Ansys

MISSION

STK SOLIS

Provide a complete spacecraft simulation environment in STK.

With STK SOLIS, developed by ASI, a Rocket Lab company, mission design engineers can:

- Configure spacecraft components including the sensor, actuator, power, communications, and payload models.
- Rapidly evaluate system trade-offs and ensure that spacecraft capabilities and constraints are considered early in the life cycle and are being maintained.
- Create and save spacecraft templates of optimal configurations for rapid assessment of changes.
- Automatically generate a validated attitude determination and control system configuration targeted for flight avionics.
- Emulate flight software using mission sequence modeling, real-time commanding, and telemetry.

These capabilities are enabled by the STK SOLIS architecture, which embeds a desktop version of ASI's on-board flight software. This modular flight software architecture provides rapid spacecraft development, assembly, test and integration. It also provides autonomous on-board operations and enhances integration and test with its high-fidelity "test like you fly" capabilities.

/ Attitude determination modeling

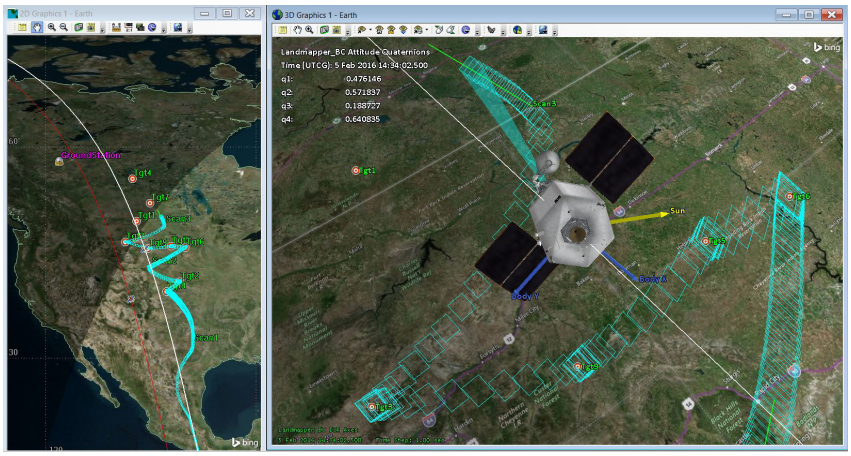
- Sun vector sensors, sun angle sensors, horizon sensors, rate sensors, magnetometers, star trackers
- Perfect attitude determination, fixed-gain filter, Kalman filter

/ Attitude control modeling

- Reaction wheels, magnetic torquers, thrusters
- Custom controllers
- Perfect control, PID control, phase-plane control

/ Attitude disturbance modeling

- Magnetic dipole torque
- Gravity gradient torque
- Solar pressure force and torque
- Aerodynamic pressure force and torque



/ Mode control / guidance

- Orbit determination, ephemeris propagation
- User-defined modes
- Idle, Rate Damp, Hold, Sun Acq, Tracking
- Reference objects: Inertial Fixed, SC->Sun, SC->Nadir (detic/centric), SC Velocity, SC Mag Field, SC->TgtObject, cross (SC->TgtObject, SC Vel), True North, True North @ Tgt, Tgt Velocity
- EigenSlew and RendezSlew

/ Power/thermal modeling

- Distance-dependent solar flux, central body infrared, albedo
- Finite element thermal. Absorptivity, emissivity, conductivity, shunt
- Solar panel size, efficiency, articulation, temperature dependency
- Battery capacity, charge/discharge regulation
- Dynamic spacecraft loads. Payload power, communications system power, reaction wheel power, thruster power. magnetic torque power, gimbal power
- Payload/communications/data modeling
- Off, On, Standby
- Define multiple payload modes. Power consumption, data collection
- Transmitters, receivers, transceivers. Data rates, overhead, power consumption
- Data recorder size, current state
- Command/telemetry availability when ground stations are visible

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Target planning

The Target Planner enables you to rapidly generate mission sequences to carry out targeting operations. As part of a fully integrated spacecraft model in STK, the Target Planner incorporates actual spacecraft algorithms and dynamics to determine an optimal targeting plan. This ensures that only real and accurate constraints are used to develop your operations. The Target Planner is tightly integrated with STK access to provide various target constraints.

Spacecraft design applications

When designing a spacecraft, STK SOLIS can help you:

- Design mission requirements.
- Analyze various system concepts to determine which can meet mission requirements.
- Analyze and refine conceptual designs.
- Verify the final design of subsystem models and components.
- Provide independent validation and sensitivity/ margin analysis.

Spacecraft operations

STK SOLIS can be used as a training and analysis tool for ground operators and mission analysts.

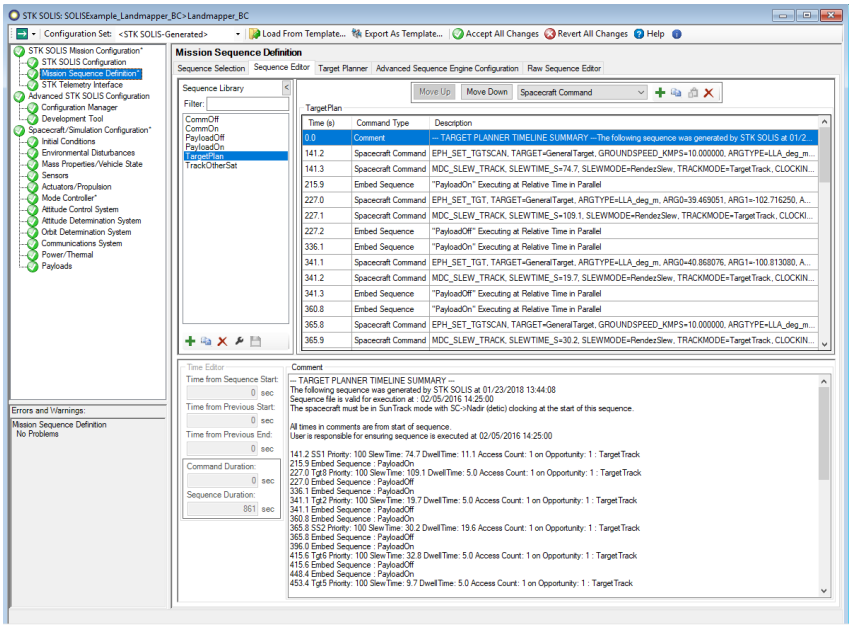
Reporting and visualization of end-to-end spacecraft simulation

As the satellite runs through the simulation of operator commands, you can track it in the following ways:

- **Analysis graphs**. For example, a dynamic graph can show when the spacecraft starts to rotate around until its solar panels face the sun and when the panels start to generate power.
- **Spacecraft status summary**. Provides information about the current state of the spacecraft, including spacecraft mode, attitude data, power system state, and payload/communication system status.
- **2D and 3D graphics windows**. Provides a visualization of the spacecraft operations, including attitude and orbit properties.

Custom development

- Generates framework code based on user-defined XML description
- Builds custom DLLs that integrate with STK SOLIS
- Enables development of custom components and algorithms



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