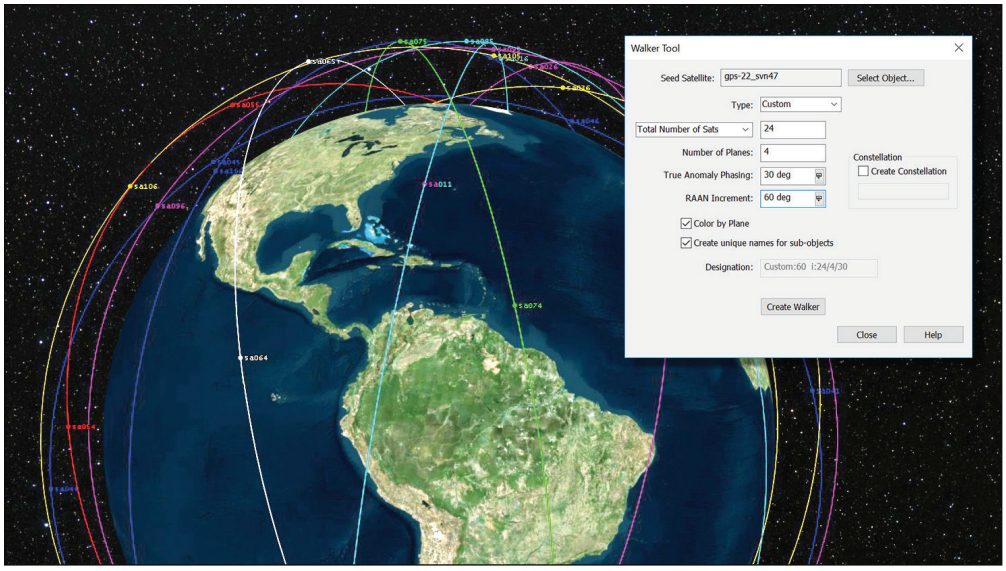
STK SATPRO

SatPro provides in-depth space tools for designing and operating satellite systems.



It adds the following functionality to STK:

- Additional high fidelity orbit propagators
- Multiple attitude enhancements
- Satellite-specific engineering tools

Additional orbit propagators

High Precision Orbit Propagator (HPOP).

HPOP uses numerical integration of the differential equations of motions to generate ephemeris. Several different force modeling effects can be included in the analysis.

- Central body gravity
- Solar radiation pressure
- Drag / atmospheric density
- Third body gravity
- Covariance
- Integrators: RK 4, RKF 7(8), RKV 8(9), Bulirsch Stoer, and Gauss Jackson

Long-term Orbit Predictor (LOP)

LOP provides an accurate prediction of the motion of a satellite's orbit over many months or years. The LOP propagator uses the same orbital elements as the Two-Body, J2, and J4 propagators.

SP3 Propagator

This propagator reads .sp3 files of type 'a' and 'c' and enables use of multiple files in sequence. These files are used to provide precise GPS orbits from the National Geodetic Survey (NGS).

Attitude profiles

Additional attitude profiles

- Nadir alignment with ECF velocity constraint, Nadir alignment with orbit normal constraint, Nadir alignment with Sun constraint,
- ECF velocity alignment with radial constraint, ECF velocity alignment with nadir constraint
- Coordinated turn
- ECI velocity alignment with nadir constraint, ECI velocity alignment with Sun constraint
- Sun alignment with nadir constraint, Sun alignment with ecliptic normal constraint, Sun alignment with ECI Z axis constraint, Sun alignment with occultation normal constraint, Sun alignment with Z in orbit plane
- XPOP inertial attitude
- Yaw to nadir
- Inertially fixed
- Spinning, spin about nadir, Precessing spin, spin aligned
- Fixed time slew, variable time slew

Targeted attitude segments

Used to override the basic attitude profile for a satellite, missile, or launch vehicle and have a selected axis (its Z axis by default) point in the direction of one or more targets, subject to applicable access constraints.

Multi-segment attitude profiles

Used to set up complex sequences of varying attitude profiles over time.

Real time attitude data

With an STK Integration license and live data, you can create an attitude profile using near-real time flight data.

Attitude analysis

SatPro provides dynamic attitude modeling and simulation using several tools and calculation components:

3D Attitude graphics window. Provides an easy way to visualize the attitude of a vehicle and changes in its attitude over time. It includes the following visual aids:

- Attitude Sphere
- Vector-based sensor pointing

Attitude coverage. Used to analyze coverage in various directions over time, using several attitude-dependent figures of merit. Requires a Coverage license.

Attitude Simulator

The Attitude Simulator provides the ability to incorporate the following when generating attitude trajectories:

- Custom torque models (e.g., gravity gradient, aerodynamic, etc.)
- Custom momentum biases
- Use of customized control laws (including static and dynamic feedback, dynamic compensators, etc.)

The tool numerically integrates an attitude state (represented by a quaternion) and its body angular velocity components as well as other optional variables.

Attitude Simulator plugin scripts may supply these variables and generally perform custom computations during numerical integration.

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Satellite engineering tools

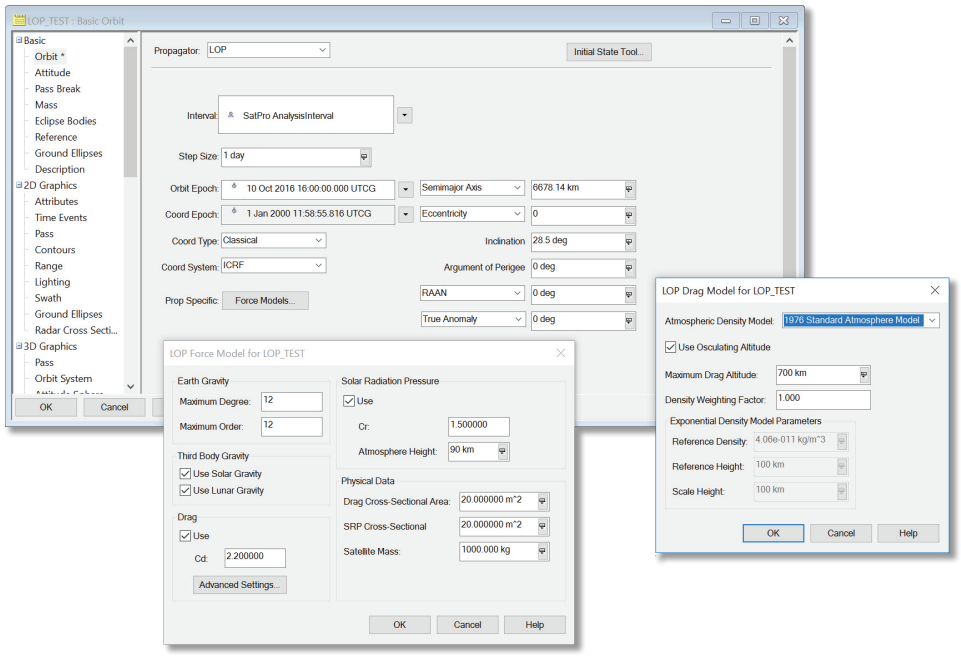
Generate TLE tool

Generates a two-line element set for the selected satellite using either the trajectory sampling method or single point method.

B-Plane template tool

The B-Plane template tool is used to create templates that define the configuration of B-Planes that can be displayed in the 3D Graphics window. Elements that can be displayed are:

- B-Plane
- B vector
- T-R axes
- Theta
- Asymptote
- S Vector
- Reference vector



Lifetime tool

The Lifetime tool estimates the amount of time a satellite can be expected to remain in orbit before atmospheric drag and other perturbations cause it to decay. Calculation options include:

- Drag coefficient
- Solar radiation pressure coefficient
- Drag area
- Area exposed to Sun
- Mass
- Atmospheric density
- Solar flux file
- Solar flux sigma level
- Advanced options to adjust computation performance

Solar Panel tool

The Solar Panel tool is used to model the exposure of solar panels over a given time interval. The resulting data can be used to determine the varying availability of electrical power for operations.

Model Area tool

The Area tool is used to calculate the area of a model from a given view direction, over a given time interval, such as an orbit period. It can be used to calculate the exposed area of:

- Drag calculations
- Solar panels
- Radiation

Walker Constellation tool

The Walker tool is used to easily generate a Walker constellation using the Two Body, J2, J4, or SGP4 orbit propagators. Walker constellations are based on a simple design strategy for distributing the satellites in a constellation based on the total number of satellites, the total number of planes and the phasing between satellites in neighboring planes.