

IAF SYMPOSIUM ON INTEGRATED APPLICATIONS (B5)  
Integrated Applications End-to-End Solutions (2)

Author: Dr. Jesús Gonzalo  
University of León, Spain

Dr. Enrique Acebo  
University of León, Spain

## INTEGRATION OF HIGH ALTITUDE PSEUDO-SATELLITES (HAPS) IN THE SPACE ECOSYSTEM

**Abstract**

Both fixed-wing and lighter-than-air High Altitude Pseudo-Satellites (HAPS) are close to become operational. A thoughtful study has been carried out to identify the most promising applications from the commercial point of view and their integration in the current space remote sensing and communications space ecosystem. HAPS provide unprecedented persistent remote sensing with very high resolution. Besides, their long endurance in near space enables the provision of long-term services similar to satellites. Besides, short range from ground stations and clear upwards view to space ease the communication link budgets. Although with limited coverage, HAPS also offer certain mobility and payload interchangeability. In this near-future scenario, HAPS can complement and multiply the capabilities of current space based assets. The presented trade-off analysis shows wide market niches in sectors such as security, maritime, emergency management, local planners and agriculture, with both private users and governmental bodies behind this interest. Besides, the availability of a HAPS platform widens opportunities for the provision of Earth observation based on GNSS signals, both reflectometry and radio occultation. Optical communications, with all its advantages, are also prone to HAPS as a mean to solve atmospheric transmission issues. The paper discusses advantages and drawbacks of HAPS with respect to satellite data providers, developing scenarios where synergy is profitable, such as surveillance and maritime applications. For these applications, cost-benefit analysis is presented and a mission concept is proposed, identifying critical aspect of aerostatic and aerodynamic solutions. Trade-off studies prove that, being both options feasible, they offer a quite different set of performances. Current HAPS initiatives are analysed, together with their development roadmap for the next years. The final conclusion is that space-based application suppliers need to rapidly accommodate HAPS applications in order to complement or augment their current service portfolios to capture new market niches or to widen existing ones.