17th IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Operations in Space Debris Environment, Situational Awareness (7)

Author: Dr. Vladimir Agapov
Keldysh Institute of Applied Mathematics, RAS, Russian Federation

Mr. Nikolay Savin
Astronomical Scientific Center, JSC, Russian Federation
Mr. Alexander Lapshin
Astronomical Scientific Center, JSC, Russian Federation
Dr. Zakhary Khutorovsky
Russian Federation

ACHIEVEMENTS AND CHALLENGES IN MORE THAN 3 YEARS OF FULL OPERATION OF
ASPOS OKP

Abstract

Automated Warning System on Hazardous Situations in Outer Space (ASPOS OKP) operated for the State Corporation for Space Activity Roscosmos is the first in the world government-built completely civilian system for provision information on objects and events in outer space to spacecraft operators in order maintain spaceflight safety. It has started to fully operate since Jan 1st, 2016. The system comprises of 4 major elements: the network of dedicated optical facilities controlled from one automated center, the main information and analytical center and two special detachments. The key tasks that have to be solving by the system are conjunction assessments, detection, continuous tracking and characterization of the well-known and the new/previously unknown objects including those appeared in new launches and on-orbit fragmentations, monitoring of operations at the end-of-life of objects in GEO, HEO and MEO and others.

Main efforts during more than 3 years of operations were devoted to solving several the most practically important tasks. The first one was improvement of optical measurement association with appropriate objects especially residing in clusters in GEO or having large uncertainties characterizing their predicted position and velocity. The second one was optimization of optical sensors scheduling in order to increase the overall amount of measurements produced by the network from the one hand, and to maximize the number of objects observed every night. The third task was modification of observation strategies in such a way that would provide for ability to make a reliable decision on the category of an observed object (the known well correlated target, the known but performed a maneuver or fragmented, the new, the previously known but then lost) and to properly establish the follow-up tracking in order to increase the accuracy of the determined orbit for all objects in the database.

The number of the new objects at high geocentric orbits that were detected and followed-up during 2016-2018 has reached nearly 2800 thus significantly increasing the completeness of the database used for conjunction assessments. In turn this created a lot of challenges since the network of the dedicated sensors has not being expanded significantly (only one new telescope was added in 2017) and therefore the average amount objects had to be observed by every facility had being increasing steadily. The task of the detection and follow-up the new objects have started to compete the task of maintaining precise orbits since each of them does required to collect certain amount of measurements, but the overall observation resource remained fixed. Therefore, significant effort was implied to construction the new scheduling system. This paper will provide expanded information on the major results obtained and improvements of ASPOS OKP made during the first 3 years of the full operation. Examples of complex situations

associated with monitoring satellites in clusters in GEO and subsequent conjunction assessments will be discussed.