

**THERMAL DISTORTION ANALYSIS FOR GOES SATELLITE  
USING MSC/NASTRAN**

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# Thermal Distortion Analysis for GOES Satellite using MSC/NASTRAN

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## Abstract

Distortions of the on-orbit Geostationary Orbiting Environmental Satellite (GOES) due to diurnal and seasonal temperature changes effect the pointing accuracy of the on-board optical instruments (imager, sounder and earth sensor). If the thermal distortion profiles are smooth and repeatable, the pointing errors can be easily accomodated through the image motion compensation system. This paper describes the thermal distortion analyses performed for the GOES satellite mainbody using MSC/NASTRAN. These analyses included transferring temperature data from the TAP thermal model to the MSC/NASTRAN structural model, performing thermal distortion sensitivity studies of the satellite panel-to-panel connections, and calculating diurnal and seasonal distortion profiles of the imager/sounder interface relative to the earth sensor. A FORTRAN program was developed to transfer the temperatures from thermal model to the structural model. MSC/NASTRAN Solution 24 Heat Transfer feature was used to interpolate temperatures among the structural grid points. Results of the connection sensivity study indicated that the assumption of 'pinned' panel-to-panel connection is more conservative than the 'fixed' panel-to-panel connection. Thermal distortion profiles generated for Summer Solstice, Winter Solstice and Equinox were smooth except for the eclipse period of Equinox. These results indicated that the pointing errors due to thermal distortion of satellite mainbody can be easily accomodated through the image motion compensation system.