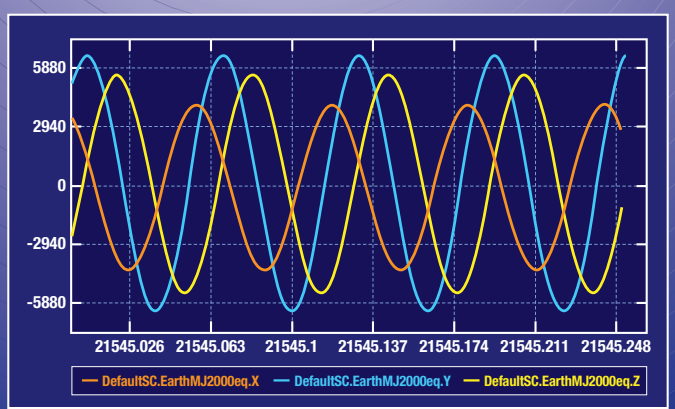
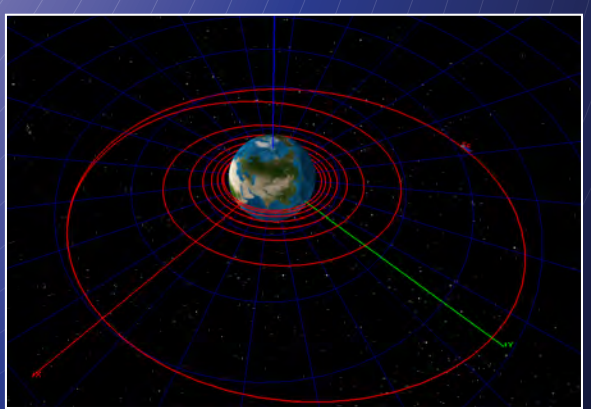
National Aeronautics and Space Administration

General Mission Analysis Tool

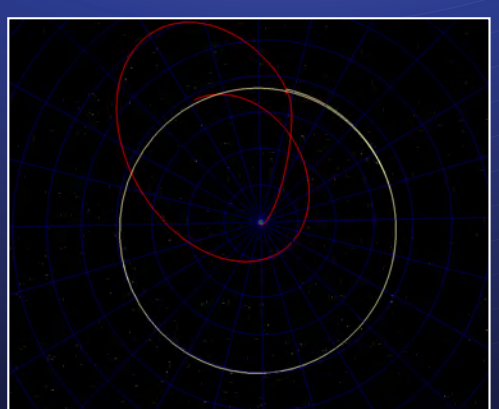
The General Mission Analysis Tool (GMAT) is an open-source space mission design tool to help you with space flight challenges. GMAT is developed by a team of NASA, private industry, and public and private contributors. It is used for real-world engineering studies, as a tool for education and public engagement, and to fly operational spacecraft.



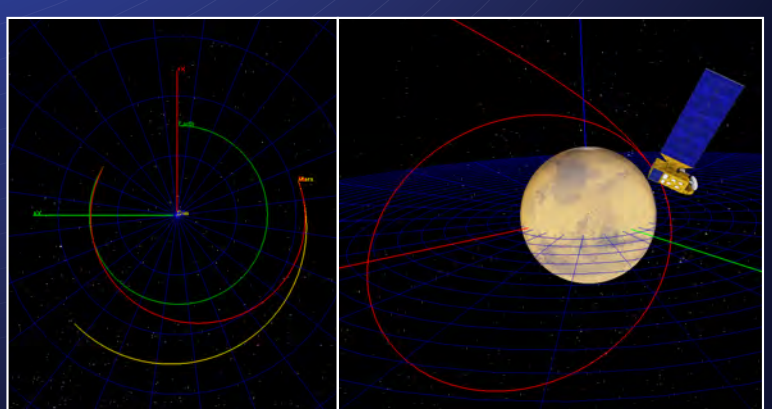
2D Graphics



Finite Burn Earth



Optimal Lunar Flyby



Interplanetary Trajectory Mars

Supported Missions: LCROSS • ARTEMIS • LRO • OSIRIS • MMS • ACE • MAVEN • TESS

Contributing Organizations: NASA/GSFC, Thinking Systems, Inc., a.i. solutions, Inc., AFRL, The Schafer Corporation, Computer Sciences Corporation, Honeywell Technology Solutions, The Boeing Company, NASA/JPL, Korea Aerospace Research Institute, Chonbuk National University, Korea Advanced Institute of Science and Technology and Yonsei University

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Features Overview

GMAT is a feature rich system containing high fidelity space system models, optimization and targeting, built in scripting and programming infrastructure, and customizable plots, reports and data products, to enable flexible analysis and solutions for custom and unique applications. GMAT can be driven from a fully featured, interactive GUI or from a custom script language. Here are some of GMAT's key features broken down by feature group.

Dynamics and Environment Modeling

- High fidelity dynamics models including harmonic gravity, drag, tides, and relativistic corrections
- Formations and constellations
- Impulsive and finite maneuver modeling and optimization
- Propulsion system modeling including tanks and thrusters
- Solar System modeling including high fidelity ephemerides, custom celestial bodies, libration points, and barycenters
- Rich set of coordinate system including J2000, ICRF, fixed, rotating, topocentric, and many others
- SPICE kernel propagation
- Propagators that naturally synchronize epochs of multiple vehicles and avoid fixed step integration and interpolation

Programming Infrastructure

- User defined variables, arrays, and strings
- User defined equations using MATLAB syntax. (i.e. overloaded array operation)
- Control flow such as If, For, and While loops for custom applications
- MATLAB interface
- Built in parameters and calculations in multiple coordinate systems

Plotting, Reporting and Product Generation

- Interactive 3-D graphics
- Customizable data plots and reports
- Post computation animation
- CCSDS, SPK, and Code-500 ephemeris generation

Optimization and Targeting

- Boundary value targeters
- Nonlinear, constrained optimization
- Custom, scriptable cost functions
- Custom, scriptable nonlinear equality and inequality constraint functions
- Custom targeter controls and constraints

Interfaces

- Fully featured, interactive GUI that makes simple analysis quick and easy
- Custom scripting language that makes complex, custom analysis possible
- MATLAB interface for custom external simulations and calculations
- File interface for the TCOPS Vector Hold File format, for loading of initial spacecraft data
- Command line interface for batch