

# International Space Station as a Model of International Cooperation for the Benefit of Humanity

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## Quick Facts:

- Launch date: November 20, 1998
- Size: one-million-pound spaceship, bigger than a football field; inside it is larger than a six-bedroom house;
- Crews: six crewmembers, always multinational;
- Scientific experiments being carried onboard: currently 160+;
- Cost: \$150 billion



# ISS - One of the Most Ambitious International Collaborations





# Operating the ISS



Operating ISS is more complicated than any other space flight endeavor because it is an international program. It involves USA, Russia, Canada, Japan and the participating countries of the European Space Agency – Belgium, Denmark, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, and United Kingdom.

The ownership of the station is established by intergovernmental treaties.

The map on the previous slide shows all the Mission Control, Research, Training and Launch Centers in various parts of the world. From the point of view of the crew actions onboard and all the operations of the station systems two MCCs play the most important role; they are MCC in Korolev, near Moscow, and Johnson Space Center in Houston, Texas. A joint mission requires coordination between Control Centers thousand miles apart from each other. Communication links, processes and procedures were developed to exchange information between the control teams; 'Joint Flight Rules' contain details of both planned operations and practical responses to off-nominal situations.

# Operating the ISS



Each of the two Control centers has the responsibility and authority to control and maintain its respective segment; there are no borders on the station, but there are two segments - the Russian segment and American segment, the latter incorporating modules belonging to other partners – Japanese modules and European Columbus.

The station is served by a variety of visiting vehicles – the Russian *Soyuz*, which is the only manned vehicle after the *Shuttle* program was shut down in 2011, Russian *Progress*, the *ATV* (ESA), *HTV* (JAXA), *Dragon* and *Cygnus*.

Crews fly expeditions of three and six months duration; most of the time it is a crew of six on board, with a relatively short period of time when there are three crewmembers after the departure of the three members of the previous mission on their manned *Soyuz* vehicle; the three are either one American and two Russians, or two American and one Russian. The ISS features alternating commanders of the crew – a Russian segment commander and American segment commander.

# Operating the ISS



Every morning on board the station starts with the morning Daily Planning Conference, or DPC (NASA loves abbreviations), when both centers – the one in Moscow and in Houston talk to the crew. Recently Payload Centers in Huntsville, Alabama, Tsukuba, Japan, and Munich, Germany, have received the opportunity to instruct the crew on the particular details of the experiments that have been planned for that particular day. A similar conference at the end of the day sums up the results of the daily work. Every minute of the crew day is accounted for, all operations are carefully scheduled in the Daily Plan that the crew can see on the screens of their computers. Altogether crewmembers from 17 different nations have visited the station; the **map on the next slide shows the countries of their origin.**







## UNDERSTANDING EACH OTHER...



Nobody wants the station to turn into the Tower of Babel; so it was necessary to choose a common language. English, the modern lingua franca of computers and hi-tech, seemed like a natural choice. As you already know, the two segments of the station are controlled from the two major Mission Control Centers, one in Russia, and another in Houston, USA. It is one thing when Houston speaks English to astronauts, it comes natural to them, and it would be quite another if all flight controllers in Moscow start speaking English to the cosmonauts.

In a life critical situation, a language-related misunderstanding might potentially turn into a catastrophe. That's why it was determined that the Russians will speak Russian when talking to the Russians. In order for both partners to understand what's going on onboard, all communications with the crew are interpreted in real time in both directions. NASA, through a sub-contractor, a major translation agency, namely TechTrans International, engages full-time services of a whole cohort of specially-trained interpreters and translators who are also a multinational crowd.



# ISS CREWS

*'A small group of people in a challenging environment with specific objectives to accomplish and no one else to rely upon except on each other'* (Chris Hadfield, Canadian, ISS Commander, describing ISS crew).

So how come people of different nationalities, backgrounds, education, and affiliations manage to live together in confined space for three and six months in a row?



# ISS CREW

- First of all, they undergo a serious and a very competitive selection process; after they have been assigned for a mission, the specialized training begins, which involves extensive travel, including living in other countries and training with their partners as a team.



- Scott Kelly, American participant of the one-year mission project, who is pictured on the slide participating in the Russian Orthodox ceremony of the spacecraft blessing, that involves being doused with 'sacred' water, spent months training in Russia with his crewmates, learning not only about the ISS systems and hardware, but also about culture, traditions and way of life in Russia, which undeniably helps to better understand the people with whom one will have to share one's living space.

# ISS Crew

- In an interview from aboard the station on July 16 Scott Kelly was asked whether the strained relations between the two countries- participants of the ISS project had had an impact on the relations between the crewmembers in both segments.



***His answer was: "I am here with two Russians, but if there were two Americans instead with me I would feel the same. We trust each other with our lives. Let politicians on the ground resolve the issues they have- there is no politics here. When you look down on Earth, you see no borders there... we all are citizens of the planet Earth".***



# One-Year Mission Crew



- **From the interview with Scott Kelly and Michail Kornienko, July 21,2015:**
- **Q:** How do you manage to live together on the station – crew members of so many different nationalities?
- **Scott Kelly:** ' We are here on the neutral territory, in a very challenging environment. We are citizens of the planet here. When you look at the Earth from here, there are no boundaries...'
- **Q:** What did you learn from Russians?
- **Scott Kelly:** 'I learn stuff all the time...Their experience of long-duration flights is more extensive than ours – they are more practical, their budget is less than that of NASA, so they have fewer resources and are very resourceful.'
- **Michail Kornienko:** 'What I learnt from Americans? Their ability to perform tasks precisely and with patience. It doesn't mean I was an angry and impatient person before. I have become more tolerant and patient.'

# ISS :What is it for? What do we get from it?

- ISS is a huge and unique laboratory on the low-earth orbit.



# **ISS :What is it for? What do we get from it?**



## **Mars – anyone?**

**The lab facilities on the station have been vital in studying the effects on the astronauts of long-duration spaceflights akin to the impacts crews might experience in future deep space missions and the eventual journey to Mars.**



# **ISS :What is it for? What do we get from it?**

**MARS IS STILL A 'PIE IN THE SKY;' ANYTHING MORE PRACTICAL, CLOSER TO EARTH?**

- **Although each space station partner had distinct agency goals for station research, each partner shares a unified goal to extend the resulting knowledge for the betterment of humanity. In the areas of human health, telemedicine, education and observations of Earth there are already demonstrated benefits to human life. Vaccine development research is just one example of such benefits. New technology for water filtration and purification is another.**

# ISS :What is it for? What do we get from it?



Components of Environmental Control and LIFE Support System, or ECLSS, are responsible for maintaining the cutting-edge water purification system that recycles water and air on board the ISS. The Water Recovery System, or WRS, conducts the water purification and filtration process.

Commercial companies and charity organizations took an interest in this part of the station ECLSS system, as they sought to adapt it to an Earth-based water treatment system. An integral component of the WRS is a Microbial Check Valve, that was originally developed for the Space Shuttle Program by Umpqua Research Corporation. The MCV is made of iodinated resin that provides a simple way to control microbial growth in water without the use of power.

# ISS :What is it for? What do we get from it?

Joint collaboration between aid organizations and NASA technology has provided aid and disaster relief for many communities in Chiapas, Mexico; Kampang Salak, Malaysia; Balakot, Pakistan, and others.



**Volunteers help install and test a water purification system in Kendala, Iraq.  
(Image courtesy of Concern for Kids organization)**



# LESSONS LEARNED



*The seven NASA astronauts who flew to MIR station*

ISS now seems to be a huge, living organism, well-organized and ticking smoothly. These outward 'smoothness' did not come easy. The plan to merge the American and Russian space station programs and launch a jointly run Space station by 2003 was conceived by Clinton administration in 1993. ISS now is in its final phase, Phase Three, the actual operation phase. It was preceded by Phase Two, the assembly phase, when various station components were lifted into space and assembled there. Before that was Phase One, also called the Shuttle-Mir program, that served as a dress-rehearsal, when American astronauts flew missions to the Russian space station Mir in 1995-1998. Those flights made both sides learn things about themselves and space exploration they didn't know; they pointed several nagging disagreements that needed to be resolved; but most importantly, they showed that people from different worlds, economic systems, with different cultural and educational backgrounds, former political foes, can work together.

# LESSONS LEARNED

- 'For all the technical, organizational, and psychological lessons learned, the most concrete legacy of the Phase One program is probably the simplest. For the first time astronauts, flight directors, doctors, and scientists from the two countries really did learn to work together. Friendships were formed, procedures adopted. At every level the men and women who will work aboard and support the ISS are no longer strangers to one another. One suspects the geopolitical and diplomatic implications of the program may be even more profound. Some day [...] there will be no nations in space, no Russians or Americans or Japanese. There will be just human beings.'
- (Bryan Burrough, *Dragonfly*, a book describing the Shuttle-Mir program).



***'Peace cannot be kept by force; it can only be achieved by understanding'.***

Albert Einstein

