

HIGH ACCURACY SATELLITE DRAG MODEL (HASDM)

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The dominant error source in the force models used to predict low perigee satellite trajectories is atmospheric drag. Errors in operational thermospheric density models cause significant errors in predicted satellite positions, since these models do not account for dynamic changes in atmospheric drag for orbit predictions. The Air Force Space Battlelab's High Accuracy Satellite Drag Model (HASDM) estimates and predicts (out three days) a dynamically varying high-resolution density field. HASDM includes the Dynamic Calibration Atmosphere (DCA) algorithm that solves for the phases and amplitudes of the diurnal, semidiurnal and terdiurnal variations of thermospheric density near real-time from the observed drag effects on a set of Low Earth Orbit (LEO) calibration satellites. The density correction is expressed as a function of latitude, local solar time and altitude. In HASDM, a time series prediction filter relates the extreme ultraviolet (EUV) energy index $E_{10.7}$ and the geomagnetic storm index a_p to the DCA density correction parameters. The $E_{10.7}$ index is generated by the SOLAR2000 model, the first full spectrum model of solar irradiance. The estimated and predicted density fields will be used operationally to significantly improve the accuracy of predicted trajectories for all low perigee satellites.