

TK Provides Key Risk Reduction for the NASA Kepler Mission

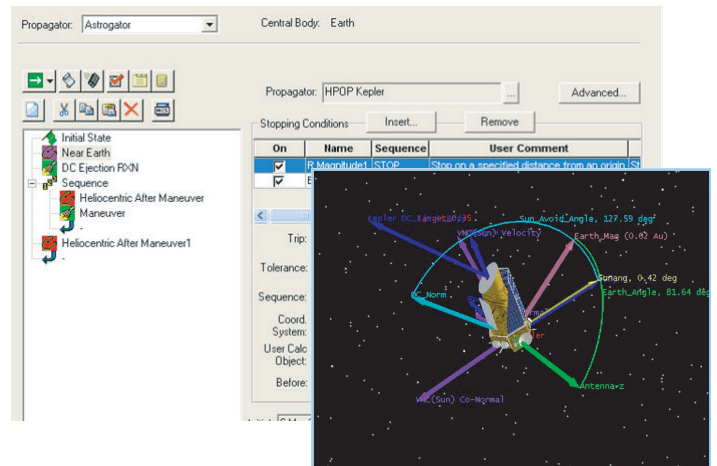
AGI Software Allows for Accurate Trajectory Modeling and Analysis

MISSION IMAGINED: NASA's Kepler Mission uses a highly sensitive photometer to search for Earth-sized planets in or near a habitable zone. The Flight Segment Design and Fabrication Team at Ball Aerospace & Technologies needed to ensure the large, heavy Photometer Dust Cover (DC)—ejected during return—does not strike and damage the Flight Segment (FS). This required Ball to determine the release attitude while meeting power, telecommunication, and sun-avoidance constraints. They also needed to test the validity of the solution against ejection direction/velocity, surface properties, and release date.

MISSION PLANNED: Ball selected STK as the standard trajectory modeling and analysis tool because of its ease-of-use, flexibility, visualization capabilities, accuracy, and familiarity to analysts. STK reduced the cost and time to address this important mission design concern. It did so based on three main capabilities. Providing analysts with the ability to fine-tune DC trajectory estimates during independent validation with customer solutions greatly lowered the risk of errors. At the same time, STK/Analyzer significantly reduced the time and cost of both optimization and Monte Carlo analysis. Finally, 3D visualization provided for simple and accurate visual verification of planned solutions.

"Tailoring STK/Astrogator to match JPL inputs has resulted in a highly accurate STK trajectory model. The Vector Geometry Tool validated antenna, star tracker, and photometer field-of-view constraints—while STK/Analyzer generated carpet plots to optimize release directions and investigated the sensitivity of the DC-FS range to variations in parameters. This reduced the risk that inaccuracy in any one parameter could throw us off the cliff."

— CHRIS ZELLER, SENIOR SYSTEMS ENGINEER,
BALL AEROSPACE & TECHNOLOGIES



For NASA's Kepler Mission, the flight segment design and fabrication team at Ball Aerospace & Technologies needed to ensure an ejected dust cover does not strike or damage the flight segment during long-term return. They selected STK as their standard trajectory modeling and analysis tool for ease-of-use, flexibility, visualization capabilities, accuracy, and familiarity. This allowed them to validate estimates; provide fast, inexpensive optimization; and visualize their results in 3D.

MISSION ACCOMPLISHED: AGI products allowed efficient analysis of a complex problem—saving time and money. In addition, Ball has also used STK for a variety of Kepler mission analyses—including power estimates; telecom range and angles for duration of mission; initial acquisition timing and angles; Deep Space Network station view periods; quarterly roll window optimization; and commissioning attitudes verification.