SPACE DEBRIS SYMPOSIUM (A6)
Space Surveillance, Legal Aspects and Space Debris Modelling (5)

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SPACE SURVEILLANCE - LESSONS LEARNED FROM THE IRIDIUM COSMOS COLLISION

Abstract

On 2009 February 10, Iridium 33–an operational US communications satellite in low-Earth orbit–was struck and destroyed by Cosmos 2251–a long-defunct Russian communications satellite. This is the first time since the dawn of the Space Age that two satellites have collided in orbit. Working directly with Iridium and the US Strategic Command to recreate, analyze, visualize, and deconflict future probable collisions from the expanding clouds of debris, the AGI-CSSI team has gained new insights into the threats and mitigation techniques for this very real problem.

To better understand the circumstances of this event and the ramifications for avoiding similar events in the future, this paper provides a detailed analysis of the predictions leading up to the collision using various data sources, and it looks in detail at the collision, the evolution of the debris clouds, and the long-term implications for satellite operations.

The only publicly available system available to satellite operators for screening for close approaches, SOCRATES, did predict this close approach, but it certainly was not the closest approach predicted for the week of February 10. Post-event analysis using high-accuracy orbital data sources will be presented to show how that information might have been used to prevent this collision, had it been available and used.

Our analysis includes limitations of screening close approach events using two-line element sets and specific examples for the Iridium constellation of how current limitations affect decision making for satellite operators.

Analysis of the collision event, along with the distribution of the debris relative to the original orbits, will be presented to help develop an understanding of the geometry of the collision and the near-term evolution of the resulting debris clouds. Additional analysis will be presented to show the long-term evolution of the debris clouds, including orbital lifetimes, and estimate the increased risk for operations conducted by Iridium and other satellite operators in the low-Earth orbit environment.

The final portion of the paper will look at how collaborative efforts, such as the current Data Center operations supporting SOCRATES-GEO, might be used to reduce the overall risk of similar events in the future.