

49th STUDENT CONFERENCE (E2)
Student Conference - Part 1 (1)

Author: Mr. Davide Vittori
Politecnico di Bari, Italy, davide@aikospace.com

Mr. Claudio Loporcaro
Politecnico di Bari, Italy, claudio.loporcaro@poliba.it
Prof. Antonio Messeni Petruzzelli
Politecnico di Bari, Italy, antonio.messenipetruzzelli@poliba.it
Prof. Francesco Cupertino
Politecnico di Bari, Italy, francesco.cupertino@poliba.it

NO MORE SPACE IN SPACE? QUANTIFICATION OF THE SPACE-ENABLED ECONOMIC VALUE
AT RISK AND ASSESSMENT OF THE ADR BUSINESS CASE**Abstract**

The digitalization wave of the past decades has fostered a rapid growth of space-based infrastructure. Propelled by strong financial prospects, individual satellites and mega-constellations are rapidly crowding the lower Earth orbits (LEO) and threatening the long-term sustainability of the space environment. Without a structured approach to exploitation activities, there is a significant risk of kickstarting the Kessler syndrome (Kessler Cour-Palais, 1978) whereby a cascade of satellite collisions and subsequent creation of debris could cause an irreversible deterioration of entire orbital regions and make spaceflight too hazardous. This study simulates such a dire scenario and quantifies the financial fallouts of a partial halt in space activities due to excessive presence of orbital debris. The global economic activity dependent on space-based services is computed through a propagation model that evaluates the reliance of individual sectors on space assets. These assets are then allocated throughout the orbits in which they operate. The extrapolated worth of each orbital regime is finally combined with the average deterioration probability for the LEO region, resulting in the expected monetary value at risk. The financial model developed is then used to assess the business case for active debris removal (ADR) services. Taking the year 2026 as a reference for the widescale deployment of ADR technologies, we forecast the market size to be between \$37-74bn. This estimate, which could grow or decrease in magnitude based on the evolution of collision probability and on the value of satellite-based services, corroborates the lucrative financial opportunity for investments from both private and public entities.