

# Functional Specifications

## Specifications Overview

Each feature in the production build of GMAT has an engineering specification that defines the working requirements, the user interfaces, and how the feature works. GMAT's features are broken down into several categories to help organize and track related features. Functional specifications are maintained in Google docs primarily because Google docs supports comments and markup during the review phases better than the wiki. Features in GMAT are tracked by requirement Id. For example, the Spacecraft Orbit State feature is governed by the requirement FRR-1.

Use the following templates to create new specs:

- Improvement
- New Feature

Links to GMAT's feature specifications are below.

- [Specifications Overview](#)
- [Basic Dynamics and Models Specifications](#)
- [Powered Flight Specifications](#)
- [Solver Infrastructure Specifications](#)
- [Programming Infrastructure Specifications](#)
- [Output and Utility Specifications](#)
- [Optimal Control Specifications](#)
- [Application Control Specifications](#)
- [Navigation](#)
- [Collocation Functionality](#)

## Basic Dynamics and Models Specifications

The basic dynamics model feature area contains features like orbital dynamics models, coordinate systems, attitude models, and solar system models such as planets, Libration points, and barycenter.

[FRR-1 Spacecraft Orbit State](#)

[FRR-2 Spacecraft Orbit Epoch](#)

[FRR-3 Spacecraft Ballistic Mass Properties](#)

[FRR-7 Spacecraft Attitude](#)

[FRC-10 Propagate Command](#)

[FRR-13 Force Model Spec](#)

[FRR-14 Numerical Integrators](#)

[FRR-16 Celestial Body](#)

[FRR-16 Solar System](#)

[FRR-17 Libration Point](#)

[FRR-18 Barycenter](#)

[FRR-27 Ephemeris Propagator](#)

[FRR-35 Coordinate Systems](#)

[FRR-10 Formation](#)

[FRR-15 GroundStation](#)

[Event Locator Utility](#)

## Powered Flight Specifications

The powered flight feature area covers features that model impulsive and finite maneuvers.

FRR-8 Spacecraft Tank Model

FRR-9 Thruster Model

FRR-11 Impulsive Burn

FRR-12 Finite Burn

FRR Spacraft Hardware

FRC-8 FiniteBurn Commands

FRC-9 Maneuver Command

## Solver Infrastructure Specifications

The solver infrastructure feature area covers features related to targeting and optimization.

FRC-1 Optimize Command

FRC-2 Vary Command

FRC-3 Target Command

FRC-5 Achieve Command

FRC-6 Minimize Command

FRC-7 Nonlinear Constraint

FRR-19 Differential Corrector

FRR-20 fmincon Optimizer

FRR-21 VF13ad Optimizer

## Programming Infrastructure Specifications

The programming infrastructure feature area covers features like control flow, variables, arrays and interfaces such as the MATLAB interface.

FRR-32 Variable

FRR-33 Array

FRR-34 String

FRR-36 MatlabFunction

FRR-38 Calculation Parameters

FRR-43 FileInterface

FRC-4 For

FRC-4 If/Else

FRC-4 While

FRC-13 ScriptEvent

FRC-19 Assignment

FRC-15 Stop

FRC-17 CallMatlabFunction

FRC-22 BeginMissionSequence

FRC-26 Display

FRC-25 Set

EIR-1 MATLAB Interface  
FRAC-10 Script Language

## Output and Utility Specifications

The programming infrastructure feature area covers features like reports, plots, and ephemeris files.

FRR-5 Spacecraft Visualization  
FRC-11 Report Command  
FRC-14 PenUp PenDown  
FRC-16 Toggle  
FRC-23 Clear Plot  
FRC-24 Mark Point  
FRC-29 Command Echo  
FRR-28 Orbit View  
FRR-29 XY Plot  
FRR-30 Report File  
FRR-31 Ephemeris File  
FRR-42 Ground Track Plot  
FRAC-8 Command Summary  
FRR-63 Dynamic Data Display

## Optimal Control Specifications

FRR-60 Phase

## Application Control Specifications

The programming infrastructure feature area covers features high level GMAT user interfaces such as the script language and the GUI.

FRAC-3 Script Editor  
FRAC-6 Resource Tree  
Mission Tree Feature Spec  
Output Resource  
Toolbar Feature Spec  
ToolbarFeatureSpec.docx

## Navigation

- 12 new Resources
  - FRR-22\_BatchEstimator
  - FRR-24 MeasurementSimulator
  - FRR-25 Transmitter
  - FRR-39 Transponder
  - FRR-40 Antenna

- FRR-46 TrackingFileSet
- FRR-47 ErrorModel
- FRR-48 StatisticsAcceptFilter
- FRR-49 StatisticsRejectFilter
- FRR-56 ThrustHistoryFile
- FRR-57 ThrustSegment
- FRR-58 Receiver
- 3 new Commands
  - FRC-20 RunEstimator
  - FRC-21 RunSimulator
  - FRC-28\_Write
- Changes to 5 existing Resources
  - FRR Spacecraft Hardware
  - FRR-1 SpacecraftOrbitState
  - FRR-15 GroundStation
  - FRR-31 EphemerisFile
  - FRR-43 FileInterface
- Measurement Models
  - Angle Measurements
  - Skin Track Range Measurements

## Collocation Functionality

- 1Resources
  - FRR-60 Trajectory
  - FRR-61 Phase

### Saved Old Specs

- FRR-? Spacecraft
- FRR-22 Batch Estimator
- FRR-? DSN Measurement Model
- FRR-? USN Measurement Model