SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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FLIGHT DYNAMICS AUTOMATIONS TO SUPPORT NEXT GENERATION OF SDARS SATELLITE OPERATIONS

Abstract

Satellite Digital Audio Radio Services (SDARS) became an operational reality for North America in the year 2000, and is now in the process of bringing online its second generation of satellites. The next generation satellites are larger, more powerful, and deliver a higher level of service availability to the SDARS customers. SIRIUS XM will launch its eighth satellite and put it into operations in mid-2009, and currently plans to launch its ninth satellite as an on-orbit spare toward the end of 2009.

Space Systems / Loral built both of these new satellites based on the LS-1300 bus series. Both will operate in geostationary orbits, and will be operated by SIRIUS XM Satellite Operations. Along with traditional chemical propulsion, these satellites employ low thrust, ion propulsion for station keeping. Due to the very low thrust of ion propulsion, the satellites will require multiple maneuvers per day, many lasting on the order of an hour or more. Daily maneuver planning, monitoring, and evaluation of these maneuvers will place a significant operation burden on the operations staff unless some level of automations is implemented. To this end, SIRIUS XM contracted Integral Systems, Inc. to provide a turn-key automations system for all flight dynamics functions, from orbit determination, to maneuver planning, to maneuver upload and verification, to maneuver monitoring, and finally to maneuver evaluation and propellant mass tracking. The system must also be able to transition from one cycle to another as the process continually repeats itself.

This paper will address the technical design and architectural considerations of the system, including automation methods, system administration needs, redundancy, flexibility, reliability, error recovery, and ease of use. The paper will go on to consider staffing considerations, advantages and risks of fully automated systems, as well as early lessons learned from the first few months of the automations implementation. Finally, the paper will address other future possible applications of the system above and beyond flight dynamics, such as diagnosis of spacecraft anomalies and automated responses.