

IAF SPACE OPERATIONS SYMPOSIUM (B6)
New Space Operations Concepts and Advanced Systems (2)

Author: Mr. James Joseph Shawe
Aistech Space, Spain

Mr. Josep Pino
Aistech Space, Spain
Mr. Marc Ortega Playà
Aistech Space, Spain

AISTECHSAT-2 AND AISTECHSAT-3 UHF TELEMETRY AND PAYLOAD DATA RELIABLE VS
UNRELIABLE CHANNEL EFFICIENCY DURING NOMINAL OPERATIONS**Abstract**

Satellite communications in the UHF band are the most widely spread in the new space sector due to their extended in-orbit testing, easy implementation in ground and relatively inexpensive hardware. The technology also carries significant limitations in terms of performance, for instance, low bitrates challenge operations teams with slow downlink and uplink speeds, severely limiting the performance of each pass. The choice of using either reliable or unreliable transfer protocol will have an impact on the output of valuable data from the nanosatellites. A reliable connection ensures all data packets transmitted/received arrive at their destination only constrained by overhead data needed to ensure completeness of transmission and bidirectional use of link in a half-duplex system. An unreliable connection is broadcasting the data without any overhead and therefore some data might be lost during transmission.

Aistechsat2 and Aistechsat3 nanosatellites were injected into sun-synchronous orbits by two different launch vehicles, Falcon-9 and PSLV, at diverse altitudes and LTDN. The paper takes into consideration not only these orbital variables, but the hardware and software differences as well. The same transceiver was integrated in both nanosatellites, but the UHF antenna was modified between the two nanosatellites to increase its link performance. The flight software and data handling architecture varied between the two nanosatellites as well affecting their communication efficiency. Aistechsat-2 implemented RDP and FTP reliable protocols to transfer telemetry and payload data to ground while Aistechsat-3 only implemented FTP as a reliable protocol. Both nanosatellites, though, can also be operated using unreliable connections.

This paper compares the implementation of reliable and unreliable transfer protocols in Aistechsat-2 and Aistechsat-3 nanosatellites, respectively, with the aim of determining the most suitable communication method for their nominal operations and follow on nanosatellites of the constellation. The results of this paper have taken into account the probability of loss of data packets and maximum data transferred during a ground pass as performance indicators.