**International Co-operation**

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| Primary contributing nations  Formerly contracted nations |  | Allocation of US Orbital Segment hardware usage between contributors |

International co-operation in space began between the United States and the Soviet Union in 1972, with the Apollo-Soyuz Test Project. This cooperative venture resulted in the July 1975 docking of Soyuz 19 with an Apollo spacecraft. From 1978–1987 the USSR's Interkosmos program included allied Warsaw Pact countries, and countries which were not Soviet allies, such as India, Syria and France, in manned and unmanned missions to Space stations Salyut 6 and 7. In 1986 the USSR extended this co-operation to a dozen countries in the MIR program. In 1994–98 NASA Space Shuttles and crew visited MIR in the Shuttle-Mir program. In 1998 the ISS program began.

In March 2012, a meeting in Quebec City between the leaders of the Canadian Space Agency and those from Japan, Russia, the United States and involved European nations resulted in a renewed pledge to maintain the International Space Station until at least 2020. NASA reports to be still committed to the principles of the mission but also to use the station in new ways of which were not elaborated. President of the CSA Steve MacLean adds his belief that the station's Canadarm will continue to function properly until 2028, alluding to Canada's probable extension of continued involvement.

Ownership of modules, station usage by participant nations, and responsibilities for station resupply are established by the Space Station Intergovernmental Agreement (IGA). This international treaty was signed on 28 January 1998 by the United States of America, Russia, Japan, Canada and eleven member states of the European Space Agency (Belgium, Denmark, France, Germany, Italy, The Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom). With the exception of the United Kingdom, all of the signatories went on to contribute to the Space Station project. A second layer of agreements was then achieved, called Memoranda of Understanding (MOU), between NASA and ESA, CSA, RKA and JAXA. These agreements are then further split, such as for the contractual obligations between nations, and trading of partners' rights and obligations. Use of the Russian Orbital Segment is also negotiated at this level.

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| Annotated image of the Russian Orbital Segment configuration as of 2011 |  | The USOS is shared by NASA, ESA, CSA and JAXA |

In addition to these main intergovernmental agreements, Brazil originally joined the program as a bilateral partner of the United States by a contract with NASA to supply hardware. In return, NASA would provide Brazil with access to its ISS facilities on-orbit, as well as a flight opportunity for one Brazilian astronaut during the course of the ISS program. However, due to cost issues, the subcontractor Embraer was unable to provide the promised ExPrESS pallet, and Brazil left the program. Italy has a similar contract with NASA to provide comparable services, although Italy also takes part in the program directly via its membership in ESA. Expanding the partnership would require unanimous agreement of the existing partners. Chinese participation has been prevented by unilateral US opposition. The heads of both the South Korean and Indian space agency ISRO announced at the first plenary session of the 2009 International Astronautical Congress that their nations wished to join the ISS program, with talks due to begin in 2010. The heads of agency also expressed support for extending ISS lifetime. European countries not part of the program will be allowed access to the station in a three-year trial period, ESA officials say.

The Russian part of the station is operated and controlled by the Russian Federation's space agency and provides Russia with the right to nearly one-half of the crew time for the ISS. The allocation of remaining crew time (three to four crew members of the total permanent crew of six) and hardware within the other sections of the station is as follows: *Columbus*: 51% for the ESA, 46.7% for NASA, and 2.3% for CSA. *Kibō*: 51% for the JAXA, 46.7% for NASA, and 2.3% for CSA. *Destiny*: 97.7% for NASA and 2.3% for CSA. Crew time, electrical power and rights to purchase supporting services (such as data upload and download and communications) are divided 76.6% for NASA, 12.8% for JAXA, 8.3% for ESA, and 2.3% for CSA.

**China**

China is not an ISS partner, and no Chinese nationals have been aboard. China has its own contemporary manned space program, Project 921, and has carried out cooperation and exchanges with countries such as Russia and Germany in manned and unmanned space projects. China launched its first experimental space station, Tiangong 1, in September 2011, and has officially initiated the permanently manned Chinese space station project. In 2007, Chinese vice minister of science and technology Li Xueyong stated that China would like to participate in the ISS, then, in 2010 ESA Director-General Jean-Jacques Dordain stated his agency was ready to propose to the other 4 partners that China be invited to join the partnership, but this needs to be a collective decision by all the current partners.

All 5 governmental partners would need to agree before China could be included. ESA is open to China's inclusion, the United States of America (US) is against it. The US concerns over the transfer of technology which could be used for military purposes echo similar concerns with Russia prior to their membership. These concerns were overcome, and NASA became solely dependent upon Russian crew capsules when its Shuttles were grounded after the Columbia accident in 2003, and again after its retirement in 2011. China believes that international exchanges and cooperation in the field of aerospace engineering should be intensified on the basis of mutual benefit, peaceful use and common development. China's manned Shenzhou spacecraft use an APAS docking system, developed after a 1994–95 deal for the transfer of Russian Soyuz spacecraft technology. Included in the agreement was training, provision of Soyuz capsules, life support systems, docking systems, and space suits. American observers comment that Shenzhou spacecraft could dock at the ISS if it became politically feasible, whilst Chinese engineers say work is still required on the rendezvous system. Shenzhou 7 passed within about 50 kilometers of the ISS.

American co-operation with China in space is limited, efforts have been made by both sides to improve relations, but in 2011 new American legislation further strengthened legal barriers to co-operation, preventing NASA co-operation with China or Chinese owned companies, even the expenditure of funds used to host Chinese visitors at NASA facilities, unless specifically authorized by new laws, at the same time China, Europe and Russia have a co-operative relationship in several space exploration projects. Between 2007 and 2011, the space agencies of Europe, Russia and China carried out the ground-based preparations in the Mars500 project, which complement the ISS-based preparations for a manned mission to Mars.

**End of mission**



Many ISS resupply spacecraft have already undergone atmospheric re-entry, such as Jules Verne ATV

According to a 2009 report, RKK Energia is considering methods to remove from the station some modules of the Russian Orbital Segment when the end of mission is reached and use them as a basis for a new station, known as the Orbital Piloted Assembly and Experiment Complex (OPSEK). The modules under consideration for removal from the current ISS include the Multipurpose Laboratory Module (MLM), currently scheduled to be launched in 2014, with other Russian modules which are currently planned to be attached to the MLM until 2015. Neither the MLM nor any additional modules attached to it would have reached the end of their useful lives in 2016 or 2020. The report presents a statement from an unnamed Russian engineer who believes that, based on the experience from *Mir*, a thirty-year life should be possible, except for micrometeorite damage, because the Russian modules have been built with on-orbit refurbishment in mind.

According to the Outer Space Treaty the United States and Russia are legally responsible for all modules they have launched. In ISS planning, NASA examined options including returning the station to Earth via shuttle missions (deemed too expensive, as the station (USOS) is not designed for disassembly and this would require at least 27 shuttle missions), natural orbital decay with random reentry similar to Skylab, boosting the station to a higher altitude (which would simply delay reentry) and a controlled targeted de-orbit to a remote ocean area.

The technical feasibility of a controlled targeted deorbit into a remote ocean was found to be possible only with Russia's assistance. The Russian Space Agency has experience from de-orbiting the Salyut 4, 5, 6, 7 and Mir space stations, while NASA's first intentional controlled de-orbit of a satellite (the Compton Gamma Ray Observatory) occurred in 2000. As of late 2010, the preferred plan is to use a slightly modified Progress spacecraft to de-orbit the ISS. This plan was seen as the simplest, most cost efficient one with the highest margin. Skylab, the only space station built and launched entirely by the US, decayed from orbit slowly over 5 years, and no attempt was made to de-orbit the station using a deorbital burn. Remains of Skylab hit populated areas of Esperance, Western Australia without injuries or loss of life.

The Exploration Gateway Platform, a discussion by NASA and Boeing at the end of 2011, suggested using leftover USOS hardware and 'Zvezda 2' [*sic*] as a refueling depot and servicing station located at one of the Earth Moon Lagrange points, L1 or L2. While the entire USOS cannot be reused and will be discarded, some other Russian modules are planned to be reused. Nauka, the Node module, two science power platforms and Rassvet, launched between 2010 and 2015 and joined to the ROS may be separated to form OPSEK. The Nauka module of the ISS will be used in the station, whose main goal is supporting manned deep space exploration. OPSEK will orbit at a higher inclination of 71 degrees, allowing observation to and from all of the Russian Federation.