

ICAO set about this by first evaluating wartime communication and navigational devices and technologies that might be adaptable to civil needs. And the result of this early work was a global air navigation system which, from the point of view of safety, regularity and efficiency, has given excellent service for over 40 years.

While, of course, there have been periodic upgrades and enhancements over the years as civil aviation has improved, it is agreed in the industry that the system has, in many ways, reached its limit for expansion.

Numerous studies conducted by ICAO indicate that the present system has reached saturation in many areas of the world and offers very little prospect for future growth. Also that the inherent limitations in the present technology and its lack of coverage do not permit the full use of automation that exists both on the ground and in the air.

They also indicate that the lack of real-time information and processing in some areas requires the use of procedural methods of air traffic management, methods which have inherent inefficiencies.

AVIONICS ADVANCE

Over the decades, a large part of the work of ICAO has been the standardization of radio systems so that aircraft from any country can fly anywhere in the world. All using the same avionic (aviation electronic) equipment, regardless of the curvature of the earth, the propagation limitation of radio signals, and other problematical geographical features.

Since the 1940s, avionics has taken the form of radio, radar and navigational aids such as **LORAN**, a word derived from long-range navigation, which is a family of radio navigation systems that determines position by measuring the difference in the times of reception of synchronized pulse signals from two or more fixed transmitters.

Since the 1960s, avionics has been supplemented by sophisticated inertial guidance equipment and techniques, all of which combine to ensure that aircraft crews have no difficulty in knowing where they are and how to reach their destination.

While the system more than ensures an adequate level of safety, it does so, however, at the expense of the most efficient flight profiles and system capacity. For in general, flights must be planned via intermediate way-points rather than on the most direct routes and there is limited opportunity to make changes to the cleared flight profiles.

This, in turn, has an adverse effect on aircraft operating costs in terms of longer flights and greater fuel consumption, congestion and delays in some areas as all aircraft are using the same routes, and wear and tear on equipment.

ICAO estimates that the cost of implementing and operating a satellite-based system would total no more than that currently being incurred and that the global benefits would reach some \$5 billion annually. The Organization also stresses that savings in fuel, time and equipment could be passed on to the travelling public.

FANS FORMED

It was in 1983 that the Organization established a Special Committee on Future Air Navigation Systems, known as **FANS**. Its task was to study technical, operational, institutional and economic questions, identify and assess new concepts and new technology, and make recommendations for the coordinated evolutionary development of air navigation into the 21st century.

This committee completed its work in 1988, having determined that the problems and limitations of the present system, which is totally dependent upon radio signals, are intrinsic to the system itself and cannot be overcome on a global scale. Also that new concepts and new CNS systems are required, which will in turn support future air traffic management (**ATM**).

Moreover, it specifically identified satellite technology as the basis of the air navigation system of the future.

FANS II

Following 10 years of study, **FANS** made recommendations in the Fall of 1993, calling for the development of this global navigation satellite system (**GNSS**) as an element of the **CNS/ATM** Systems Concept.

CNS/ATM will use advanced satellite, computer, data link and flight deck avionics technology applications under a co-ordinated plan to make obsolete much of the expensive ground-based equipment currently in use.