



NASA Software General Mission Analysis Tool

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General Mission Analysis Tool

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General Mission Analysis Tool (GMAT) is [open-source](#) space mission analysis software developed by [NASA](#) and private industry.^[2]

It has been used for several missions, including [LCROSS](#), the [Lunar Reconnaissance Orbiter](#), [OSIRIS-REx](#), the [Magnetospheric Multiscale Mission](#), and the [Transiting Exoplanet Survey Satellite \(TESS\)](#) mission.^{[2][3]}

GMAT is an open-source alternative to software like [Systems Tool Kit](#) and [FreeFlyer](#).

References [\[edit \]](#)

1. ^a Hughes, Steven P.; Conway, Darrel J.; Parker, Joel (2017). *Using the General Mission Analysis Tool (GMAT)*  (PDF). AAS Guidance and Control Conference.
2. ^a ^b Hughes, Steven P.; Qureshi, Rizwan H.; Cooley, Steven D.; Parker, Joel J. (2014). *Verification and Validation of the General Mission Analysis Tool (GMAT)*  (PDF). AIAA/AAS Astrodynamics Specialist Conference.
3. ^a "GMAT Wiki - Overview" . 5 January 2022. Retrieved 5 January 2022.

External links [[edit](#)]

- [GMAT Wiki](#)
- [GMAT Download](#) (SourceForge)
- [GMAT channel on YouTube](#)


General Mission Analysis Tool

Initial release	2007 ^[1]
Stable release	R2022a / January 2023; 1 year ago
Repository	sourceforge.net/projects/gmat/files/GMAT/ 
Written in	C++
Operating system	Microsoft Windows, Linux, macOS
Type	Technical computing
License	Apache License 2.0
Website	GMAT Wiki 

Categories: [Aerospace engineering](#) | [3D graphics software](#) | [Astronomy software](#) | [Mathematical software](#) | [Physics software](#)



GMAT Splash Page



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
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General Mission Analysis Tool (GMAT)

- [Project Home Page](#)
- [Software](#)

The General Mission Analysis Tool (GMAT) is a space trajectory optimization and mission analysis system developed by NASA and private industry in the spirit of the NASA Vision. GMAT contains new technology and is a testbed for future technology development.

General Mission Analysis Tool (GMAT) Goals

GMAT is an open source, platform independent trajectory optimization and design system designed to model and optimize spacecraft trajectories in flight regimes ranging from low Earth orbit to lunar applications, interplanetary trajectories, and other deep space missions. The system supports constrained and unconstrained trajectory optimization and built-in features make defining cost and constraint functions trivial so analysts can determine how their inclusion or exclusion affects solutions. The system also contains initial value solvers (propagation) and boundary value solvers and efficiently propagates spacecraft either singly or coupled. GMAT's propagators naturally synchronize the epochs of multiple vehicles and shorten run times by avoiding fixed step integration or interpolation to synchronize epochs of spacecraft.

A user can interact with GMAT using either a graphical user interface (GUI) or script language that has a syntax similar to the MathWorks' MATLAB® system. All of the system elements can be expressed through either interface and users can configure elements in the GUI and then view the corresponding script, or write script and load it into GMAT.

Analysts model space missions in GMAT by first creating resources such as spacecraft, propagators, and optimizers to name a few. These resources can be configured to meet the needs of specific applications and missions. After the resources are configured they are used in the mission sequence to model the motion of spacecraft and simulate events in a mission's time evolution. The mission sequence supports commands such as Nonlinear Constraint, Minimize, Propagate, Function Calls, Inline Math, and Script Events among others.

The system can display trajectories in space, plot parameters against one another, and save parameters to files for later processing. The trajectory and plot capabilities are fully interactive, plotting data as a mission is run and allowing users to zoom into regions of interest. Trajectories and data can be viewed in any coordinate system defined in GMAT, and GMAT allows users to rotate the view and set the focus to any object in the display. The trajectory view can be animated so users can watch the evolution of the trajectory over time.



GMAT Overview

Overview

The General Mission Analysis Tool (GMAT) is the worlds only enterprise, multi-mission, open source software system for space mission design, optimization, and navigation. The system supports missions in flight regimes ranging from low Earth orbit to lunar, libration point, and deep space missions. GMAT is developed by a team of NASA, private industry, public, and private contributors and is used for real-world mission support, engineering studies, as a tool for education, and public engagement. GMAT contains models of real world objects such as spacecraft and thrusters, and analysis "objects" such as propagators, plots, and reports. These objects are used in a mission sequence in which the user employs commands supported by the system to model mission events and perform estimation. For a complete list of new features, compatibility changes, and bug fixes, see the Release Notes. Below are just some of the new capabilities contained in this release. Production quality orbit determination (Operational Certification expected in November, 2016) Code 500 ephemeris propagator STK ephemeris file output Write command to save GMAT configurations during execution Include macro to load GMAT configurations from external sources during execution Many new built in math functions and parameters 130 pages of new user documentation

Software Details

Category	Design and Integration Tools
Reference Number	GSC-17177-1
Release Type	Open Source
Operating System	

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GMAT Contact

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GMAT Goals

GMAT is an **open source**, platform independent **trajectory optimization** and design system



GMAT Goals

GMAT is an open source, platform independent trajectory optimization and design system designed to model and optimize spacecraft trajectories in flight regimes ranging from low Earth orbit to lunar applications, interplanetary trajectories, and other deep space missions.



Bertrand's Theorem





No Bertrand Theorem



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Bibliography I



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