

IAF SPACE OPERATIONS SYMPOSIUM (B6)  
Large Constellations & Fleet Operations (5)

Author: Mr. Calum Hervieu  
Oneweb, United Kingdom

Mr. Layne Droppers  
Oneweb, United States

Mr. Kamran Memon  
Oneweb, United Kingdom

Mr. Eduardo Zapardiel Fernandez  
Oneweb, United Kingdom

Mr. COle Brown  
Oneweb, United States

## COLLISION RISK MITIGATION STRATEGIES OF THE ONEWEB CONSTELLATION

**Abstract**

There has been a significant increase in Low Earth Orbit (LEO) spacecraft in recent years. New use cases are providing a growing list of transformative benefits to governments, institutions, agencies, and the public around the world. However, this increased utilisation of LEO also heralds an increased number of conjunction events and risk of collision. Current conjunction risk mitigation efforts are based on best effort by all actors, and there remains no formal regulation dictating collision avoidance responsibilities. As such, all responsible space operators must develop a comprehensive methodology for processing and reacting to potential conjunction events involving their vehicles. Crucially, these methods must also be as transparent as possible, as any obscurity inherently results in increased collision risk for all actors in the region.

OneWeb is a global communications network powered by a growing constellation of 650 LEO satellites, and is deeply committed to demonstrating responsible use of space and cooperating closely with other industry players to maximise safety for all. The size of this constellation necessitates a conjunction assessment and avoidance system that is fast, robust, and able to reliably process vast data sets. The architecture must also be future-oriented, with scalability and security being among the primary concerns as the number of active satellites in space continues to grow dramatically in the coming decades.

This paper presents an overview of OneWeb's conjunction Concept of Operations (ConOps) and software architecture. These have been developed with the aim of maximising Space Situational Awareness (SSA), vehicle safety and optimising Flight Dynamics Operations to provide consistent, stable service to customers around the globe. The authors first present an overview of the OneWeb Constellation and the common problems faced by all operators active in LEO. Details of the conjunction ConOps are then explored - including ingestion of Conjunction Data Messages (CDMs) from external providers, such as the 18th Space Control Squadron (18SPCS) and LeoLabs the internal recalculation performed to ensure CDMs are screened against the latest state vector for each vehicle and triggering Collision Avoidance Maneuvers as necessary. Needless to say, the success of the OneWeb constellation relies on precise formation flying of all vehicles. As such, the Flight Dynamics Element (FDE) ensures safe operations of OneWeb's satellite fleet by maintaining an extensive internal collision avoidance system, which is also detailed herein. Finally, a synopsis of OneWeb FDE's considerable experience in flying a constellation is condensed and recommendations are provided for best practises to be adopted by other LEO operators to maximise Space Situational Awareness for all.