

A CASE STUDY: NASA GODDARD USES STK/ANALYZER FOR HUMAN LUNAR FAST-RETURN STUDIES

NASA Goddard Space Flight Center

David Folta, aerospace engineer in the Flight Dynamics division of NASA Goddard Space Flight Center, Greenbelt, MD, used STK/Analyzer software to run trade study analysis as part of human lunar fast-return studies.

Challenge

Folta calculated the point at which a spacecraft circling the moon should perform an engine burn so it would use the least fuel when returning to Earth orbit in an emergency. He was interested in two return-trip lengths—one 24 hours, the other, 36. To find a solution, Folta used carpet plots, because they permit the variation of two items over a range and study resulting behavior of other parameters.

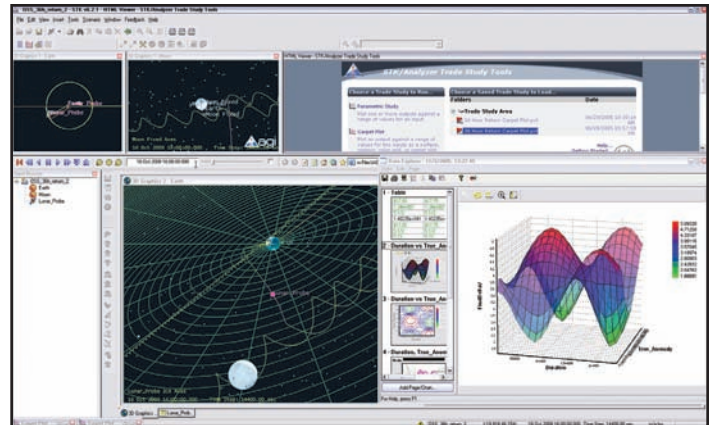
In his planning, Folta chose to use STK/Astrogator with STK/Analyzer because the combination allowed him to perform analysis easily, and more importantly, quickly. For instance, after he designed the mission in STK/Astrogator, STK/Analyzer automatically imported the mission elements for trade-study analysis. In those studies, Folta changed two parameters: True Anomaly (the orbital point where the maneuver was performed), and the length of time the spacecraft circled the moon before the maneuver took place. Because he didn't have to set up his own mathematical equations to run analysis in STK/Analyzer, he estimates the software saved him several days' preparation time. STK/Analyzer's further capability to automatically generate carpet plots saved Folta time over manually exporting data to another program to set up graphs.

Solution

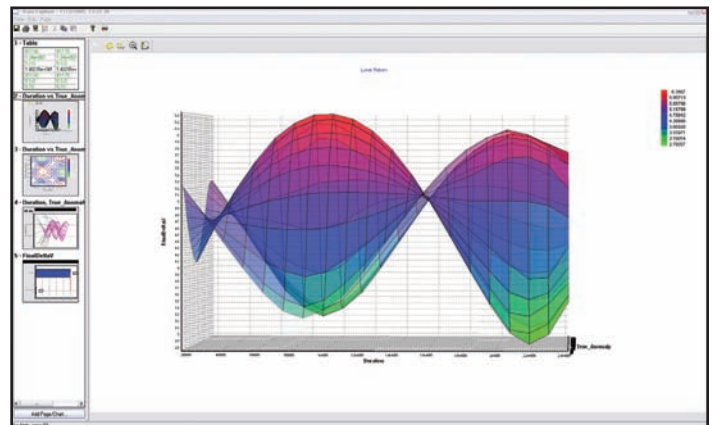
The trade study results showed that over the course of a month, there were days in which delaying the return maneuver greatly reduced the required change in velocity (ΔV). On other days, the maneuver timing had a negligible effect on the required ΔV . These were also the days when the maximum ΔV was needed. By knowing this maximum, Folta was able to set a fuel requirement for fast returns.

Summary

Observations like these, which were made quickly and easily in STK/Analyzer, could one day have a significant impact on human spaceflight. To read more case studies detailing the use of AGI's software technologies, visit www.agi.com/casestudies. STK/Analyzer can automatically import STK/Astrogator mission design elements for rapid maneuver optimization. STK/Analyzer's capability to automatically generate carpet plots save time over traditional techniques.



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