

Hi this is Steve Nerlich from Cheap Astronomy www.cheapastro.com and this is *Finishing the ISS*.

The clock is ticking with only five more Space Shuttle launches confirmed to complete – at least the USA's contribution to – the International Space Station. This podcast is about how all that will happen – and what happens then.

Commenced in 1998, the construction of the ISS was sadly interrupted with the destruction of the Columbia orbiter in mission STS 107 in February 2003 – followed by a subsequent two year hiatus while the Space Shuttle program was reconfigured.

Of course the Russians have done their bit keeping the station manned and flying before and after the Columbia disaster – as well as contributing some important components, including the original Zarya module that started it all, the Zvezda, the Pirs – and just a couple of weeks ago, on the 12th of November 2009, the Poisk. Other international players have also got their modules in place now, with the European Columbus module delivered in February 2008 and the Japanese Kibo module in May 2008.

As of today, the ISS is 108 by 73 by 20 metres and weighs over 300 metric tonnes. It is composed of 10 pressurised modules and a huge Integrated Truss Structure supporting 16 large solar arrays in addition to four smaller arrays on some of the Russian modules. With all the planned solar arrays now in place the ISS has become brighter than Venus and replaces it as the second brightest object in the night sky after the Moon.

The recent launch of STS 129 in November 2009 represents the 31st visit of a space shuttle to the ISS and brings up two Express Logistics Carriers – Express is an acronym for *Expedite the Processing of Experiments to the Space Station*. Essentially an unpressurised mechanical platform interface thingy, that will deliver power and data connection to any experiments that are plugged into it. So, it's kind of a giant USB port. With two of these units in place, the station will be considered to be about 85% complete.

STS 130 scheduled for February 2010 will carry the pressurised Tranquillity module with life support and recycling equipment and the capacity to attach further modules to it – but for the moment it will just have the Cupola attached – also to be launched aboard STS 130. The Cupola will be the first genuinely science fictiony part of the ISS – providing a dome shaped observatory – allowing anyone in it to gain 360 degree views of the surrounding station and of the Earth. Hopefully some astronauts will find time to hang there for a Stanley Kubrick moment – while playing the Blue Danube through their iPod.

STS 131 is scheduled for March 2010 and will carry a Multi-Purpose Logistics Module. An MPLM is kind of a sophisticated suitcase – just the right size to fill a shuttle orbiter's cargo bay. Basically you carry stuff up in it which needs to be pressurised and powered – and then bring other stuff back down in it. Built by the Italian Space Agency, three MPLM's have been flown to the station so far – which are called Leonardo, Raffaello, and Donatello – and consequently the MPLM logo has a Teenage Mutant Ninja Turtle. The Leonardo module will be used on STS 131.

STS 132 scheduled for May 2010 will deliver the Russian Rassvet MRM – or mini-research module, which will be attached to the existing Zarya module to provide cargo and docking capability. STS 132 will also carry a range of spare parts, notably a new elbow for the European Robotic arm and an extension to the Canadian Dextre arm – all carried within an Integrated Cargo Carrier – which is another one of those sophisticated suitcases that fits in a shuttle cargo bay, except it is not pressurised.

Then the numbering goes a bit awry with STS 134 scheduled to launch in July 2010 with the Alpha Magnetic Spectrometer, also known as AMS-02 – since a prototype AMS 01 flew aboard STS 91, way back in 1998, searching unsuccessfully for anti-helium, but proving the concept of a space based particle detector. The Alpha Magnetic Spectrometer will be attached to the ISS's Integrated Truss Structure to detect and analyse cosmic rays – as well as searching for anti-matter, such as that pesky anti-helium and dark matter in the form of hypothetical neutralinos.

Unlike the AMS-01 prototype, AMS-02 will need to draw so much power than running it off the ISS is the only realistic option to operate it in space. STS 134 will also bring another Express Logistics Carrier to the station – that is one of those things that's kind of like a giant USB port – to support even more space experiments.

After that there's the 36th ever space shuttle flight to the station and the very last scheduled shuttle mission of all, STS 133, which will carry yet another Express Logistics Carrier – making a total of four giant USB port thingys on the station. It will also be using the Leonardo Multi-Purpose Logistics Module (or MPLM) to carry a whole bunch of spare parts – and this time it will leave the MPLM with the station where it will be re-classified as a Pressurised Multipurpose Module (or PPM).

One further pressurised module called the Nauka, intended to become Russia's primary research module will be launched aboard an unmanned Proton M rocket around December 2011 – and that seems to be about it, apart from further routine crew rotation and supply runs. In the absence of the Space Shuttle, the Russian Soyuz spacecraft is currently the only spacecraft available for crew rotation. The Russian's Progress spacecraft, the European Automated Transfer Vehicle and Japan's HII Transfer Vehicle will be available for unmanned supply runs and waste disposal – since these craft are just used once and then deorbited to burn up on re-entry.

Of course there remains some umming and aahing about whether STS 133 really will be the last Space Shuttle flight. There's also doubt about the original end date of the whole ISS mission – which is currently stated as 2015 with subsequent deorbiting of the ISS components in early 2016.

However, the recent Augustine committee is already suggesting the US should stay involved with the ISS until 2020 and some people on the Russian side have suggested, based on their experience with Mir space station, that appropriate refurbishment could keep their modules going for thirty years – which means at least 2028. At this stage – who knows?

And just in case you haven't heard all this before – you should go to www.heavens-above.com. Look where it says configuration and decide how you want to tell it where you

are. You can either register – which is free, anonymous and all that – or just use the map. Then click on the ISS 10 day prediction – which gives you a list of times and dates the ISS will pass overhead of where you are.

Ideally pick a time not long after sunset and a date where its max altitude is between 60 and 90 degrees. This doesn't happen that often – so check in once a week say. Seriously, you will not regret taking the trouble to do this – and if you see it alongside a space shuttle in orbit, that's bonus points.

Thanks for listening. This is Steve Nerlich from Cheap Astronomy, www.cheapastro.com. Cheap Astronomy offers an educational website where you'll get no sorrow looking out your back door. No ads, no profit, just good science. Bye.