SYMPOSIUM ON INTEGRATED APPLICATIONS (B5)
Tools and Technology in Support of Integrated Applications (2)

Author: Mr. Yuval Brodsky
European Space Agency (ESA), Israel, yuval.brodsky@gmail.com

Mr. Tom Nordheim
International Space University (ISU), France, tom.nordheim@gmail.com
Mr. Richard Rieber
International Space University (ISU), United States, richard.rieber@masters.isunet.edu
Ms. Katarina Eriksson
International Space University (ISU), Sweden, katarina@markadesign.se

BALLOON-BORNE AIR TRAFFIC MANAGEMENT (ATM) EXPERIMENT AS A PRECURSOR TO SPACE-BASED ATM

Abstract

The International Space University Balloon-borne Air Traffic Experiment (I-BATE) can play a critical role in the future of global Air Traffic Management (ATM). The experiment seeks to track aircraft from an altitude of 30 kilometers in real-time by receiving the Automatic Dependant Surveillance-Broadcasting (ADS-B) signal transmitted from these aircraft. This experiment serves as a precursor to flying ADS-B technology in Low-Earth Orbit (LEO), where a constellation of satellites carrying ADS-B receivers can provide global ADS-B coverage. The results of the experiment will be of interest to policy-makers and to the space and aviation industries.

Presently, ATM is conducted primarily by tracking aircraft using ground-based radar stations within national controlled airspace. Aircraft outside of controlled airspace and those on trans-polar and trans-oceanic routes are therefore not tracked for those portions of their flights. Catastrophes such as the loss of Air France flight 447 on 1 June 2009 over the Atlantic Ocean could have significantly different outcomes with a global ATM system in place, such as a constellation flying ADS-B receivers in LEO.

The European Union has realized that the current ATM framework is rapidly becoming inadequate and has launched a program called Single European Sky (SES), which will re-examine the current legal framework, best practices and procedures, and establish a consolidated, Europe-wide ATM scheme. Part of this program is the Single European Sky ATM Research (SESAR) program, which will provide all of the technical solutions and innovations for the SES program. I-BATE's work ties in closely with the work being done by SESAR, and there is a potential for collaboration.

I-BATE will fly an ADS-B receiver for approximately five hours at an altitude of 30 kilometers on-board a high-altitude balloon BEXUS (Balloon-borne EXperiment for University Students) program in October 2010. I-BATE will receive ADS-B broadcasts from aircraft within a 500 km radius. Each ADS-B packet is transmitted from aircraft at 1 Hz and contains vital flight data such as the aircraft's identification, GPS position, velocity vector and intent. The data will be down-linked and aircraft will be tracked in real-time using a variety of software solutions; including a Geographic Information System (GIS) which will provide a new set of capabilities and added value to ground controllers, particularly in the event of any anomalies during flight. In the future, other aircraft flight systems can be interfaced with ADS-B transmissions to provide ground controllers with the operational status of onboard systems.