

# Drag and Atmospheric Neutral Density Explorer (DANDE)

## *A Program for Drag Environment Research with Small Satellites*

DANDE (<http://spacegrant.colorado.edu/dande/index.htm>) is a 50 kg, spherical spacecraft, 50 cm in diameter, being developed at the Colorado Space Grant Consortium in conjunction with the Aerospace Engineering Sciences department at the University of Colorado, Boulder. The spacecraft will carry a mass spectrometer, wind sensor, and accelerometers in order to collect in-situ measurements of drag and atmospheric properties. These instruments will measure neutral composition, winds, and density in low-earth orbit. Radar tracking will be used in conjunction with this unique in-situ drag data to obtain coefficient of drag measurements between 350 and 100 km.

The mission objectives include improving density and wind models and describing quantitatively how much neutral-wind variations contribute to the drag on satellites. Such research is crucial to a better understanding of the neutral-atmosphere dynamics and to improving our capability to perform precise orbit determination through better modeling. Improved orbit determination has direct benefits to rendezvous operations, tracking, laser communications and other applications.

As the spacecraft will be in orbit with a minimum range of 350km, communications are essential to retrieving data and sending commands to the satellite to complete the experiment. The communications (COM) subsystem onboard the spacecraft is capable of receiving command data from the ground station at a 9,600 baud data rate in the 2m band. It is capable of transmitting science and telemetry data to the ground station at a data rate of 38,400 baud in the 70cm band. Maximum transmit power from the spacecraft is 6W.