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LEVERAGING NON-TRADITIONAL SENSORS FOR ENHANCED RE-ENTRY TRACKING AND IMPACT PREDICTION: A COLLABORATIVE APPROACH

Abstract

The increasing frequency of uncontrolled satellite and rocket body re-entries presents a challenge for global space situational awareness and public safety. While existing space surveillance networks provide valuable tracking and prediction capabilities the complexities of tracking objects in very low earth orbits and throughout the atmosphere can reduce the prediction certainty for re-entering objects. Systems that can provide additional verification of re-entry and impact locations are needed to help mitigate the risk of these re-entering objects, enhance response times, and improve the ability for civil agencies to respond to any re-entry event. This paper, a joint effort by the Australian Space Agency and the U.S. Office of Space Commerce, explores the use of non-traditional sensors—such as weather radars, seismic monitoring networks, and infrasound arrays—as complementary assets to existing space tracking capabilities.

By leveraging infrastructure already in place for terrestrial applications, these sensor networks can provide a critical means for validating re-entry predictions, refining impact assessments, and corroborating TIP messages from the 18th Space Defense Squadron (SDS). Integration of these internationally dispersed sensors can strengthen international collaboration in space situational awareness, particularly within the Asia-Pacific region, where diverse geographies and national capabilities offer unique opportunities for cooperative data sharing and improved hazard mitigation.

The paper will outline case studies demonstrating the effectiveness of such sensors, discuss integration strategies with existing space surveillance frameworks, and propose mechanisms for enhancing cross-agency coordination. By utilizing a more distributed and collaborative monitoring approach, we can improve re-entry tracking capabilities, support timely responses from civil authorities, and contribute to a safer and more sustainable space environment.