

REDUCTION OF SATELLITE VIBRATION DUE TO TRANSIENT EVENTS

US Air Force Research Laboratory



PROJECT DESCRIPTION

Stiff and very lightweight satellites with sophisticated optical systems, destined for a particular position in space, are sent into space attached to booster rockets with smaller thruster rockets. Once near the destination, the satellites are commanded to separate from boosters and are then guided into position by the thruster rockets. Initial onset shock, or transient vibrations, caused by the thruster and positioning rockets can reduce the effectiveness of the satellites' optical systems. Given the light and stiff characteristics of the satellites, these vibrations are difficult to damp by ordinary methods.

The RH Lyon Division of Acentech developed a system of actuators and an adaptive signal processing scheme based on robust inverse filtering to be applied to the satellite, which would oppose the transient forces causing unwanted vibrations. We conducted analyses, constructed a model satellite structure, performed lab experiments that showed significant reductions in transient vibrations, and developed an embedded hardware system that implemented the procedures and algorithms.

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Acentech

CONSULTING SERVICES

- Signal processing development
- Vibration analyses
- Model construction
- Hardware system development



Model of satellite truss structure.



Embedded hardware.