

# **From Napkin to Orbit in 9 Months; The TechEdSat Spacecraft Mission**

Aaron Cohen, Nicholas Hoppins, Greenfield Trinh  
*NASA Ames Research Center, M/S 202-3, Moffett Field, CA, 94035*

Jan Schulte, Fredrik Bruhn, Henrik Löfgren, Per Selin  
*ÅAC Microtec AB, 751 38 Uppsala, Sweden*

**The TechEdSat spacecraft mission saw one of the fastest turn around times for concept through launch of a CubeSat. On 26 October 2011, John Hines sketched on a brown paper napkin the outline for which components would be in this 1U CubeSat, and how they would be stacked; 269 days later that spacecraft launched from Tanegashima Space Center aboard the HTV-3 ISS resupply mission, with a total development time of only eight months. TechEdSat was among the first of five CubeSats deployed from the ISS. The goals of the TechEdSat mission were to explore the use of the Space Plug-n-Play Architecture (SPA) in a CubeSat, and to evaluate Commercial Off The Shelf (COTS) space-to-space communication solutions. TechEdSat featured an array of processors from ÅAC Microtec including four NanoRTU's and the RTULite main processor, all communicating using the SPA-1 protocol. TechEdSat featured two primary payloads: an Iridium 9602 Modem, and a Quake Global Q1000 OrbComm modem. After a successful deployment on 4 October 2012 from the ISS, over 2000 packets of 122 bytes each (250 kB total) were received in the first four months of the mission. In this paper we discuss the challenges to rapid CubeSat development, the experience of having a CubeSat approved for deployment from the ISS, the ongoing results of the mission and lessons learned.**