Guidance System and Control System Capabilities

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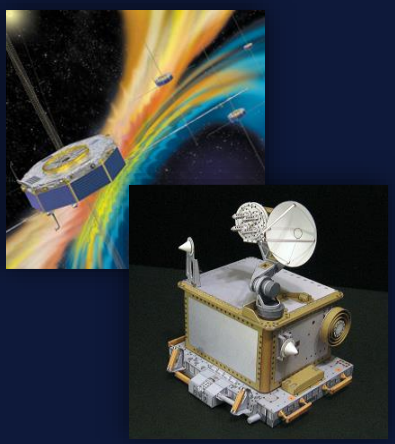
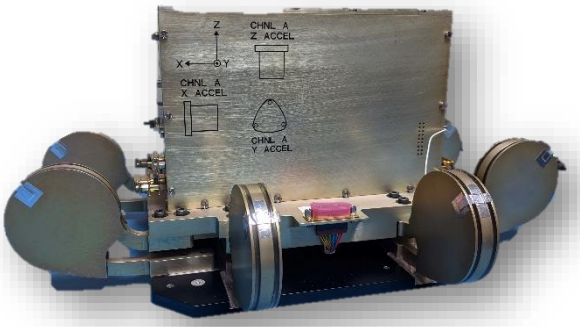
Performance - For the NASA Space Communication and Navigation (SCaN) payload ZIN provided expertise in developing precision pointing control systems including integrated attitude control systems, including sub-arc-second pointing, requiring attitude estimation via star trackers and sensor fusion.

For the NASA Goddard Magnetospheric Multiscale Mission (MMS) Satellite constellation, ZIN developed inertial navigation measurement units. These units provide navigation control data during spin stabilized maneuvers and in the absence of valid start tracker data.



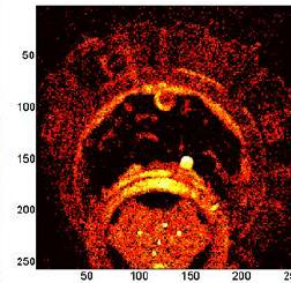


ZIN has delivered its Inertial Measurement Unit (IMU) for the GSFC MMS and MAXAR OSAM-1 missions

Our team is experienced in orbital mechanics simulation. ZIN has demonstrated experience in development of orbital propagation software, LEO orbit propagation, look-angle prediction, access analysis, optical tracking, link line predictions and error dispersion analysis, development, and testing of ground tracking stations. Experience includes the development of system specification and modeling of error propagation into spacecraft trajectories.

Our team has been responsible for the design of various hydraulic servo-control and real-time dynamic simulation control systems. ZIN has developed control systems for Hardware-in-the-Loop ground simulators of rocket engine thrust vector control systems and upper stage rocket dynamics. This included a full simulation of flight dynamics at greater than 100,000 lb and 10Hz onto engine simulators system "flying" flight trajectories. This cascaded control system tested flight actuator and controls laws by imposing external flight forces using faster and more robust actuators and controls.

- **Our team has capabilities in simulation of electro-mechanical and hydromechanical actuator systems, thermal-fluid and pneumatic control systems.**
- **ZIN has experience in MIMO and SISO modern and classical control system design, parameter estimation and model identification, design optimization, stability analysis employing time and frequency domain methods.**
- **We are skilled in the use of commercial simulation codes: Matlab-Simulink and Matlab RTW (Real Time Workshop) Embedded Coder.**
- **Complex mechanical mechanisms are modeled in MSC ADAMS. This work has expanded to modeling one the most complex mechanism: modeling of human kinetics and kinematics using the OpenSim Biomechanics software package.**



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