

SPACE OPERATIONS SYMPOSIUM (B6)
Training Relevant for Operations (3)

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DYNAMIC SATELLITE SOFTWARE SIMULATOR – A TRAINING TOOL

Abstract

Dynamic Satellite Software Simulator (DSSS) is a training and testing tool for the Satellite Operators working in Spacecraft Control Centre for different phases of spacecraft lifecycle. It is also used to check the adequacy of the satellite operating procedures and to validate the ground systems. The satellite software simulator simulates the functions of the entire spacecraft system using software modules and provides a realtime simulated scenario of the operational environment. It mathematically models the spacecraft dynamics as realistically as possible with the characteristics of geostationary communication satellites using a momentum-biased three-axes stabilization control technique. DSSS provides near realistic functional behavior of the satellite system as a whole with various sub-systems such as ADCS, Sensors, Inertial Systems, Power, Thermal, Telemetry, TeleCommand Processor Orbit simulation. All software modules of DSSS run in real-time, simulate the spacecraft behavior, accept telecommands from Spacecraft Control Center and provide realistic response. In addition to the sub-system modeling, several novel features have been incorporated which facilitate extensive and efficient utilization of the simulator. It can run in real time environment or Fast Forward mode providing features like Hold, Pause, Skip, Reinit, Sync and so on. Simulation can be started with default subsystem configuration; facility is also provided to the user to change the existing configuration at any point before or during the simulation. Delivered States for all mission phases have been pre-defined to match with the expected spacecraft configuration attitude in that phase; any one of the nine delivered states can be selected by the user to start the simulation. Breakpoint feature preserves the state of the simulator during any progressing simulation; created breakpoints can be selected by user for use in later simulations. Real time utilities are provided for display and plotting of simulated engineering values. Telemetry Data storage, Offline

plotting and display are also provided. Fault detection isolation and reconfiguration (FDIR) functions are also modeled. Generated Telemetry parameters can be forced to user-defined values. Failure simulations (pre-defined) to handle contingency conditions are also modeled. DSSS has been realized, tested and being extensively used. This paper presents the features, design and architecture, subsystem modeling and applications of the DSSS.