

NASA RANGE SAFETY PROGRAM 2005 ANNUAL REPORT

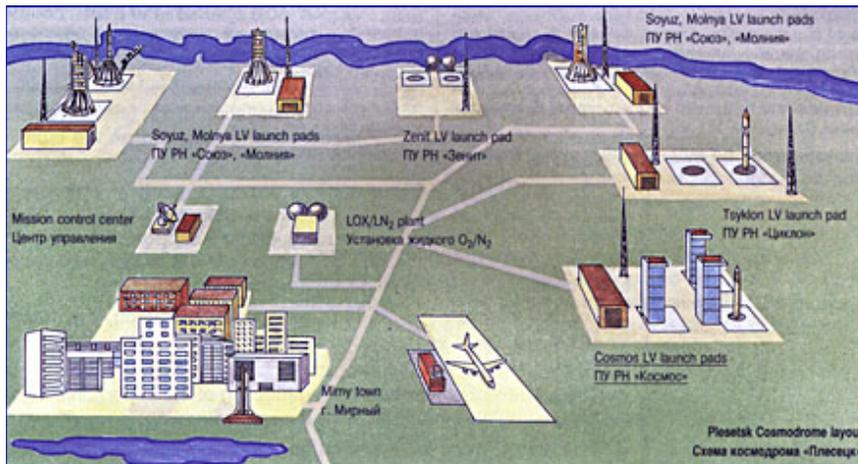
Special Interest Items

Russian Launch Failures

In the space of twenty-four hours, the Russian launch industry suffered two launch failures. On 21 June 2005, a Molniya-M rocket carrying a military communications satellite and a Volna rocket carrying a US-sponsored solar sail both failed before placing their payloads in orbit.

Molniya-M Failure

Early on the morning of June 21, Russian Space Forces conducted the launch of a 315-ton Molniya-M rocket to place a Molniya-3K military communications satellite into what was presumed to be a highly elliptical orbit that could have reached as high as 25,000 miles. The launch was conducted from the Plesetsk Cosmodrome in far northern Russia. The spacecraft was expected to reach orbit approximately 53 minutes later, but it never established communications with ground control.



A review panel made up of Space Forces, the Federal Space Agency *Roskosmos*, and Russia's leading space enterprises and research institutes, reportedly determined that the rocket crashed as a result of excessive fuel consumption by the second-stage engine, leading to its destruction. The flight of the Molniya-M ended approximately six minutes after launch. The vehicle and its payload made impact in the Uvat region of the Tyumen Oblast, a relatively unpopulated region of western Siberia. No injuries on the ground were reported and the environmental impact appeared to have been minimal since the main fuel components are kerosene and liquid oxygen.

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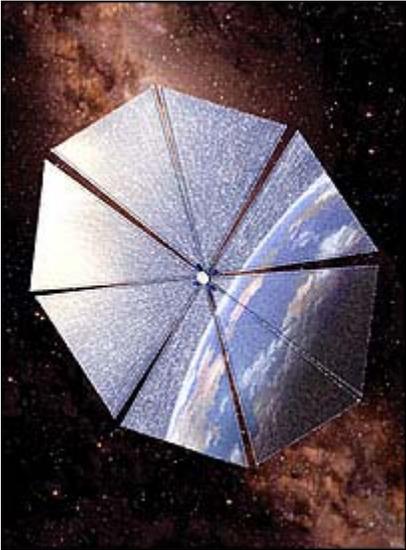
The Molniya-M launch vehicle is basically a Soyuz launch vehicle with an additional third stage. The Molniya-M was originally developed for lunar and planetary missions, but it is now used to place payloads of 1.6 to 1.8 metric tons into orbit. This launch vehicle, with a length of 138 feet and a diameter of 8.9 feet, has been among the most reliable space launchers currently in service according to the manufacturer, TsSKB Progress.



Volna Failure

Later on the afternoon of June 21, a Volna rocket was launched near Murmansk in the Barents Sea from the K-496 *Borisoglebsk*, a Kalmar class submarine. The Volna, carrying the Planetary Society's Cosmos 1 solar sail payload, failed because of a premature shutdown of the first-stage engine. According to the failure review board, made up of representatives from the Makeev Rocket Design bureau, the Lavochkin Association (which built Cosmos 1), and Tsniimast, a lead engineering design center of Roskosmos, the engine stopped firing at approximately 83 seconds into the flight as a result of the degradation in the operation of the engine turbo-pump.

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The review board also noted that the first and second stages never separated so the Cosmos 1 orbit insertion motor did not fire and the spacecraft did not separate from the first stage. The Volna's on-board control system automatically aborted the mission 160 seconds into flight. In all likelihood, the payload and rocket fell into the Barents Sea.

The Volna, a launcher based on the R-29R submarine-launched ballistic missile—NATO designator SS-N-18/Stingray—has a length of 46 feet long and a diameter of 6 feet. It is designed to launch small spacecraft, with the warhead section used to accommodate the payload. A small rocket engine mounted in the payload section allows the injection of small spacecraft into near-earth orbits.