



**USA**  
#505, 1919 14<sup>th</sup> Street  
Boulder, CO 80302  
(720) 589-6086  
[www.saberastro.com](http://www.saberastro.com)

**AUSTRALIA**  
Level 3, 53 Balfour Street  
Chippendale NSW, Australia  
+61-433-178-740

## ABSTRACT

### *Mitigating challenges in Complex Space Systems*

Space systems are important to modern industry, providing critical information for navigation, communication, weather tracking, and imagery. Systems are typically expensive and meticulously engineered. Nevertheless, spacecraft can still exhibit a range of degradation and failures. Diagnosing those failures are important, as every minute of satellite down-time results in millions of dollars in lost revenue to customers here on Earth.

Fault Detection for space systems is challenging not just because of the complexity of the machines but because of dynamics in the space environment. Operational conditions and tempos also add to the difficulty and can cause state changes in the system.

This presentation discusses the Saber Astronautics method for modelling highly complex systems. In particular, the goal is to find data-driven relationships between space systems and space environments then use these models for intelligent control. The NASA Advanced Composition Explorer (ACE) satellite is a case study demonstrating a machine learning solution to modelling complex space systems, and how the approach is being adopted to modernise a range of space operations problems. The benefits can reduce mission cost, improve efficiency, and streamline the way we live and work in space.