

Moving aviation towards a 21st-century communications system

COMMUN

Jacky Pouzet, Head of the Communications and Frequency Coordination Unit at EUROCONTROL, explains what the aviation community needs to do in order to create a global and interoperable 21st-century communications system for both civil and military, manned and unmanned aircraft.

A KEY ATM ENABLER

The need to communicate with pilots to ensure that flights take place in a safe manner dates back to the very early stages of aviation. Up to the end of the last millennium, voice communication was a key tool for managing air traffic and passing information and instructions between air traffic controllers and pilots.

THE NEED FOR CHANGES

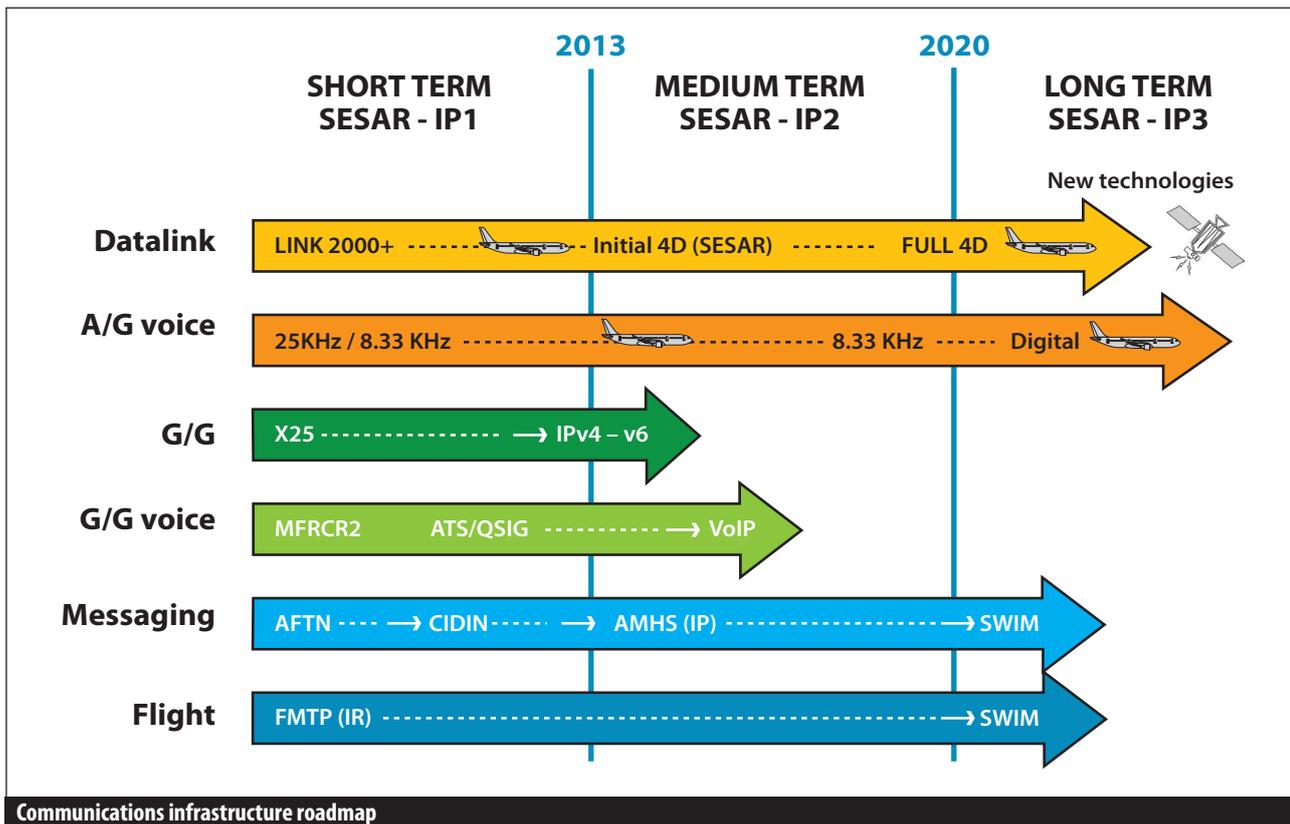
However, as traffic has increased beyond expectations, this form of communication has now reached operational limits in some of the more busy areas. To solve this problem, the aviation community has developed and started to implement digital data communication to support and, probably at later stage, replace the voice as the principal means of communication. Not surprisingly, such a paradigm shift requires operational changes, and also creates technical and institutional challenges related to the safe implementation of a harmonised and

coherent system which can operate in parallel with the existing infrastructure and ensure a smooth transition at local, regional and global levels.

ONGOING CHANGES

EUROCONTROL, in conjunction with all of its aviation partners, is supporting the move towards the future communication infrastructure, primarily in the context of SESAR. This new communications infrastructure requires changes as illustrated in the following picture. The main elements of these changes are described in more detail in subsequent articles.





Moving aviation towards a 21st-century communications system (cont'd)

SELECTING THE APPROPRIATE TECHNOLOGIES



The main change which will bring about increases in safety and capacity is enhanced airborne and ground system co-ordination. The target, as described in the SESAR concept of operation, is to move to full 4D trajectory management in an incremental step-by-step way. This will be achieved through LINK 2000+, initial 4D and full 4D implementation. Full 4D will require root-and-branch adaptations to operations and technology in order to bring the appropriate air-ground link capacity in all the different airspace areas – airport, TMA, en-route, polar and oceanic. Not surprisingly, in view of SESAR, the selection and development of the required technology is taking place in Europe. However, this critical work is being closely coordinated with the US Federal Aviation Authority (FAA) and ICAO (International Civil Aviation Organization). Furthermore, these new technologies will have to support both air traffic management (ATM) and aeronautical operational control (AOC) communications, both of which also require more capacity. Other articles on datalink, future communications infrastructure and AeroMACS cover this process in more depth.



Today, voice is still the main link between airborne and ground ATM systems. In the face of increasing capacity demand, more communication channels need to be found as the VHF-COM band has reached its limits and has become congested. To bring additional capacity in that band, 8.33 kHz channelisation and efficient frequency management are required. Potential digital voice will come later, if required.



MODERNISING GROUND/GROUND COMMUNICATION



Current ATM ground/ground communication (voice and data) is dependent on legacy technologies that need to be updated to meet future capacity. The migration from X25 to Internet protocol (IP) has started with the pan-European network service (PENS), while voice communication will migrate onto voice over Internet protocol technology (VoIP). IP and VoIP are now ICAO standards and will allow more flexible and cost-efficient communications. Industry has followed these lines with products that are (or will soon be) readily available off the shelf.



Ground messaging and flight plan (FPL) exchanges have also been standardised for global harmonisation with modern technologies, and the current AMHS (ATM messaging) and FMTP (flight message transfer protocol) processes are covered by this standardisation. The next challenge will be interconnection of the messaging between all the stakeholders (mainly airlines, airport and military systems) in order to exchange 4D trajectory data rapidly. In the future, all these applications will have to be embedded in SWIM (system-wide information management).



ENSURING A SMOOTH MIGRATION

Implementing new concepts and technologies in aviation takes time, particularly if it requires retrofitting equipment as a mandatory activity. The most complex challenge which all the actors will have to confront is implementing the new technologies and systems so that they are able to operate with legacy systems. This will have to be done through a smooth transition, and a typical example of such a challenge will be the successful migration towards SWIM.

THE NEED FOR GLOBAL STANDARD DEVELOPMENTS

Obviously, changes to a new ATM system on such a major scale cannot be made in isolation. Coordination at global level is therefore of paramount importance. Consequently, ICAO will have a key role to play in developing clear and concise standards for these new communication systems. Recent experience in IP standardisation, for instance, has shown that the overall standardisation time can be contained and even reduced by reusing industrial standards.

INCREASED CIVIL-MILITARY COORDINATION

So far, the civil and military communities have developed technologies on their own. This cannot continue, and in the future there will be a need for both sectors to coordinate their development activities in order to ensure global operation with a minimum of disparity together with global harmonisation across all the airspace. Moreover, the unmanned aerial vehicle (UAV) community will also have to coordinate their activities.

RATIONALISATION OF CNS TECHNICAL SYSTEMS

CNS (communications, navigation and surveillance) technical systems all share a common resource: the frequency spectrum. In addition, technology is evolving, and hard-coded CNS systems are gradually being replaced by software-based systems, opening new areas for development. The technology of the software defined radio (SDR) is now offering the potential for integrating several CNS systems in the same piece of radio

equipment. These technologies are opening up new paths which need to be exploited in the context of SESAR, with the objective of defining the number of "boxes" required on board the aircraft and on the ground in order to perform CNS functions.

CHALLENGES

As future ATM concepts will be based on key enablers such as communications, it is important to modernise the COM technologies used in aviation in order to meet future challenges.

Key projects such as LINK 2000+, PENS, FMTP, ATM messaging and 8.33 which are already in progress will have to be completed. However, they will need to incorporate developments to meet the new ATM application demands, and this will in turn require wider secured communication systems interconnection to all the ATM actors across the air navigation service provider, airline and airport domains. These independent systems will have to converge to become a global standardised interoperable system. EUROCONTROL will be working together with its partners to make this happen. ■

