The Significance of DLR/ESA MIR Missions for Columbus
“20the Anniversary of MIR’97”
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MIR'97 was the last flight in a series of missions that resulted from a cooperation agreement between Russia and Germany to expand scientific and technological cooperation.
These negotiations were initiated between the German Ministry of Research (BMFT) and the Russian space agency even before the Soviet Union dissolved in 1991.
With his historical flight to the Salyut-6 station on August 26, 1978, Sigmund Jaehn was predestined to work under the new political conditions after the German reunification on October 3rd 1990 to intensify the cooperation in human space flight between Germany and Russia. Jaehn's experience also served as a "door opener" for the German Space Operations Center (GSOC) to the Russian human spaceflight control center (ZUP, Kaliningrad near Moscow).

The first mission of this type was MIR'92 with astronaut K.D. Flade. MIR’92 mission operations with K.D. Flade performing experiments onboard MIR essentially took place in ZUP, where a small DLR operations team was able to carry out all operational tasks in a separate control room in direct cooperation with the Russian operations teams.
In addition to important PR events with German politicians, actual real-time video sequences e.g., of the Video Oculography (VOG) experiment, were transmitted directly from ZUP to GSOC via satellite link. Likewise, real-time telemetry data could be transmitted to GSOC using the Austrian DATAMIR transfer unit installed onboard for the Austrian astronaut Franz Viehboeck’s flight in October 1991.
A "Mission Timeline" transfer from GSOC to ZUP was also successfully demonstrated.

This successful GSOC data exchange with ZUP was the prerequisite for the commissioning of GSOC by ESA for the operational preparation and execution of the 174-day flight of Thomas Reiter, called EUROMIR'95 (NB: The ESA-EUROMIR'94 mission carried out a year earlier with Ulf Merbold took place without GSOC participation).
A completely new data transmission system, implementing a decentralized operating concept was installed for EUROMIR'95 and Europe’s first long-term human spaceflight mission was controlled and monitored by an ESA/DLR operations team outside Russia at Oberpfaffenhofen for the first time – of course in close cooperation with the ZUP control teams.

Taking these experiences into account, similar principles were applied to Reinhold Ewald’s 18-day MIR'97 mission, but actual mission operations took place at ZUP. However, the DLR Microgravity User Support Center (MUSC) in Cologne was used to exchange experiment data and commands directly with experimentation equipment on board and thus tested a new concept for remote monitoring and control of onboard experiments (“telescience”). GSOC had an active role in ensuring communications for two such experiments using the Russian data relay satellite system LOUTCH. For this purpose a 4.5 meter antenna was reconfigured on the rooftop of GSOC and qualified for handling LOUTCH data transmissions.
In addition, an operational, laptop-based "timelinig envelope planning" experiment was contributed by GSOC (NB: The IBM laptop was later flight qualified for the shuttle flight STS-99, launched Feb 11th 2000, and used by G. Thiele during his flight for planning purposes).

GSOC’s operational "all-round experience", gained during three MIR missions, together with its previous cooperation with NASA during the FSLP, D-1, D-2 missions was unique in Western Europe. This experience was essential for being appointed by ESA to take over the Columbus operational tasks and act as ESA human spaceflight center for the ISS as Columbus Control Center (Col-CC).
However it should be remarked that the direct use of the MIR experience was probably more in gaining knowledge of the Russian space industry, understanding of ZUP’s operations concepts, managerial culture and technical interfaces under sometimes problematic political conditions. But over the years, this cooperation resulted in excellent relations between GSOC’s and ZUP’s management at

technical and operational levels, which ultimately enabled effective and pragmatic solutions for later ISS operations - with Russia as equal partner.

Reinhold’s “Babtism of Fire”

During the dramatic MIR'97 incident on Feb. 24th 1997, when an oxygen cartridge ignited in the Quant module and covered the module in a flash of fire and dense smoke, Reinhold Ewald could solve the shock of the team by shouting "pozhar" (fire!) – a word you never want to hear in space nor on the ground. By actively supporting the immediate countermeasures by his crew mates getting the fire under control and taking precaution measures against the smoke pollution the crew ultimately regained control over the space station in so far as allowing the experimentation onboard to be resumed after a couple of days.
The known problem of communicating with the MIR station was that the radio communication with the ZUP was not continuous, since data and voice exchange could only be ensured via ground stations (orbit dependent). A small contribution to defusing the situation during the fire emergency could be made by using a VHF antenna installed on the rooftop of GSOC. The antenna could contact MIR about 10 minutes before the MIR station passing over ZUP reception systems at Moscow, thus establishing an additional voice connection with the ZUP approximately 10 minutes earlier than expected. These were precious additional minutes of "direct voice contact" during the critical situation onboard to get a quick overview of the condition of the cosmonauts/astronauts and the situation onboard.

▲ GSOC’s VHF antenna on the rooftop for voice transmissions with MIR (courtesy of George Hiendlmeier, GSOC).
◄ The MIR’97 crew fighting fire and smoke.

From GSOC’s point of view the developments of new technologies in the communications sector during the cooperative MIR missions led to the development a ground operating system, which met the complex, decentralized operating requirements for the MIR missions in a cost efficient manner.
With this “precursor” experience an efficient operational system for the ISS, guided by rigorous safety and redundancy conditions of ISS space technology could be developed by GSOC for ESA as ISS partner. As of today this ground operations system is still operated by GSOC under ESA contract. This was only possible by incorporating existing, then newly emerging technologies, e.g. using Internet capabilities or through "outsourcing" to commercial providers.
Without the experience gained by the MIR / EUROMIR missions, a number of additional “trial and error” efforts would have been inevitable. In addition, we at DLR/GSOC were able to negotiate with regard to operational aspects with NASA and RKA on equal footing.