

SPACE DOMAIN AWARENESS

Mastering the space environment for mission success



As the space domain becomes increasingly more critical to defense and civilian missions, so does having the ability to successfully detect, track, and analyze objects and activities in space to ensure secure and effective operations.

Different conditions in the space environment, including both natural and man-made objects, can severely disrupt satellite communications, GPS signals and other national security systems. To combat this complex and congested environment, space domain awareness (SDA) is integral to understanding, protecting, and supporting national interests in space.

Arcfield and its subsidiary, Orion Space Solutions, provide a comprehensive capability suite in SDA which enhance operational effectiveness, security and resilience of space assets. Together, they combine Arcfield's space mission engineering and systems integration

expertise with Orion's innovations in satellite data solutions, small satellite development, and advanced space-based sensing, to offer real-time monitoring, early-warning systems and predictive tools which empower decision-makers, support national security, and maintain mission continuity and superiority in space.

MISSION OPERATIONS

Arcfield offers a wide range of capabilities to enhance SDA. These services include de-orbit and decommissioning operations, which involve re-entry burn design and end-of-life testing. Our team of expert analysts monitor and predict collision risks with high accuracy, designing avoidance maneuvers to ensure flight safety for space-based missions.

Additionally, potential adversarial threats are assessed by tracking evolving risks and developing innovative courses of action

to counter them. Constellation orbits and propellant usage are managed to maximize mission life while optimizing sensor and communication performance. Specialized sensor models are integrated into analytics tools, providing support for calibration, initialization and anomaly recovery.

M3SDA

Arcfield is revolutionizing ionospheric data assimilation by decomposing, rearchitecting and reimagining how modern datasets, advanced computational resources and tropospheric assimilation techniques can be integrated. Our new modular framework called the Modular, Modern, Model for Space Data Assimilation (M3SDA), designed by Orion Space Solutions, efficiently assimilate oblique ionograms and other diverse data sources.

M3SDA plays a critical role in understanding and forecasting space weather by offering unprecedented precision in modeling ionospheric disturbances, such as those caused by solar storms and geomagnetic activity. These insights are essential for predicting disruptions to satellite communications, GPS signals and other space-based infrastructure, ensuring mission-critical systems remain operational even during adverse space weather conditions.

DRAGSTER

When it comes to space operations, providing accurate and real-time drag data to satellite operators is critical for collision avoidance. Dragster, Arcfield's nowcasting solution, optimizes drag predictions through a novel data assimilation approach that combines real-time atmospheric and space weather inputs, such as ionospheric disturbances and solar activity, for a comprehensive view of the ionosphere. The enhanced accuracy achieved by Dragster reduces the size of safety bubbles around satellites,

minimizing unnecessary collision warnings and allowing operators to allocate resources more efficiently. With its ability to account for rapidly changing space weather conditions, Dragster offers a critical advantage in maintaining operational readiness and improving mission success.

IONOSPHERE AS A SENSOR

Our unique Doppler radar system called TIDDBIT, and soon TRIDENT, is designed to observe and measure the propagation properties of traveling ionospheric disturbances (TID) turning the ionosphere itself into a sensor. In near real time, models using data from the system can reconstruct the iso-ionic contours in the ionosphere—displaying the wavelength, amplitude, speed and period of hypersonic movers' TID signatures as they form—to show the wave structure as a function of time. Additionally, analysis of the TID signatures produced by the system can be traced to the mover originating the disturbance. For example, correlating a water wake to a ship or locating a hypersonic vehicle.

ARCHITECTING ADVANTAGE ACROSS THE SPACE DOMAIN

Through a robust suite of technologies, engineering capabilities and advanced analytics, Arcfield delivers advanced SDA solutions that protect and enhance the resilience of national security space programs. By enabling mission continuity, preventing collisions and identifying potential threats, Arcfield's deep expertise and technological innovations, help to safeguard space operations and ensure mission success for our government partners.

Learn more at arcfield.com.

IONOSPHERIC VISUALIZATION

The M3SDA data platform integrates multiple datasets from diverse sources, including space weather observations, to create a comprehensive, real-time visualization of the ionosphere. By modeling how ionospheric disturbances impact satellite orbits, the platform enables operators to anticipate disruptions, optimize orbital paths and enhance mission resilience.

