What are Iridium Flares?

Recently I've become obsessed with observing and photographing Iridium flares. A lot of people have asked me what they are. I knew the basics, but this question led me to find out more about them.

Basically, an Iridium flare is when the sun catches the reflective panel on an Iridium satellite, and this causes it to glint in the sky. The flare can last anywhere from 5 to 20 seconds and may as bright as magnitude -8; that is 30 times brighter than Venus! Each satellite has 3 reflective panels, each called a main mission antenna, which are arranged in a kind of triangular structure and angled at 40°. Each panel measures just 188cm x 86cm x 4cm but they are highly reflective aluminium plates which have been treated with silver coated Teflon.

Structure of an Iridium Satellite:

(Image: www.satobs.org)

When in orbit, the satellites are in a vertical position. When one of the main mission antennae catches the Sun, it produces a bright but small reflection which projects onto the surface of the Earth. This reflection is only 10s of kilometres in size, so this means that Iridium Flares are very location specific.

So what are these Iridium satellites? They are a network of 66 active satellites which are used for worldwide voice and data communication from satellite phones. This means the network of satellites needs to provide full global coverage, so their orbits cover all parts of the Earth. This is called the Iridium Satellite Constellation" (ISC). The ISC launched in 1998 with financial backing from Motorola. Unfortunately they went bankrupt 9 months later, partly due to the huge costs involved with getting all 66 satellites functional before the satellite phone network could properly function.

Another factor was that the handsets were very bulky and would only work outside, therefore the popularity of mobile telephones overtook satellite phones. At one point it was looking like the satellites would have to be de-orbited. Fortunately, the scheme was restarted in 2001 by Iridium Satellite LCC, who later merged with GHQ in 2009 to form Iridium Communications Ltd. The system was largely used by the US Department of Defence.

The Iridium Satellite Constellation was originally planned to consist of 77 satellites, the atomic number of Iridium. However, it actually consists of 66 satellites, in 6 polar low-Earth orbital planes. All satellite calls are routed via space. As well as communicating with the hand-held devices, each satellite is in communication with up to 4 adjacent satellites. This effectively forms a mesh network. In addition there are 4 Earth base stations, which are in communication with any satellites within range. They can only communicate if there is clear sky between the device and the satellite, therefore they don't work well indoors or in areas of dense forest.

Iridium are currently developing a second generation network, called Iridium NEXT. This will consist of 66 new satellites plus 6 spare in orbit and 9 spare on the ground. These are due to launch in 2015 via Space X Falcon 9 launchers. Each satellite will also contain cameras and additional sensors. The current ISC will remain in service until the NEXT network is fully functional, estimated to be during the 2020s.

There are currently over 8,000 satellites in orbit, around 3,000 of which are defunct. With such high numbers in orbit it's hardly surprising that on 10th February, 2009 there was a collision between Iridium 33 and Kosmos 2251. They collided at a speed of over 26,000 miles per hour!

So how can you observe an Iridium Flare? There are many flare prediction programs available, either online or in the form of smart phone apps. I use either www.heavensabove.com or the SatTrack app. As they are so location specific, it is necessary to first input your exact latitude and longitude. Then you will see a list of upcoming flares, along with their predicted magnitude and exact location in the sky. If you are very lucky, you may get multiple satellites glinting at once, producing a double or even a triple flare. There are some Iridium satellites which are out of commission and which are tumbling; flares from these cannot be predicted. The angle of the flare is dependant on the orbit of that particular satellite. If you want to photograph an Iridium Flare, you need to be organised. First of all, I manually focus my camera on a bright star or planet. Then using a remote shutter cable I start the exposure between 10 - 30 seconds before the peak of the flare (depending on the magnitude) and continue to expose for the same length of time after the peak. This will give you a really nice, symmetrical flare on your photo. The result will depend on how dark the sky is at the time of the flare and will be affected by moonlight, etc. It took me quite a few attempts before getting decent results but it was worth persevering!

Iridium Flare Photos by Mary Spicer