

14TH IAA SYMPOSIUM ON SPACE DEBRIS (A6)  
Operations in Space Debris Environment, Situational Awareness (7)

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CURRENT STATUS AND FUTURE DEVELOPMENT OF THE RUSSIAN HAZARD PREVENTION  
SYSTEM WHILE PROVIDING FLIGHT SAFETY OF CONTROLLED SPACECRAFT

**Abstract**

The flight safety problem of controlled spacecraft has become of exceptional importance with a rising population of space debris in the near-Earth space (NES). It is known that there is a dissimilar population of space debris in the NES numbering hundreds of thousands objects. There are registered cases of spacecraft destruction as a result of collision with the space debris as well as the fall of massive space debris pieces on Earth. The whole range of safety measures is being implemented by the world community to provide safe space activities. However one of the main aspects is the whole new level of on-line monitoring and forecasting of space debris situation in the NES. The automated hazard prevention system was developed in the Russian Federation with broad cooperation of organizations including the Mission Control Centre of the Federal Unitary State Enterprise “Central scientific research institute of machine building”, Keldysh institute of applied mathematics, joint stock company “Astronomical scientific centre” and others. The system consists of the main information-analytical centre, segments for monitoring of hazardous situations in different areas of the NES, calculation of solar and geomagnetic activity parameters, analysis of non-coordinate information about space objects. Currently the system provides detection, forecasting and warning of dangerous approaches of space debris with more than seventy manned and automated spacecraft, including International Space Station (ISS), “Resurs” satellite, “Electro” and “Luch” satellites, GLONASS satellites, “Express” satellite, “Yamal” satellite. Supporting works are conducted on de-orbiting risk space objects with definition of time and area of their fall, information and analytical support of interested parties on space debris environment is provided. The analysis of hazardous approaches of spacecraft with space debris showed that depending on altitude ranges of near-earth environment, space debris objects approach spacecraft less than 6 kilometers from 6 up to 20 times a month. Thus, about 6-10 approaches of space objects to ISS were detected and 12-15 approaches to “Resurs-DK” satellite. The number of approaches in the medium-altitude and geostationary area is considerably less: up to 2-3 approaches a month of space objects to GLONASS satellites, “Express”, “Yamal” and “Luch” satellites. The planned development of measuring tools, software and hardware will allow providing control of hazardous approaches for up to 100 spacecraft of different types and purposes with space debris. In this context the development of international cooperation seems to be efficient to provide safe flight of orbit spacecraft constellations of different countries.