

ON THE EXPERIENCE OF THE MANAGEMENT OF THE FINAL FLIGHT PHASE OF THE ORBITAL MANNED SPACE COMPLEX "MIR"

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The Russian Federation as a launching state is absolutely liable to pay compensation for damage caused by its space object on the Earth surface or to an aircraft in flight in accordance with the Convention on International Liability for Damage Caused by Space Objects of March 29, 1972.

Considering the necessity of the absolute realization of the international obligations undertaken by Russia, the Government of the Russian Federation adopted the Regulation on the termination of the orbital manned complex "Mir" operation in February – March (with a controlled safe de-orbiting) with its submergence in the World Ocean. In accordance with this Regulation the State Interagency Commission for the management of the Final Flight Phase of the Orbital Manned Space Complex "MIR" was established, chaired by the Director General of Rosaviakosmos, Y. N. Koptev. The commission consisted of representatives of the federal bodies of the executive power, including representatives of the Ministry of Foreign Affairs, the Ministry of Emergency Situations, the Ministry of Defense, the Ministry of Health Protection of Russia, and the leaders of the main space – rocket organizations. Rosaviakosmos developed technical-organizational actions with the purpose of work organization for all phases of the termination of the flight of the orbital complex "Mir".

The leading organization of the complex "Mir" – Korolev Rocket and Space Corporation "Energia" in cooperation with the leading research institute in the area – TsNIIMash developed the program of the OMC "Mir" final flight phase, which included:

- Fuel delivery sufficient for the program realization by means of the LV "Progress M1-5";
- Gradual descent of the Mir complex to an orbit altitude of 240 – 250 km;
- Obtaining the intermediate descending orbit with several deceleration impulses;
- Final deceleration of the complex using the corrective propulsion system of the LV "Progress M1-5" for de-orbiting and submergence in the south part of the Pacific Ocean.

In order to solve the problems immediately during the final flight phase of the orbital complex "Mir" the State Commission decided to create three working

groups with the following directions of work (Fig. 1):

- ballistic-navigation and information provision for the flight of the complex "Mir";
- technical status of complex "Mir" analysis;
- preparation of proposals and procedure to advise interested states through Russian embassies.

The work plans of these groups were adopted at the State Commission meeting.

The group on ballistic-navigation and information provision of complex "Mir" flight collaborated with organizations of the Ministry of Defense on the preparation and use of all necessary ground control facilities, tracking and telemetry stations, preparation of flight ballistic bulletins with the predicted date for reaching the 240 km orbit altitude as well as dealt with problems of flight control during the final phase of the flight of Mir.

The group on technical status analysis of the complex "Mir" carried out a continuous control for the main systems of the complex operation, analyzed possible non-nominal situations and developed the necessary solutions.

The group on preparation of proposals and procedure for advising the interested states prepared information notes and disseminated it through missions of Russia in foreign countries.

In order to receive additional information on the flight process of the complex "Mir" Rosaviakosmos has reached an agreement with ESA on the exchange of data received from ground stations and orbit analysis. The same agreement has been reached also with NASA.

Implementation of the measures developed by the Interdepartmental Commission and its working groups, led to the successful controlled de-orbiting of the orbital complex "Mir" and submergence of its fragments in the planned region of the Pacific Ocean.

In conclusion, the experience of the realization of the final flight phase of the complex "Mir" demonstrated the efficiency of the work organization by the Interdepartmental Commission.

Fig. 1. Organizational Scheme of the Russian Interagency Collaboration on the Management of the Final Flight Phase of the Orbital Manned Space Complex "MIR"

