



# Orbital Debris Quarterly News

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## Only a Few Minor Satellite Breakups in 2011

The year 2011 ended with the least number of identified satellite breakups since 2002. Moreover, the number of long-lived, 10 cm and larger debris appears to have been only a few dozen – good news for the satellite operator community.

Only three standard satellite breakups were detected by the U.S. Space Surveillance Network (SSN) during the year, two involving small auxiliary motors associated with the Russian Proton Block-DM upper stage. On 18 August 2011, a small (~55 kg) ullage motor (International Designator 2007-065G, U.S. Satellite Number 32399) used for the deployment of the Cosmos 2434-2436 navigation satellites in late December 2007, fragmented in an orbit of 540 km by 18,965 km. Although some small debris were initially observed by the SSN, by year's end none had been officially cataloged.

A similar situation existed with another ullage motor (International Designator 1990-045F, U.S. Satellite Number 20630) flown in May 1990 on the Cosmos 2079-2081 mission. This engine unit broke-up on 17 November 2011 in an orbit of 420 km by 18,620 km. Again, none of the originally seen debris have yet been officially cataloged.

These two events represent the 38<sup>th</sup> and 39<sup>th</sup> known fragmentations of Block-DM ullage motors.

Within a few days of its launch on 19 December, a Chinese CZ-3B/E launch vehicle third stage (International Designator 2011-077B, U.S. Satellite Number 38015) fragmented into as many as a few dozen debris. The stage was in a geosynchronous transfer orbit of 230 km by 41,715 km with an inclination of 24.3 degrees. Fragmentations had been noted with similar upper stages in February 2007 and November 2010. Due to their low perigees, the debris from this latest breakup appeared to be short-lived.

Three other satellites experienced minor fragmentations just prior to reentry as a result of aerodynamic forces. These breakups occur when the perigee of an elliptical orbit drops to a very low altitude (typically below 120 km) for days or more before the satellite ultimately falls back to Earth. During 2011 such events were seen with Chinese and U.S. rocket bodies (a CZ-3C upper stage in March and an Atlas Centaur upper stage in August) and a Russian Molniya 3K spacecraft in December. Fortunately, debris created in such catastrophic orbital decays are very short-lived. ♦

## Two Derelict NOAA Satellites Experience Anomalous Events

In the span of a month two decommissioned NOAA spacecraft, one in low Earth orbit (LEO) and one above geosynchronous orbit (GEO), exhibited anomalies of interest to the orbital debris community. In one case two new debris were created, and in the other a noticeable orbital perturbation occurred.

After more than 16 years of service, NOAA-12 (International Designator 1991-032A, U.S. Satellite Number 21263) was deactivated on 10 August 2007, following a series of power system problems. The passivation process included the depletion of the

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