

Telemetry, Tracking & Control (TT&C) Through Commercial LEO Satellites

Abstract for ITC 2001 GPS/DGPS Applications

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Personnel from the Goddard Space Flight Center Wallops Flight Facility (GSFC/WFF) in Virginia have successfully tested commercial LEO communications satellites for sounding rocket, balloon and aircraft flight TT&C. The Flight Modem became a GSFC/WFF Advanced Range Technology Initiative (ARTI) in an effort to streamline TT&C capability to the user community at low cost. Ground tests of the Flight Modem verified duplex communications quality of service and measured transmission latencies. These tests were completed last year and results reported in the John Hopkins University (JHU) Applied Physics Laboratory (APL) 4th International Symposium on Reducing Spacecraft Costs for Ground Systems and Operations. The second phase of the Flight Modem baseline test program was a demonstration of the ruggedized version of the WFF Flight Modem flown on a sounding rocket launched at the Swedish rocket range (Esrange) near Kiruna, Sweden, with results contained in this paper. Aircraft flight tests have been and continue to be conducted. Flights of opportunity are being actively pursued with other centers, ranges and users at universities. The WFF Flight Modem contains a GPS receiver to provide vehicle position for tracking and vehicle recovery. The system architecture, which integrates antennas, GPS receiver, commercial satellite packet data modem, and a single board computer with custom software, is described. Small satellite use of the WFF Flight Modem is also being investigated.

The Flight Modem provides an independent vehicle position source for Range Safety applications. The LEO communication system contains a coarse position location system, which is compared to GPS accuracy. This comparison allows users to determine the need for a GPS receiver in addition to the satellite packet data modem for their application.