Foreword

Airborne Separation Assistance System (ASAS)

Ever since the start of aviation, pilots have dreamed about knowing the positions and intentions of surrounding traffic, as this information is essential to safely conduct their flights. A new affordable technology called ADS-B (Automatic Dependent Surveillance – Broadcast) is now available for civil pilots to enhance the rudimentary Flight Information Services now relayed to them by air traffic controllers.

It is possible to discuss forever the pros-and-cons of a top-down approach or a bottom-up approach. Or should the technologies of communication, navigation, and surveillance (CNS) precede the operational procedures of air traffic management (ATM)? There is no single right approach. To avoid dead-ends or failures to act, the solution seems always to be pragmatic and to find a balance between the two approaches.

The Airborne Separation Assistance (ASAS) concept was proposed to ICAO in March 1995. The overall idea has always been to improve ATM operations through a greater involvement of pilots in cooperation with air traffic controllers. The range of ASAS applications is very wide, from the use of cockpit traffic displays enhancing visual operations to more autonomous aircraft operations. There is no “ASAS concept” per se; ASAS and its operational applications are only components of the overall ATM system. ASAS applications are designed to be fully integrated into ATM operations, and most of them involve the active cooperation of air traffic controllers and pilots.

Taking advantage of several years of research and development work, Action Plan 1 of the FAA/EUROCONTROL R&D Committee released the document Principles of Operations for the Use of ASAS in June 2001. After considering several aspects (i.e. conceptual perspective, operational procedures, human factors, aircraft systems, enabling technologies, users’ perspectives and implementation), four ASAS application categories were defined: 1) Airborne Traffic Situational Awareness applications, 2) Airborne Spacing applications, 3) Airborne Separation applications and 4) Airborne Self-separation applications. This classification is now used worldwide by the R&D community and industry because it allows addressing the full range of ASAS applications and also focuses the issues to be resolved.

Because airspace users wanted some benefits to materialise and because industry was willing to propose solutions, all ATM stakeholders worked together within the scope of CARE/ASAS (Co-operative Actions of R&D in EUROCONTROL/Action on ASAS). A document Description of a first package of GS/AS (Ground Surveillance/Airborne Surveillance) applications was delivered in September 2002. It was a pragmatic approach trying to identify applications suitable for an early implementation and capable of providing operational benefits. This first package of operational applications, known as Package I, includes ASAS applications from the two first ASAS application categories, and also ground surveillance applications. All these GS/AS applications are enabled by ADS-B, and their grouping was necessary because they are going to be supported by the same aircraft ADS-B system.

Package I is a challenging first step, and future packages are envisaged to include ASAS applications from the two last ASAS application categories. These categories are much
more demanding because they require the definition of airborne separation minima based on the CNS capabilities of the aircraft, and the transfer of separation tasks from air traffic controllers to pilots.

*Package I* was proposed by both EUROCONTROL and the FAA at the 11th ICAO Air Navigation Conference in September 2003. The Recommendation 1/7 of the Conference on “Ground and airborne automatic dependent surveillance-broadcast (ADS-B) applications for global interoperability” includes the following statement: “*ICAO and States support the cost-effective early implementation of packages of ground and airborne ADS-B applications, noting the early achievable benefits from new ATM applications.*”

Before going to the core of this special issue of the *Air Traffic Control Quarterly* on ASAS, it is also necessary to highlight the document *Safety and ASAS applications* developed by Action Plan 1 (March 2004). It provides guidance on how to develop safe applications and on how to test for their level of safety. Guidelines jointly address safety and human performances.

The above background information may give the impression “Yet another ATM concept.” To illustrate the scope of real effort in this field, five papers have been selected for this special issue. The selection criteria included “real achievements for short/medium-term applications” but please consider that this is just a snapshot of an overall picture.

The first paper, titled *Traffic Awareness for General Aviation*, is related to flight trials performed with General Aviation aircraft equipped with a cockpit display of traffic information. Data indicates that detection probability of traffic is increased significantly. Technical limitations as well as areas of improvement are identified. How the pilot is going to manage these new functions raises some safety concerns.

The second paper, *Spacing instructions in approach: A stepwise design*, describes how new instructions called “spacing instructions”, initially developed for en-route sectors to manage arrival flows of traffic, were applied in approach. Based on a series of real-time simulations, clear benefits are identified related to safety, efficiency, flexibility and (potentially) capacity and environment.

The third paper, *A Time-Based Airborne Inter-Arrival Spacing Tool: Flight Evaluation Results*, presents the flight evaluation of a tool to support the pilots performing spacing instructions. Following evaluations in a full mission engineering B757 simulator, flight trials were performed at night in an operational environment at the Chicago O’Hare International Airport. Considering this complex phase of flight, delivery precision at the runway threshold is excellent.

The forth paper, *ASAS – From Concept to Reality*, reports on flight trials performed within a European Commission project led by industry. There are technical retrofit solutions to integrate ASAS functions on board transport aircraft. Assistance was provided to pilots to perform “pass behind” or “merge behind” manoeuvres. The conclusion of the paper is clear “The technology works, we now need the will to implement it.”

The fifth paper, *Integrated Air/Ground System: Trajectory-oriented air traffic operations, datalink communication, and airborne separation assistance*, provides a new approach to the modernisation of the ATM system. Instead of viewing trajectory-based ATM, data link communication and airborne separation assistance as competing approaches, they should be considered as complementary components of a true integrated air/ground system. This is the result of several years of research. It is the authors’ opinion that “new investments in modernisation may render disappointing returns, if the ground systems, the airborne
systems and the communication infrastructure are not compatible with a common concept of operations.”

A single special issue of the *Air Traffic Control Quarterly* on ASAS cannot cover all the topics. Future issues and future papers will address longer-term ASAS applications and operations, especially those establishing airborne separation minima. Work is on-going on both sides of the Atlantic.

As a conclusion, I would like to react to the common feeling that “R&D is not delivering.” Rather, I suggest that ASAS is a contrary example. Indeed, starting in 1995 with a concept paper, the R&D community succeeded in delivering major documents, to perform credible validation work and to propose a path towards implementation. This has been possible with the active participation of industry people, pilots and air traffic controllers, and many others. Of course, this is not the end of the road but ASAS is not just a buzz word. It should be taken seriously by ATM decision-makers because it can significantly contribute to a better ATM system.

While you are reading this special issue of the *Air Traffic Control Quarterly* on ASAS, experts from EUROCONTROL, FAA, EUROCAE, RTCA, Australia and Japan are working within the scope of the Requirement Focus Group to harmonise Package I applications for global interoperability.

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