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THE INTERNATIONAL SPACE STATION

ISS history

In 1998 16 countries signed the agreement to build the *International Space Station (ISS)*: USA, Russia, Japan, Canada, Brazil and 11 European countries, members of ESA.

In November of the same year the first modules were launched. Since then there has been a constant succession of parts being sent up towards the station. The new modules and instruments have been connected to the station by robotic arms, or by astronauts during space walks. From 2000 until last year crews of usually three astronauts stayed at the Station for about six months, and since a further extension of the Station, there are now usually crews of six (and sometimes of up to 13 during a *Shuttle* visit).

Lay-out

The ISS consists of 14 modules, built by various countries: *service modules*, *habitation modules* and *research modules* (laboratories). All modules are interconnected. Further there are 8 enormous solar panels to produce electricity. Part of this is stored into batteries, which are used when the SS is in the Earth's shadow. Finally, there is an escape vehicle, which can bring the crew safely back to Earth in case of an emergency. When complete – by the end of 2010 - the Station weighs over 450 tonnes and measures 88 x 110 metres = 2 football pitches!

Movement

The Station orbits the Earth at some 386 km or 240 miles above the surface, at a speed of 27,700 km or 17,200 miles per hour. One orbit takes 91 minutes, which means that the astronauts on board see the sun set and rise 16 times every 24 hours.

Life on board

Space is the most hostile environment for humans to live: there is no air to breathe or water to drink, there are extreme temperatures and various forms of dangerous radiation, plus the danger of collisions with space junk or meteorites. In addition to all that, there is weightlessness. Everybody and everything floats around if not secured.

Doing exercises is very important, because in a weightless situation bones and muscles have far less work to do than when on Earth. As a consequence, they tend to weaken, and that makes about three hours of exercises per day a necessity.

Water, oxygen, drink and food are all transported to the Station from Earth. During 24 hours on board the SS astronauts roughly work during 8 hours, sleep for 8 hours (in a secured sleeping bag, preventing them from floating around) and do things like exercises, preparing and eating food, having a bath, play games, read a book, make contact with their family etc. during the remaining 8 hours.

The most dangerous astronaut activities are space walks. They have to use space suits, to keep them from freezing and boiling, to supply them with air to breathe and water to drink (from a straw) and to maintain a 'normal' pressure. Space walkers can work in a space suit for about eight hours. They move around by pulling themselves from one handhold or foothold to another. They are tied to the station by a tether, and so are the tools they use. Otherwise, people or tools could drift away and be lost forever.

Scientific Research

All the 16 participating countries are providing experiments for research in various fields, such as:

Medicine: study of viruses, bacteria, cancer cells etc., trying to find better ways of treatment.

Biology: how do plants grow in a weightless environment; will it be possible for future space travellers to grow their own vegetables, what are the effects of weightlessness on the human body.

Earth: of course, the SS is a very good location from which to study Earth: hurricanes, volcanism, climate change etc.

Future

Until recently, the station was supposed to remain operational until 2015. Two months ago, however, plans were discussed to extend the station's life until 2020, or perhaps 2028, exactly 30 years after its birth.

NEWS

The Large Hadron Collider

On 30/3 the LHC was restarted. Beams of protons were sent around in opposite directions successfully, albeit at not more than half the maximum speed. This kind of operations will continue until the end of next year. Then a year of further engineering work will follow, and after that, in 2013, the machine is hoped to operate at full speed, which is close to the speed of light (= over 11,000 rounds per second).

Then the LHC is expected to make new discoveries about the laws of physics at the highest energies and the smallest scales ever probed.

UK Space Agency

On 01/04 the UK Space Agency - an organisation dedicated to overseeing the UK's space activities - began work, launched at a ceremony at Westminster with (former) ministers. The UK space industry supports some 68,000 jobs and contributes £ 6 bn to the economy.

Obama and NASA

On the 15th of April President Obama came to the Kennedy Space Centre in Florida to explain his views on future American space research to a NASA audience.

He said that NASA will not receive less money, but over 3 billion dollars more in order to develop a heavy-lift rocket to take astronauts to Mars. It is expected that by 2035 a manned expedition will orbit Mars, to be followed by a landing soon after that.

One of the reasons for Obama's decision is that the American public is not really interested in travel to the Moon anymore, and that the US do not want a new space race with the countries in Asia, like that between the USA and the Soviet Union in the 1960's. In the meantime it is expected that activities like transporting astronauts and cargo to and from the Space Station, will become a task for commercial enterprises. Several private companies are already active in this field in the USA.

Various launches

On 20/5 Japan successfully launched a weather satellite - called *Akatsuki* - to Venus. With 5 very special cameras it hopes to get detailed views of the atmosphere, find active volcanoes and take pictures of lightning strikes. The spacecraft is expected to get in orbit around Venus in early December.

NASA's and Russia's missions to the ISS have become a matter of routine. Over the past two months there were several missions. On 4/4 a *Soyuz* took three astronauts to the ISS, bringing the total crew of the station back to 6 again.

One day later, the shuttle *Discovery* was launched with a crew of seven, delivering a multi-purpose logistics module, a new sleeping quarter and new parts for the station's laboratories. The shuttle returned safely to Florida on 20/4.

Then, on 14/5 the shuttle *Atlantis* was launched towards the ISS, for what was probably its last flight, the 32nd over a period of 25 years. It brought a Russian module to the station, containing both a docking compartment for receiving Russian spacecraft and a small laboratory. It returned to Florida on 26/5.

This *Atlantis* flight was the 132nd of all shuttle flights. Only two of these 132 missions went wrong: the *Challenger* in 1986 and the *Columbia* in 2003, each with the loss of all 7 crew members.

The night sky

This time of the year brings us longer days and shorter nights – a poor time for star gazers! But that doesn't mean that there is nothing to be seen. For instance, it's a good time for seeing 'earth shine' on the Moon. This happens during the very first days after 'New Moon', when there is only a very narrow edge of the Moon lit by the Sun. The dark rest of the Moon then often reflects light from the Earth, which is, of course just sunlight reflected by white clouds etc. And then there's of course still the bright evening 'star' (!) *Venus* in the western sky.