DMSP Block 5D-1 Computer Controlled Spacecraft

Lt. Col. Stephen M. McElroy [1]
Louis Gomberg [2]
Roger Te Beest [2]

Abstract

The Defense Meteorological Satellite Program (DMSP) Block 5D-1 satellite is the first of a new generation of DMSP long life satellites to utilize onboard programmable computers for spacecraft control functions. During ascent and orbit injection the computers perform the navigation, guidance, and control functions autonomously; during on-orbit operations, they perform attitude determination and control, command and control, and miscellaneous other control functions, with only modest interaction from the ground.

Four DMSP Block 5D-1 satellites employing these computer controls are currently on orbit and operational. On-orbit experience shows that performance has exceeded all expectations with respect to reliability and satellite life-time. In addition to providing the control functions for which they were designed, the computers have provided additional benefits by allowing the control systems to be reprogrammed from the ground to overcome hardware failure and degradation in other on-board components.

This paper describes the DMSP mission, gives a brief overview of the integrated spacecraft system configuration, and provides the details of the control systems used in the various mission phases. The hardware and software portions of the control systems are described and some examples are provided showing how the reprogrammable capability allowed several orbital anomalies to be overcome and satellite life extended.

[1] SAMSO, Los Angeles, CA

[2] RCA/AED, Hightstown, NJ