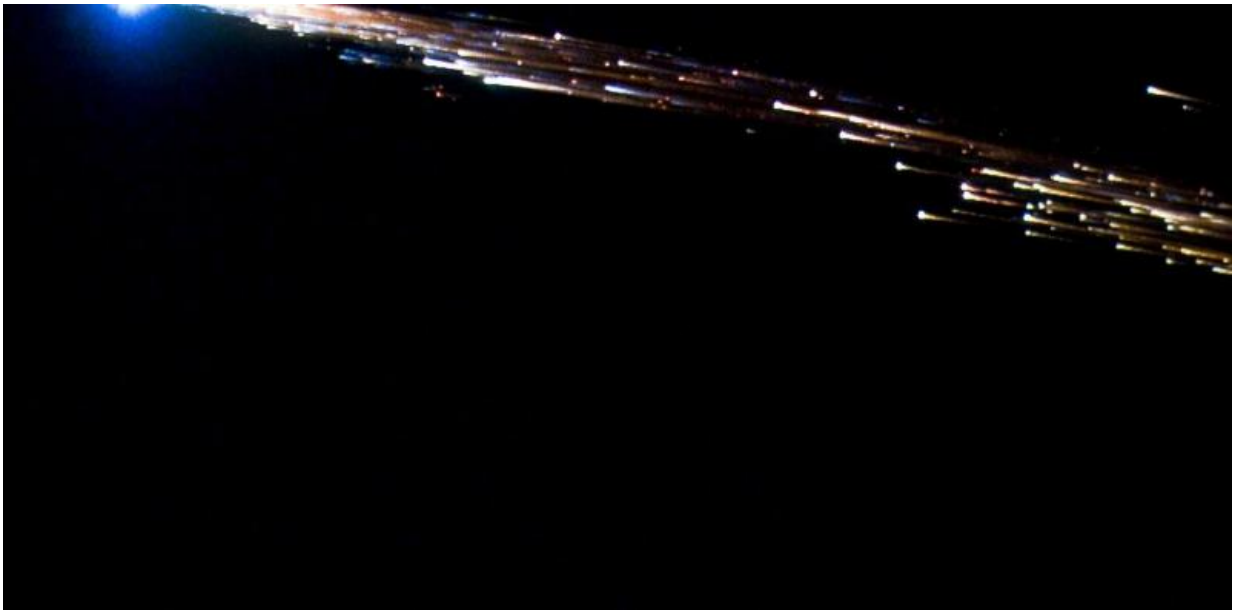
Space junk will crash back to Earth on Friday the 13th – but it's no bad omen

November 13 2015, by Jim Wild



Old junk: the Jules Verne Automated Transfer Vehicle crashing into Earth's atmosphere in 2008. NASA/wikimedia

According to the European Space Agency, something is going to fall to Earth on Friday, 13 November. A mysterious piece of space debris named WT1190F is predicted to re-enter the Earth's atmosphere at around 06:20 GMT in the skies above the Indian Ocean. While it's expected to burn up in the atmosphere about 100km off the south coast of Sri Lanka, it is not impossible that smaller fragments could crash onto

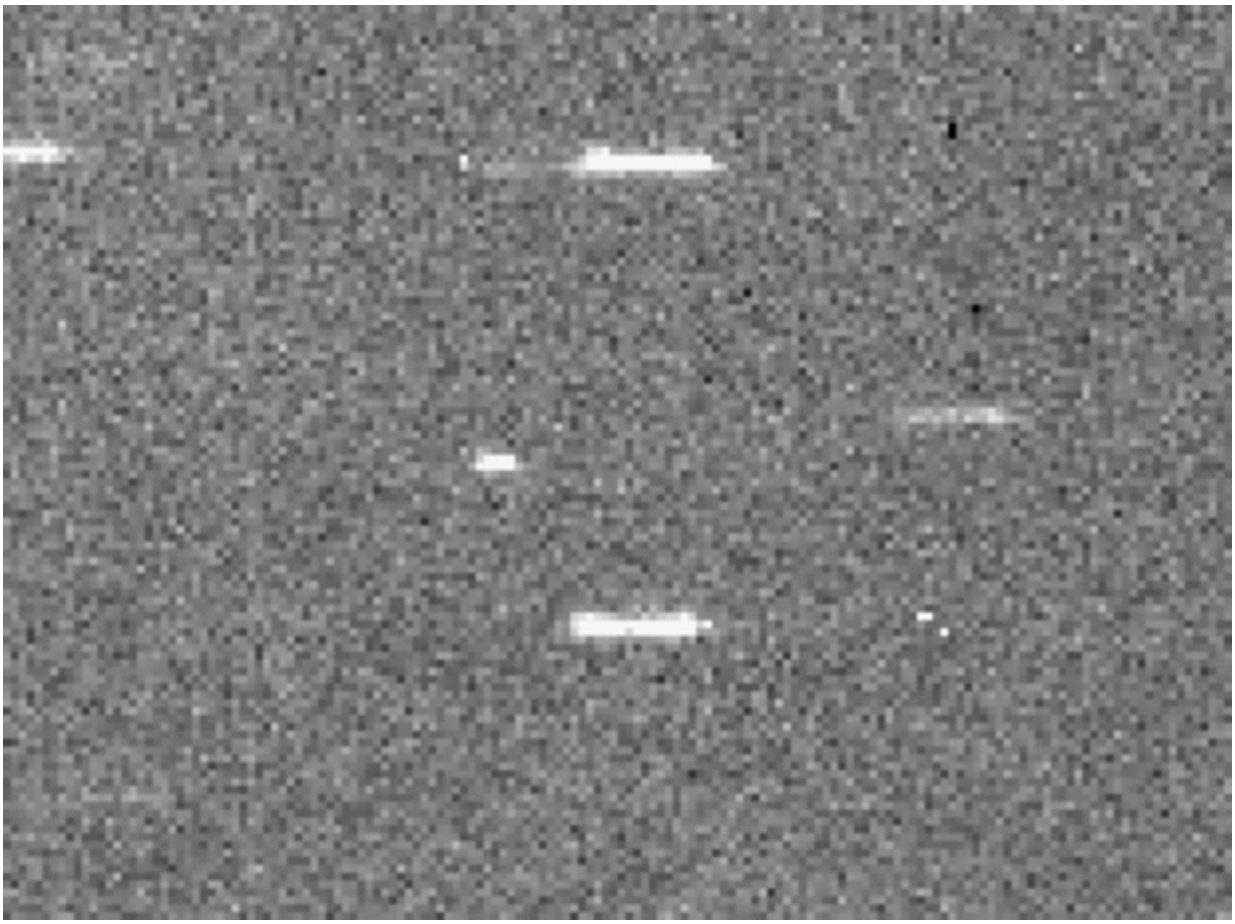
the surface.

The object must be the remains from a previous space mission, most likely a spent rocket from one of the recent robotic moon missions or even a relic from the Apollo era. But while it may seem like a bad omen, scientists are excited. It is notoriously difficult to predict exactly where debris that fall to the Earth will hit, so the opportunity to study the trajectory of WT1190F could help improve current methods.

A display of fireballs

The object was first spotted by the Catalina Sky Survey in 2013, swinging within 250,000km of the Earth before plunging back out into space to a distance of around half a million kilometres, twice as far away as the moon. But its elliptical orbit is unstable and the altitude of the object's closest approach to the Earth has been falling. On Friday, this will cause it to dip into the atmosphere while moving at a speed of several kilometres per second. When this happens, atmospheric drag will slow it down and cause it to fall from orbit while the frictional effect of the air rushing past will pummel, heat and vaporise the object.

According to astronomers who have estimated its size and density, the object is about 1-2 metres in diameter and hollow. Luckily that means it is too small and fragile to be likely to make it to the surface. As it disintegrates, the smaller fragments will rapidly burn up creating a brilliant display of fireballs that may be visible streaking across the midday sky to the south of Sri Lanka. Only very small fragments, if anything, will splashdown in the Indian Ocean. There simply isn't enough mass involved for this to be a cause for too much concern.



Object WT1190F, the fast-moving white spot in the middle. Credit: B. Bolin, R. Jedicke, M. Micheli

We know this because it is by no means the first human-made object to fall from orbit, nor is it the largest. When the 135-tonne Russian Mir space station came to end of its life in 2001, most of the massive station vaporised during re-entry, some fragments fell harmlessly into the South Pacific Ocean.

The difficulty in predicting a crash site

However, it is not always easy to predict. When it became clear that NASA's 75-tonne Skylab space station was going to re-enter the Earth's atmosphere in July 1979, NASA estimated that the chances of a human being hit somewhere on the planet was one in 152.

Ultimately, instead of re-entering over the ocean south-east of South Africa while speeding eastwards, Skylab burned up slightly later than expected and fragments fell to Earth south-east of Perth, in Western Australia. While nobody was injured, Skylab's demise highlighted uncertainties in the re-entry estimates of the day. Skylab turned out to be sturdier than expected, meaning the drag of the tumbling space station had been miscalculated.

Skylab also highlighted the important effect that mother nature has on such orbits. It had originally been thought that the space station, launched in May 1973, would remain in orbit for around nine years. But greater than expected solar activity in the 1970s resulted in increased heating and expansion of the Earth's upper atmosphere. The resulting extra drag on the space station slowed it and caused its orbit to descend more quickly than predicted.

Largest recovered piece of Skylab, on of its six air tanks. Before the crash, it was eight feet long, four feet in diameter and weighted 2,800 pounds empty. Credit: Rycho626/Wikipedia

Nowadays, the influence of solar activity of the near-Earth space environment is dubbed "space weather" and its impact on low-Earth orbiting objects is the focus of considerable research. As well as studying how it can increase the atmospheric drag on satellites and manned spacecraft, there is considerable interest in how it can alter the trajectory of space debris – a catch-all description that includes everything from rocket boosters and long-dead satellites to nuts and bolts. Surveys using ground-based radar have revealed more than 21,000

objects larger than 10cm in Earth orbit. Meanwhile, the estimated number of particles between 1cm and 10cm in diameter is about 500,000, while the number of particles smaller than 1cm runs into many millions.

Being able to predict how the orbits of these objects will evolve is important to avoid future high-speed collisions between space debris and orbiting satellites or manned spacecraft. It is also vital to national defence agencies, who need to be able to discriminate between incoming space debris and inter-continental ballistic missiles.

But having filled the space surrounding our planet with an orbiting cloud of junk, best practice is now to design an end-of-life "exit strategy" into modern satellites. Typically this involves a planned and controlled de-orbit, usually resulting in the complete destruction of the satellite in the upper atmosphere, or a planned manoeuvre into a stable graveyard orbit, tucked safely out of harm's ways beyond geostationary orbit.

So should we be worried about WT1190F? No. Friday the 13th is going to be a bad day for that particular piece of space junk, but for researchers it's a piece of good fortune. Simulations and predictions have come a long way since Skylab's day and if the measurements made so far are correct, this is a relatively lightweight piece of debris and is very likely to burn up in a predictable fashion over in a well-defined area. Nevertheless, scientists will be monitoring WT1190F's predicted re-entry zone carefully to gather data in an effort to improve our understanding of the physics of re-entry even further.

Source: The Conversation