

SPACE DEBRIS SYMPOSIUM (A6)  
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STUDY RESULTS FOR A CANADIAN SPACE-DEBRIS MONITORING SYSTEM

**Abstract**

The increasing space debris population in orbits used by the Canadian Space Agency (CSA) satellites is a growing concern for their safety and operation. Recently, several alerts, triggered by conjunction analyses forecasting space debris coming dangerously close to space assets, have highlighted the lack of an independent system to provide accurate and timely orbit data.

To support the CSA's Satellite Operations group, an assessment of the feasibility of developing an independent system able to detect and track space debris has been performed. The system would need to provide a capability to detect, track, and catalogue space debris down to 5 cm in LEO orbits, with an accuracy of 5 m by 5 m by 50 m in cross-track, radial and along-track directions respectively at the time of closest approach.

An engineering study was undertaken to study options for a low-cost, low development risk approach to establish a system in Canada. The proposed system, called the Space Debris Monitoring System (SDMS), would consist of an array of 24 receive antenna and one transmit antenna operating in S-band that would detect new debris, update orbital elements of objects in the current catalogue and provide highly accurate orbit elements for objects affecting the operation of Canadian assets.

The paper reviews the risk caused by space debris, establishes the performance parameters required for safe operation, presents the system parameters and provides several analyses on the various aspects of the system in order to confirm the feasibility of the proposed concept. A preliminary cost estimate for a system implementation near Suffield, Alberta is presented to support the decision process.

SDMS could provide independent, timely and accurate orbit data to estimate collision risks with great precision. Accurate knowledge of the probability of collision would reduce cost of spacecraft operations by avoiding unnecessary maneuvers and disruption of operational service. When not involved in tracking activities, the system would scan for space debris in order to build and maintain existing database and therefore contribute to global systems for monitoring space debris developed by CSA's partners.