

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)  
Space-Based Navigation Systems and Services (2)

Author: Dr. Norbert Frischauf  
SpaceTec Partners SPRL, Belgium

Dr. Manfred Wittig  
European Space Agency (ESA) retired, The Netherlands

Mr. Bertram Arbesser-Rastburg  
ex-ESA/ESTEC, The Netherlands

Prof. Otto Koudelka  
Graz University of Technology (TU Graz), Austria

Ms. Carmen Aguilera-Rios  
European Union Agency for the Space Programme (EUSPA), Czech Republic

Mr. Mike Rampey  
Parhelion Aerospace GmbH, Switzerland

INTRODUCING SBAS SUPPORTED PRECISION APPROACH PROCEDURES IN THE GENERAL  
AND BUSINESS AVIATION WORLD - WHAT DOES IT TAKE TO ACHIEVE A LASTING EFFECT?

**Abstract**

Air transport has become an indispensable part of our modern civilisation. Today there are about 15,000 commercial aircrafts in operation and about 31,000 are envisaged for the year 2030. This growth is fueled by surging passenger numbers - with recent predictions calling for 220 million airline passengers per year in 2029, while 2009 featured 'only' 80 millions. At the same time, 250,000 General Aviation (GA) aircraft provide for another substantial number of movements in the air; movements that need to be controlled and coordinated to ensure safety and to avoid congestions.

Guiding an airplane from A to B under all weather conditions requires Air Navigation Systems (ANS). ILS, NDBs, VORs are proven systems, however they represent also expensive infrastructures and smaller airports cannot readily afford such systems, since they have difficulties offsetting the related CAPEX and OPEX with their low passenger numbers. GPS, GLONASS and Galileo provide a way out of that cost issue – provided that they can ensure a Safety-of-Life (SoL) service. Such a service provides a constant feedback loop to the GNSS user telling him whether the satellite navigation signal is reliable to enable safe flight navigation and landings. EGNOS, WAAS, GAGAN, MSAS and SDCM are all representatives of such Space Based Augmentation Systems (SBAS), providing an SoL-service to the various GNSS services. Developed in the last two decades, these systems have recently reached a stage of maturity; consequently more and more airports adopt their approach and landing procedures to facilitate SBAS-supported Approaches with Vertical Guidance (APV).

To have a lasting effect in the aviation world however, it will be necessary to not only upgrade the airports to feature SBAS approaches but also to introduce SBAS in the airborne part. This calls for IFR training and raising "SBAS awareness" within the GA and Business Aviation (BA) sector, as these communities are the biggest winners of the new approach classes.

This paper examines the current status of the different SBAS based approaches and what is required to increase the adoption in the GA and BA sector. An analysis of the driving user requirements, associated constraints and trade-offs will be undertaken to point out important considerations, which need to be respected to achieve a lasting effect. Due to the global character of SBAS, the insights gained will not only

be of great value for EGNOS but will also help to support the adoption of WAAS/GAGAN/MSAS/SDCM in the respective region.