

2013: 15 Years of ISS and 5 Years Columbus Operations

The International Space Station (ISS) and the ESA Columbus program are intimately interwoven. The following (historical) time table recalls the significant events for both projects from an European point of view.

The highlighted **years** indicate decisive Columbus Project related ESA Council meetings on Ministerial level. In the Council meetings all Research Ministers of the European countries participating in the Columbus Program are present and have to come to conclusions respecting the interest of their respective aerospace companies governed by the ESA geographical return regulations.

The mission names in **bold** indicate Columbus Control Center's (Col-CC) experience/responsibility in human spaceflight operations. The Col-CC is operated by the German Aerospace Center (DLR) at Oberpfaffenhofen/Bavaria for ESA under EADS contract.

Another significant event in 2011 was the decommissioning of the STS-fleet, relying on Soyuz, Progress, ATV and HTV to resupply the ISS. The STS decommissioning on the other hand established the provision of successful "commercial" resupply flights to the ISS by the private companies Space-X (Dragon/Falcon system) and Orbital Sciences (Cygnus/Antares system).

1983	Nov	First SpaceLab Mission (FSLP) , Remote Payload monitoring from GSOC (German Astronaut: Ulf Merbold)
1984	Jan	President Reagan's proposal to build a permanently manned space station and invitation to international partners: "...to participate in the development of a permanently manned space station and to do it within a decade!" The "original" Partners became: Canada, Europe and Japan.
1985	Jan	ESA Council on Ministerial level at Rom: The European Research Ministers accept the US Presidents` invitation. A Phase-B study for potential European contributions was initiated, consisting of: > Attached Laboratory > Free Flying Laboratory (man-tended free flyer - MTFF) > Co-orbiting Platforms (serviceable) > Polar Platform (serviceable), became later the ENVISAT project > Manned and unmanned Service Vehicles (HERMES)
1985	Jan	German SpaceLab mission D-1 , The first "Remote Payload Operations Control Center" (POCC) outside the US SpaceLab missions was established at GSOC (German Astronauts: R. Furrer, E. Messerschmidt)
1986	Jan	Challenger explosion – critical assessment of program management by NASA
1986	Sep	Space station baseline configuration: "Dual Keel"
1987	Nov	ESA Council on Ministerial level at The Hague: ESA established the European In-Orbit-Infrastructure (IOI) as facultative program comprising the following elements: >.Columbus Attached Laboratory (previously Attached Laboratory), >.Columbus Free Flyer (previously MTFF) > Columbus Data Relay Satellite System (DRS) – two satellites >.HERMES and Ariane 5 and the associated Ground Segment (IOI GS) to operate the above

		<p>elements, to be set up in Germany (Oberpfaffenhofen, Darmstadt) Italy, France as well as multiple decentralized Utilization Centers (User Support Operations Centers - USOs) as national contributions. Main contributors to the Columbus program were: Germany 38%, Italy 25%, and France 14%. The total estimated Columbus program cost amounted to 3.7 billion € (Ref.: ESA Council Resolution ESA/C- M/LXXX/Res1)</p> <p>The co-orbiting Platform was deleted.</p>
1988	July	US President Reagan re-names the station "Freedom"
	Sep	ESA/NASA sign the Memorandum of Understanding (MoU) for space station Phases C/D&E
	Nov	Start of construction of the Columbus Control Center at DLR/Oberpfaffenhofen as an advanced national contribution to the ESA Columbus Program
1990	Nov	ESA Council on Ministerial level at Munich: Cutback of Station funding, postponement of the final decision on Columbus and Hermes.
1991	Early	European Industry submits a revalidated program proposal
	March	NASA downsized Station configuration: single truss, shorter US modules, fully outfitted and tested on the ground
	June	Completion of the Columbus Control Center
1992	March	D. Goldin was appointed as new NASA Administrator (faster, cheaper, better) by G. Bush.
	July	<p>After the development leading to the disintegration of the UdSSR, the new NASA Administrator D. Goldin visited Russia to explore the Russian potential.</p> <p>ESA cancels work on Hermes and Free Flyer due to budget limitations, too heavy weight of Hermes and cost-overruns (both).</p>
		MIR-92: First German Astronaut flying in the MIR station (K.-D. Flade)
1993	Feb	President Clinton requests a space station redesign to reduce cost, the ceiling being 21 billion Dollars
	June	US Congress defeats the termination of the space station program by only one single vote (216:215)
	April	German SpaceLab mission D-2 , used for qualification of the new "Manned SpaceLaboratories Control Center (MCC) at DLR-Oberpfaffenhofen acting as mission responsible POCC (German Astronauts: H. Schlegel, U. Walter)
	Dec	<p>On 7th Dec Al Gore and V. Chernomyrdin sign the US/Russian agreement to participate in space station, Russia terminates plans for a MIR-2 station and grants US astronauts to visit the MIR station in regular intervals using the Shuttle (altogether 10 STS flights with 7 US astronauts accumulating 979 days in space took place).</p> <p>International partners invite Russia formally to participate as a new partner in the Station activities.</p> <p>Start of ISS-A (Alpha) Program, later renamed ISS</p>
1994	Early	Further cost cuts by ESA: Columbus length reduced, study of implications of the ISS redesign, use of an Automated Transfer Vehicle (ATV) together with Ariane-5 for Station logistics and

		decentralized operations from Europe for ESA elements (bulkhead approach approved)
	End	“Early” ESA Space Station contributions approved and development initiated: European Robotic Arm (ERA) for the Russian segment, Data Management System (DMS-R) for the Russian service module. In addition equipment for Utilization, the Pointing System Hexapod, Minus-80-degree-Freezer and Glove-box was agreed to be provided. Software infrastructure for the US Software Verification Facility (SVF) and Environmental Control and Life Support System (ECLSS) for the Italian “Mini-”, later: changed to “Multi”-Logistics Module (MPLM) was approved as well. The contributions were bartered with the Russian Space Agency RSA, NASA and the Italian Space Agency ASI.
1995	Sept	Launch of EUROMIR95 , operated from GSOC under ESA contract in preparation of Columbus operations (Thomas Reiter, 165 days in orbit, 2 EVA’s)
	Oct	ESA Council on Ministerial level in Toulouse finally approved ESA’s contributions to the ISS development program consisting of > Columbus Orbital Facility (COF), later became “Columbus” (Col), > Automated Transfer Vehicle (ATV), with decentralized operations control centers at: > DLR/Oberpfaffenhofen (Col-CC) and > CNES/Toulouse (ATV-CC) and the associated > Communications network (Interconnect Ground Network- IGS), > Crew Training Facilities (ESA Astronaut Training Center – EAC and > Engineering Support Centers (ESC’s) for the above elements > Multiple research facilities (User Support Operations Centers USOC’s)
1996	Early	ESA signs Columbus the Industrial development contract with DASA, later Astrium, now EADS.
1997	Oct	ESA/NASA barter agreement for all European ISS-contributions securing 8.3% of all ISS resources for European utilization.
	Nov	ESA/Japanese Space Agency barter agreement
		German MIR-97 mission, controlled from GSOC (Astronaut: Reinhold Ewald)
1998	Jan	All participating countries and relevant Space Agencies sign the Intergovernmental Agreement (IGA)
	Nov	First ISS element launch (Zarya on a Proton-K rocket)
	Dec	Node-1 (Unity) launched by STS-8/E
	Nov	ESA signs ATV industrial development contract with Aerospatiale
	Nov	ESA signs the Col-CC Design, Development and Integration (DDI) contract with DLR. Formal assignment of operational responsibility to DLR/Col-CC
2000	Nov	First “permanent” 3-man crew (Gidzenko, Krikalev, Shephard) established.
2001	March	On March 23rd the MIR station was de-orbited under ZUP control (MIR operations control center) after 15 years of useful lifetime
2003	Feb	Columbia accident
2004	Oct	Col-CC Inauguration
2006	Early	Formal acceptance and close-out of the Col-CC DDI contract
	June	Appointment of Industrial Operator (EADS) for Columbus operations

		Phases
	July	ASTROLAB mission, 150 days long-term flight by Thomas Reiter on the ISS, controlled and coordinated by the Col-CC Flight Team at GSOC under ESA contract in preparation for Columbus operations
2007	6 Dec (Thur)	First Columbus launch attempt, countdown halted because of 3 faulty Engine Cut-off Sensors (ECOs)
	8 Dec (Sat)	Second launch attempt, halted again because of ECO problems
	10 Dec (Sun)	Third launch attempt halted because ECO problems persist, the next launch attempt is set not before January 2 nd 2008
2008	7 Feb 20:45 CET	Launch of Columbus and begin of the operational phase, planned for approx. 10 years of continuous operations
	9 Mar	ATV-1 (Jules Verne)
	11 Mar	JLP Japanese laboratory module (JEM-ELM-PS)
	10 Sep	HTV-1 Japanese cargo vehicle
2010	8 Jan	Cupola provided by ESA, Node3 (Tranquility)
2011	22 Jan	HTV-2 (Kounotori 2)
	16 Feb	ATV-2 (Johannes Kepler)
	8 Jul	Last STS-flight (Atlantis, STS-135A)
2012	23 Mar	ATV-3 (Edoardo Amaldi)
	22 May	Dragon C2 , first commercial supply flight (Space-X) Launch vehicle: Falcon-9v1.0
	21 Jul	HTV-3 (Kounotori 3)
2013	1 Mar	Dragon CR-2
	5 Jun	ATV-4 (Albert Einstein)
	3 Aug	HTV-4 (Kounotori 4)
	18 Sep	Cygnus 1, second commercial supplier (Orbital Sciences) Launch vehicle: Antares-110