The Spacecraft Simulator

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The Mostly Harmless Simulator

Simulation of GLAST attitude and orbit dynamics
Tailored version of “42: The Mostly Harmless Simulation”
- IGRF 2000 Geomagnetic Field Model
- Jacchia-Roberts Atmosphere Density Model
- EGM-96 Earth Gravity Model (Non-spherical geopotential)
- Non-spherical geoid, third-body (e.g. Sun, Moon) gravity
- Attitude Control Torques
- Visualization using OpenGL graphical libraries

Written by Eric Stoneking, beginning August 6, 2001
Attitude Control in “GLAST 42” approximately models GLAST Guidance Navigation & Control (GNC) flight software. Performs pointing, Sun avoidance, Earth avoidance, solar array pointing, etc. The flight software will be expected to meet performance requirements. 

GNC Software Disclaimer
GLAST 42 Visualization
Visualizing Fields of View, Keep-Out Zones
Spacecraft Commands

Master Input File defines sim parameters, environment
- Sim duration, file output interval
- Date, time
- Order of geomagnetic and geopotential models
- Toggle disturbances ON/OFF

Spacecraft Input File defines spacecraft parameters, initial conditions
- Mass, inertias
- Initial orbit, attitude

Command Input File models Sky Survey, Pointed Observation

Geometry Files define spacecraft as a solid model
- Used for disturbance force/torque calculation and visualization
Simulator Outputs

- Desired quantities written to files at specified intervals
- Position, attitude (RA, Dec), satellite point data
- Easily customizable output commands
Simulator Outputs
Spacecraft Simulator Uses at the

- Exploring Observing Strategies
- Pointed mode vs Scanning mode
- Mode transitions
- Does Not Handle SAA passage
- Auto re-pointing
Conclusions

- Simulator provides a flexible method of determining S/C pointing parameters
- Can provide tables of position and pointing data
- Can take a long time to run