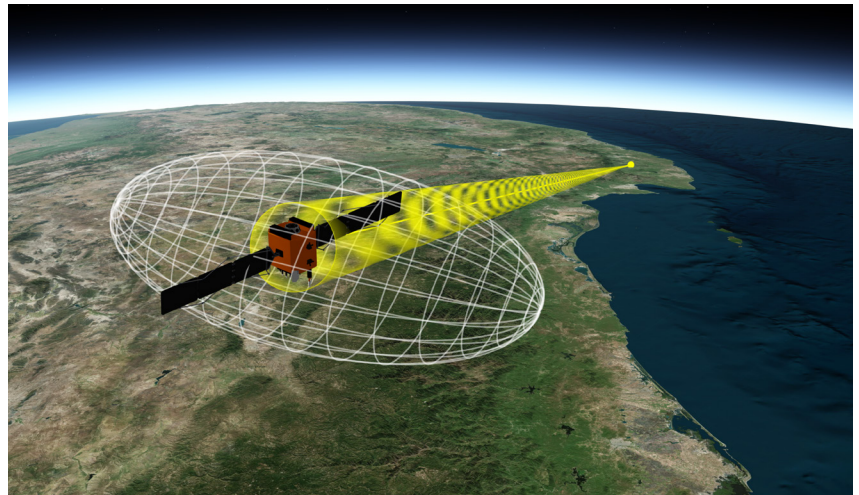


ODTK®

Operationally proven orbit determination solution.

Orbit Determination Tool Kit (ODTK) orbital measurement processing software provides highly accurate orbit estimates throughout the engineering life cycle, from mission design through operations. Run pre-flight simulations to evaluate proposed tracking methodologies, reducing costs and optimizing resources while ensuring that mission requirements are met. Visualize your results in customized output products, using the embedded reporting and graphing capability. Meet your most stringent mission requirements with ODTK's state-of-the-art optimal sequential filter and matched smoother. Use ODTK's automated interface to simplify your operator workflows or integrate into larger systems. Since 2005, ODTK has been the industry's trusted solution for orbit determination software.



/ Use Cases

- Support early phase mission design and planning, trade studies, proposals, or internal research.
- Simulate predicted orbit accuracies for a proposed mission to ensure that it is flyable.
- Process spacecraft tracking data to navigate accurately and confidently on live missions.
- Integrate into a flight dynamics system for hands-on or lights-out operations.
- Support landing operations on other bodies, such as the Moon or Mars.
- Geolocate ground emitters.
- Containerize for deployment to the cloud.

/ Key Value Points

- Provides over 100 unique measurement models.
- Strong operational legacy.
- Applicable to any orbit regime: LEO to deep space.
- Can estimate across multiple maneuvers and compute corrections to thrust and direction.
- Produces realistic ephemeris covariance.
- Supports simultaneous orbit determination on multiple objects in the same solution.
- Easy to integrate into larger systems or extend with more detailed models.

/ Core Capabilities

- **Optimal sequential estimation.** Automate data editing, generation of ephemeris including realistic covariance, and quality assurance information sensitive to measurements and system dynamics.
- **Tracking data simulation.** Evaluate proposed tracking methodologies and schedules with respect to mission requirements. ODTK supports integrated system testing including the effects of anomalies in the tracking data.
- **Initial orbit determination (IOD) methods:** Gooding Angles Only, Herrick-Gibbs, GNSS navigation solution, and Geosynchronous — to determine the initial state of a satellite.
- **Cislunar IOD.** The Collocation object is specifically designed to estimate multi-body orbits. Initial IOD is specialized for estimating cislunar orbits for the Earth-Moon L1 and L2 Lagrange points.
- **Analysis capabilities.** Includes a wide variety of data elements and pre-defined styles for reporting and graphing. You can also use custom styles for graphs and Python based report styles, for near limitless customization. Export output data as text or CSV files to easily import into other analysis tools. Load ODTK results into Systems Tool Kit (STK) for further analysis.
- **Robust, well-documented API.** Automate processing in support of large parametric or Monte-Carlo analyses, simplified operator workflows, and lights-out operations. You can use the Component Object Model (COM) or cross-platform support of MATLAB, Python, and C++ integration on Windows and Linux.

/ ODTK Technical Details

/ High fidelity dynamical models

- From the Sun to Mars
- Unlimited size gravity-potential model, solid and ocean tide models, third-body perturbations
- Atmospheric drag with multiple shape and density model selections, plus plugin extensibility
- Solar pressure with multiple shape model selections, plus plugin extensibility
- Impulsive and finite, including low-thrust, maneuver models
- Plug-in point for additional customized modeling

/ Measurement types

- Ground-based, relay-based, and space-based tracking
- Multi-GNSS support including pseudo-range and carrier phase
- Deep Space Network, including DDOR
- Optical navigation
- Geolocation observations/TDOA/FDOA
- Accelerometer

/ Estimation states

- Orbit, force model parameters, thrust correction: multi-satellites and multiple maneuvers
- Tracking system biases, station and GNSS receiver clocks, transponder delay, antenna offsets
- Facility location, troposphere corrections

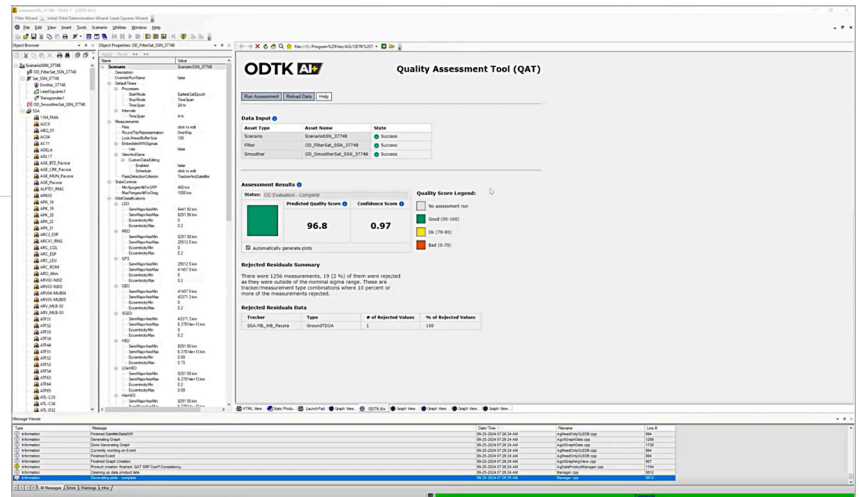
/ Ansys Missions AI+: ODTK Quality Assessment Tool

Challenges. Assessing the quality of an orbit determination (OD) is time consuming, even for an experienced OD expert. And it can be nearly impossible for a non-expert to assess the quality of their orbit solution. The impacts of flawed ephemeris or covariance can range from inefficient processes to catastrophic outcomes:

- **Flight safety.** Getting false conjunction warnings, or *not* getting conjunction warnings when you should, can waste resources and put your spacecraft at risk.
- **Mission success.** As an example, geolocation requires highly accurate ephemeris. If you are kilometers off your planned position, then you won't have the correct angles to provide an accurate real-world location.
- **Cost.** Both cases described above can be very expensive: not only in direct costs but also in wasted or lost resources.

Where we are today. In operations, we see ODTK used in situations that can contribute to low-quality OD products, including:

- Limited OD runs combined with less experienced operators
- High-volume automated OD runs



/ Solving OD Quality Using AI/ML

The first Ansys Missions AI+ capability is the ODTK Quality Assessment Tool. It is an available add-on for ODTK that automatically evaluates the quality of resulting orbits. Combining tuned models with AI algorithms, the tool encapsulates decades of subject matter knowledge and experience and allows analysts to confidently assess the quality of their orbit solutions. Less experienced users also benefit from using the Quality Assessment Tool for critical operational needs and to support the safety of flight routines.

/ QAT Use Cases

- Defense organizations and intelligence communities
- Civil and commercial operators
- Mission planners

/ QAT Key Value Points

- Automate and improve OD quality in organizations with less-experienced operators
- Leverage 30+ years of embedded OD expertise
- Streamline operations with additional automation capabilities, especially organizations managing large fleets



Learn more
[ansys.com](https://www.ansys.com)