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ELEVENTH AIR NAVIGATION CONFERENCE

Montreal, 22 September to 3 October 2003

Agenda Item 1: Introduction and assessment of a global air traffic management (ATM) operational concept
1.1 The global ATM operational concept
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INTEGRATING GENERAL AVIATION AND AERIAL WORK INTO THE GLOBAL CNS/ATM CONCEPT

(Presented by the International Council of Aircraft Owner and Pilot Associations (IAOPA))

SUMMARY

Communications, navigation, and surveillance/air traffic management (CNS/ATM) systems are intended to accommodate the needs of all airspace users, including general aviation (GA) and aerial work (AW) operations. Yet, airspace design, aircraft equipment requirements and operational procedures sometimes ignore or unintentionally exclude the needs of GA/AW operators. While CNS/ATM systems must be designed to provide services to the majority, user provisions must also be made to accommodate the needs of GA/AW operators as well. This may be accomplished by instituting procedures and employing technology that will permit access to valuable airspace segments without either unnecessarily excluding GA/AW operations or requiring equipment effectively excluding them.

Action by the conference is in paragraph 3.

1. INTRODUCTION

1.1 When the name *general aviation* is mentioned most members of the public conjure up a mental image of a small single-engine piston-powered aircraft, operating for recreation out of a small rural aerodrome. This image is correct for only about one-quarter of worldwide general aviation and aerial work activities. The other three-quarters of the roughly 40 million annual GA/AW flight hours are occupied with flight instruction, business travel, agricultural application, emergency medical services and other gainful pursuits. In fact, the diversity of GA/AW is so great that ICAO defines general aviation operation by exception: *those flight activities not involving commercial air transportation or aerial work.* Similarly, aerial work may only be generally defined as *operations used for specialized services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, aerial development,*

etc.[1]

1.2 In sheer numbers GA/AW is impressive: Approximately 350 000 aircraft and 1 000 000 pilots are involved in these activities worldwide. On balance, roughly 60 000 aircraft and 500 000 pilots are employed in commercial air transportation (including cargo and charter). The significance of GA/AW becomes greater when it is realized that every airline and military pilot must begin their journey to professional competence in the cockpit of a general aviation aircraft. Further, the essential services provided to the public by GA/AW for police, emergency medical services and search and rescue make all of our lives safer and more productive. Aerial survey, agricultural application and pipeline/powerline patrol add significantly to many aspects of the economy. And, for the many remote areas of the world, life and civilization would not be possible without the benefits provided by GA/AW operations.

1.3 GA/AW activities globally create hundreds of thousands of jobs and tens of billions of dollars for the countries and small business enterprises these activities serve. Without this activity essential transportation functions would be eliminated and the opportunities associated with them would be lost to the economies they potentially serve. Therefore, GA/AW needs and desires should be taken seriously as a worldwide economic engine.

2. GENERAL AVIATION AND AERIAL WORK OPERATIONAL NEEDS

2.1 AN-Conf/11-WP/4 for this conference, entitled "The Global ATM Operational Concept," (generated by the Secretariat) states:

> *The ATM operational concept seeks to bring benefits to the international civil aviation community. From an airspace user perspective, greater equity in airspace access, greater access to timely and meaningful information for decision support and more autonomy in decision-making including conflict management, will provide the opportunity to better deliver business and personal outcomes, within an appropriate safety framework. In particular, system harmonization and integration will provide high levels of assurance of predictability to airline operators and their customers.*

2.1.1 While the omission of GA/AW operations from the assurances afforded the airline community may have been an oversight, it bears emphasizing that we too desire these assurances. While we acknowledge that the ATM system was designed principally to accommodate the needs of the airlines and military, a significant amount of GA/AW traffic regularly participates in this system worldwide. Therefore, the system must "bring benefits to the *entire* civil aviation community."

2.2 Overview

2.2.1 CNS/ATM requirements for GA/AW are similar to those of commercial air transport: reliable on-demand access to an air traffic system and efficient routings and handling by air traffic service providers, all at a positive cost-benefit ratio. Yet, there are differences.

2.2.2 The majority of the world's GA/AW operations are conducted under visual flight rules (VFR)

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[1] *ICAO Annex 6, Operation of Aircraft, Definitions.*

and in visual meteorological conditions. Something less than half of the world's general aviation aircraft and pilots are equipped and trained to fly under instrument flight rules (IFR), separating them from the mainstream of air traffic supported by modern CNS/ATM systems. Yet, these activities still need large portions of the airspace in which to operate, particularly in the low altitude structure, and to be able to gain access to airports located in closely controlled airspace.

2.2.3 The point being that while closely controlled airspace, especially in busy terminal areas, is designed primarily for high speed IFR air traffic, slower VFR traffic also require access into or around these areas, either to operate into major airports or to peripheral reliever airports. As control constraints escalate in airspace along busy routes and equipment requirements to operate in that airspace grow, VFR operations are effectively eliminated in favor of well-equipped IFR operations.

2.2.4 GA/AW IFR traffic constitute approximately 20 per cent of the total in North America and less that 10 per cent in Europe. While these percentages will probably not grow appreciably in the near future, this access is increasingly important to those who use this service. General aviation IFR users are those who employ their aircraft in pursuit of legitimate business goals, making access to the system vital. And, this category of user incorporates an increasing number of turbine-powered aircraft, currently more than 29 000 worldwide or about half the size of commercial air transport fleet.

2.2.5 Because of the diversity of GA/AW operations and the differing capabilities of their diverse elements, it is important not to consider this segment of aviation as a homogenous group; the intercontinental Gulfstream V has very different needs than the Robinson R22 helicopter employed to muster cattle. Yet, each of these lay a legitimate claim to CNS/ATM needs.

2.3 Communications, navigation, and surveillance

2.3.1 VHF data link (VDL), global navigation satellite systems (GNSS) and automatic dependent surveillance (ADS) systems offer great promise for international aviation, yet with that promise comes two considerations: as use of this equipment becomes the price of access to the system, will the benefits provided be adequate to offset the costs, and, will those who cannot equip be excluded from vital airspace and airports?

2.3.2 GA/AW operators readily embrace new technology when a clear benefit to use of that technology is available. For instance, it is estimated that two-thirds of the world's GA/AW fleet uses a global positioning system (GPS) receiver of some sort, either panel-mounted or hand-held. No one mandated these devices; it was the clear benefit available to the user that led them to embrace them. However, GPS receivers requiring a sophisticated pedigree to be used for IFR enroute and approach applications contain a less certain and well defined cost-benefit ratio.

2.3.3 An IFR capable single-engine Raytheon (Beechcraft) Bonanza valued at $100 000 can ill afford to install $50 000 worth of satellite-based augmentation system (SBAS) certified GPS, enhanced Mode S transponder and VDL equipment that may be required to operate in some locations within the next five to ten years. Similarly, it may require as much as $500 000 of equipment to properly equip and configure an older million dollar Learjet. Moreover, even if this equipment is not mandated, will access to desired routes, altitudes and terminal areas be available without it?

2.3.4 As the transition to space-based navigation systems some backup system is envisioned for the foreseeable future. Airlines will be able to employ already installed inertial navigation systems (INS) or multiple distance measuring equipment (DME/DME) sensors. GA/AW will be forced to use the existing VHF omnidirectional radio range (VOR) ground stations for as long as they exist. However, these stations may begin to be phased out as early as 2005 in some parts of the world, leaving GA/AW with no effective

backup means for comprehensive IFR enroute or approach guidance. Either ground or space-based backup navigation systems, developed with economy in mind, must be designated to accommodate GA/AW needs.

2.3.5 The timing of required equipment changes is an important consideration for GA/AW operations. For instance, does it make sense for an IFR operator to install a Mode S transponder that may be eclipsed by ADS-B just a few years later? That is, will existing Mode C transponders provide adequate surveillance signals until ADS becomes a mature technology. Therefore, single-step solutions are preferable to costly and disruptive multi-step solutions.

2.4 Air traffic management

2.4.1 While ATM is designed to accommodate and direct IFR traffic flows, it also indirectly affects VFR traffic, as well. In order to safely control IFR traffic ATM designers must designate certain portions of the airspace for varying degrees of access and control. In doing so, VFR traffic, especially in busy terminal areas, is constrained and restricted from access to increasingly valuable portions of the airspace.

2.4.2 Over-classification of airspace segments appears to be a natural tendency for ATM specialists seeking the most suitable conditions for controllers. Yet, in doing so, access to valuable airspace is lost to the VFR-trained and equipped pilot. More importantly, in over-classifying airspace designers may unintentionally overload both surveillance equipment and the controller's ability to accommodate additional traffic generated by additional closely controlled airspace.

2.4.3 It is clear that increasing amounts of managed airspace will be required as more flights continue to crowd into a finite amount of sky. However, compromises are available to the ATM specialist to properly classify airspace segments, providing VFR entry points and routes in terminal areas and imposing less controlled airspace segments where possible. Importantly, the equipment required as a precondition for access to managed airspace should be carefully evaluated and minimized.

2.4.4 Perhaps the most important consideration for air traffic managers to acknowledge that non-airline and non-scheduled traffic exists that have legitimate requirements to use the air traffic system. This is particularly important when devising airspace structures, rules and procedures that impose constraints on the system. GA/AW cannot claim access equal to the mass flow of airline traffic, yet their needs must be acknowledged and accommodated fairly and equitably.

2.4.5 It is useful to note that a principal constraint on air traffic systems is airport capacity. Unless the runway launch and acceptance rate at key airports can be enhanced airborne capacity improvement efforts may prove to be of little value. Therefore, ATM efforts should be directed to solving airport capacity problems as well as the airborne capacity component. Land-long and land-and-hold-short techniques can provide short-term improvements but, long-term, additional airports to relieve terminal area congestion may hold the ultimate solution.

2.5 Working with GA/AW

2.5.1 IAOPA has been working with ICAO and regional aviation authorities since 1962 to present and promote GA/AW needs and requirements. IAOPA represents the interests of affiliates in 58 ICAO States, involving more than 450 000 pilots and aircraft operators. Each of our affiliates is available to work with State regulatory authorities to find ways to accomplish the goals stated above. Our representatives regularly attend ICAO CNS/ATM meetings as well. We are available to assist with CNS/ATM systems design and validation issues.

3. ACTION BY THE CONFERENCE

3.1 The conference is invited to note the needs and concerns of GA/AW and use the information contained in this paper to continue the implementation of global CNS/ATM systems.

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