

SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
NEW WORLDS - INNOVATIVE SPACE EDUCATION AND OUTREACH (4)

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BUILDING THE BRIDGE FROM MISSION ANALYSIS TO SPACECRAFT OPERATIONS IN
EDUCATION

Abstract

One of the most difficult challenges in space technology education and training is covering the practical, operational, and hands-on aspects. Mission analysis for example ends with the computation of orbit manoeuvres, which are validated by using a mission simulator. However when work on a real mission has been started, the challenges of daily space operations are faced where the missing hands-on practical training is identified as a major problem.

This paper introduces the Mission Analysis Tool (MAT), a comprehensive, user-friendly tool for simple mission analysis exercises. After a short introduction of the tool its use in Satellite Operator Training and Space Education, and the benefits discussed. Furthermore recent and planned future developments such as automatic generation of telecommand sequences and integration of MAT in the Satellite Operator Training Centre (STC) are discussed.

Although simple to use, MAT has been validated against ESTEC's Galileo System Simulation Facility GSSF and provides advanced features such as Hohmann Transfer, J2/J4 perturbations, and 3D visualization.

MAT's main features are Simulation, Space/Ground Objects, Reports, and Visualization. Simulation is done using Kepler and Runge-Kutta orbit propagators with or without J2/J4 perturbations. Objects include multiple Satellites, Stations, and Targets. Satellite orbits can be defined by Kepler Parameters or the initial state vector. Reports generated include for example mission summary, track data, satellite / station / target contacts (Acquisition and Loss of Signal times, contact durations), and station/target-satellite geometry. Visualization modules are the tiltable, zoomable map view and 3D view.

The proposed paper furthermore gives an introduction of future development plans and concepts such as integration into the Satellite Operator Training Centre (STC) and automatic telecommand generation based on orbit transfer analysis, closing the gap between mission analysis and operations, finally discussing the benefits of MAT in the educational environment.