

IAF SPACE OPERATIONS SYMPOSIUM (B6)
Ground Operations - Systems and Solutions (1)

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AUTONOMOUS SYSTEMS OF REAL-TIME MONITORING AND SATELLITE MISSION ANALYSIS
TOOL**Abstract**

Flight dynamics system (FDS), one of fundamental subsystems in satellite ground systems, serves as an orbital prediction, trajectory and navigation analysis and preparation of maneuver information to achieve the mission objectives. The first FDS for Thaichote (Earth observation satellite) operated by Geo-Informatics and Space Technology Development Agency (GISTDA) is dependent on a specific hardware and cannot be modified to accommodate future mission requirements leading to high maintenance cost. To minimize the impact, GISTDA has developed FDS known as “EMERALD” to support Thaichote and future missions. EMERALD has analysis capabilities of orbit determination, orbit prediction, event prediction, orbit control maneuver, propellant monitoring and collision risk assessment. The replacement of previous FDS with EMERALD has resulted in high operational performance, more flexibility of the system and effective maintenance cost.

To enhance the capability of EMERALD, one of our goals is to develop the autonomous systems for the real-time mission monitoring and analysis tool. The tool would allow users to monitor the satellite’s current position and mission operation and increase the effectiveness of mission control. This paper presents the methodology and architecture design of the real-time monitoring and mission analysis tools for Thaichote mission and future large constellations. The tool provides eight key features: real-time satellite tracking (ground track and 3D orbit), mission control, GPS downlink status, propellant remaining, orbit maintenance and ground track control, spacecraft collision warning, solar eclipse and operational status. The well-designed graphical user interface (GUI) is developed to fit and simplify the information for users to access easily. In addition, the main advantage of this tool is a fully autonomous process to retrieve data (e.g. GPS, conjunction data message (CDM) and other essential data of mission operation) and notify real-time mission critical events to users. Currently, this tool is integrated with the satellite ground control to support the current and future satellites of GISTDA.