Leverage the power and flexibility of FreeFlyer® Astrodynamics Software in your next mission.

**SOFTWARE FOR SPACE MISSION DESIGN, ANALYSIS AND OPERATIONS**

FreeFlyer® provides complete astrodynamics functionality for missions of any size, any scale, any orbit regime. With customizable interfaces and cross-platform use, FreeFlyer supports the full life cycle of your mission.

**DESIGN**

Design satellite orbits in any regime, define constellation parameters, target maneuvers, and simulate the full mission life cycle from launch to nominal operations to disposal.

**ANALYSIS**

Analyze any mission requirements, including spacecraft and ground sensor coverages. Generate fuel consumption reports and perform parametric trade studies. Augment FreeFlyer’s internal algorithms with user-defined math functions and custom computations, or use the native MATLAB API.

**OPERATIONS**

Automate satellite operations for both routine and complex flight dynamics tasks. Integration with ground system databases, 3rd party TT&C software, and custom / legacy code via the FreeFlyer Runtime API with interfaces for C/C++, C#, Java, and Python.

**AT A GLANCE**

**Core Functionality:**
- Spacecraft Propagation
- Coverage & Contact Analysis
- Maneuver Modeling & Targeting
- Orbit Determination
- Attitude Modeling
- Custom Math & Algorithms
- External Interfacing

**Heritage:**
- USAF Programs
- NASA Science Missions
- NOAA Science Missions
- International Space Station
- NASA Orion
- Commercial Satellite Programs (U.S. and Abroad)

**Operationally Proven For:**
- Space Situational Awareness
- Orbital Debris/Collision Avoidance
- Ground System Integration
- Automated Operations
- Mission Design & Analysis
- Wargame Strategies
- Constellations
Experience our multi-domain operations capabilities for space and missile defense.

Custom visualizations bring situational awareness to your mission controllers.

**FreeFlyer®** is a commercial off-the-shelf (COTS) software application for space mission design, analysis, and operations. FreeFlyer stands out as the most powerful tool of its kind by providing users with a robust scripting language for solving all types of astrodynamics problems. FreeFlyer has been validated, flight-tested, and proven accurate. It is used for spacecraft analysis and operations by NASA, NOAA, USAF, DoD, and commercial satellite providers.

**FREEFLYER FEATURES**

**Generating Output**
- Customizable 2D and 3D OpenGL visualizations of your mission.
- Fully tailorable cartesian and polar plots for use with mission parameters.
- Total control over output layout, which means you can deliver a consistent high-quality output experience.
- Data can be reported to consoles, tables, or exported via custom reports.
- Custom visualization foreground and background elements give full control over the way output looks and what is displayed.

**FreeFlyer Scripting**
- Scripting language gives you full control over the inputs, outputs, and logical flow of an astrodynamical simulation.
- Integrated development and execution environment includes auto-complete, text color controls, and indenting controls.
- In-script interfaces with MATLAB® and TCP/IP sockets.
- Matrix math, mathematical functions, and coordinate system conversion functions simplify script design.
- User-defined functions, macros, and lists enable systems to be complex yet not overwhelming.

**Interfacing with External Resources**
- Custom force modeling and custom object definitions via FreeFlyer Extensions.
- Runtime Application Program Interface (API) for use with other C/C++, C#, Java, MATLAB®, and Python applications.
- Read and write arbitrary plain text and binary file types with the FileInterface object.
- Interfaces with ODBC databases created in MySQL®, Microsoft Access®, Oracle®, and more.
- Customizable user interfaces to manage operations script flow and allow operators to conveniently input information at runtime.
**Spacecraft Propagation**
- Fixed or variable step propagation using numerous propagators and ephemeris types.
- Full force modeling capability includes Solar System, atmospheric drag/lift, solar radiation pressure, IRI, and custom celestial bodies.
- Detailed spacecraft modeling includes fuel tanks, thrusters, collision avoidance calculations, and full attitude modeling.
- Formation support gives constellation customers an efficient way to model and analyze multi-spacecraft problems.

**Coverage and Contact**
- Nearly 500 pre-defined ground station geodetic and masking profiles for full customization options.
- Easy-to-use visibility calculations that factor refraction among spacecraft, sensors, ground stations, and celestial bodies.
- Easily gather field of view, elevation, azimuth, range, range rate, cross track, and along track information about your system.
- Point Groups provide coverage and revisit statistics for constellation design.

**Maneuvering and Targeting**
- Impulsive and finite burn types fully supported.
- Modeling for mono- and bi-propellant blow down systems.
- Electric and chemical propulsion modeling support.
- Built-in multi-variable targeting tool with differential corrector capability.

**Interplanetary**
- Support for a multitude of coordinate systems that apply across celestial objects.
- Define custom celestial objects to represent asteroids, moons, or other gravitationally interacting bodies.
- B-plane analysis, rotating libration point, and rotating-pulsating system support.
- Dynamically control parameters of the solar system to adjust propagation for the specifics of a mission.

**Orbit Determination***
- Extended and unscented Kalman filters, batch least squares, and square root information filter methods for orbit determination solutions.
- Spacecraft state estimation with receiver and transponder modeling and covariance propagation.
- Tracking data simulator and editor can be used to manage outliers and view multiple measurement types simultaneously.
- Ground-based, TDRS, GPS point solution, spacecraft-to-spacecraft, and BRTS tracking data options supported.

*Note: *Orbit determination and interfacing with external resources functions are only available with the FreeFlyer Mission tier.

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Contact us at Sales@ai-solutions.com for a free evaluation, and a customized demonstration to see what FreeFlyer® can do for your mission.