IFALPA

The Global Voice of Pilots

Statement

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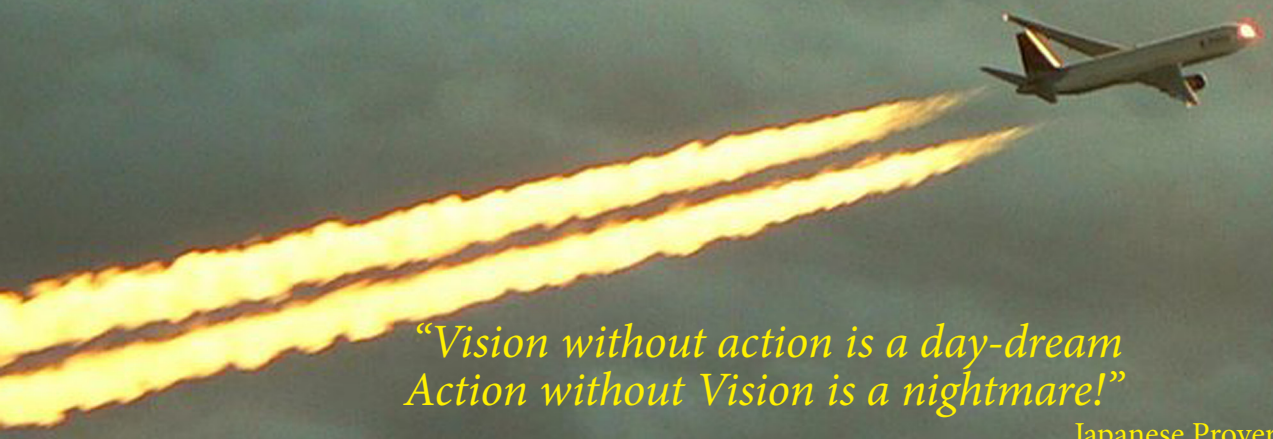
IFALPA Vision Statement

The Future of Air Navigation



"Vision without action is a day-dream
Action without Vision is a nightmare!"

Japanese Proverb

Introduction

Since its founding in 1948, IFALPA has always striven to be at the forefront of developments within aviation. In some areas of this endeavour there have been dramatic changes in air navigation, the pace has been gradual with periodic step changes. However in recent years with the advent of the liberalisation of the airline industry there has been an unprecedented growth in air traffic volume. The growth has, at times, threatened to overwhelm the existing system capacity and a paradigm shift is required for the system to safely keep pace with the explosion in demand. Against this challenging background, and apart from Air Traffic Management (ATM) driven needs for new technologies there have also been developments in the military sector, specifically the growth in unmanned aerial systems (UAS) technology which may enter the civil arena. Clearly, this also presents significant threats not only for the future of the profession but more importantly, the safety of the air transport system. While the vision originally outlined in this document was rooted in Air Traffic Management work it rapidly became apparent that the outcome of this technical revolution would have an impact on the profession in a much wider context.

ICAO's role

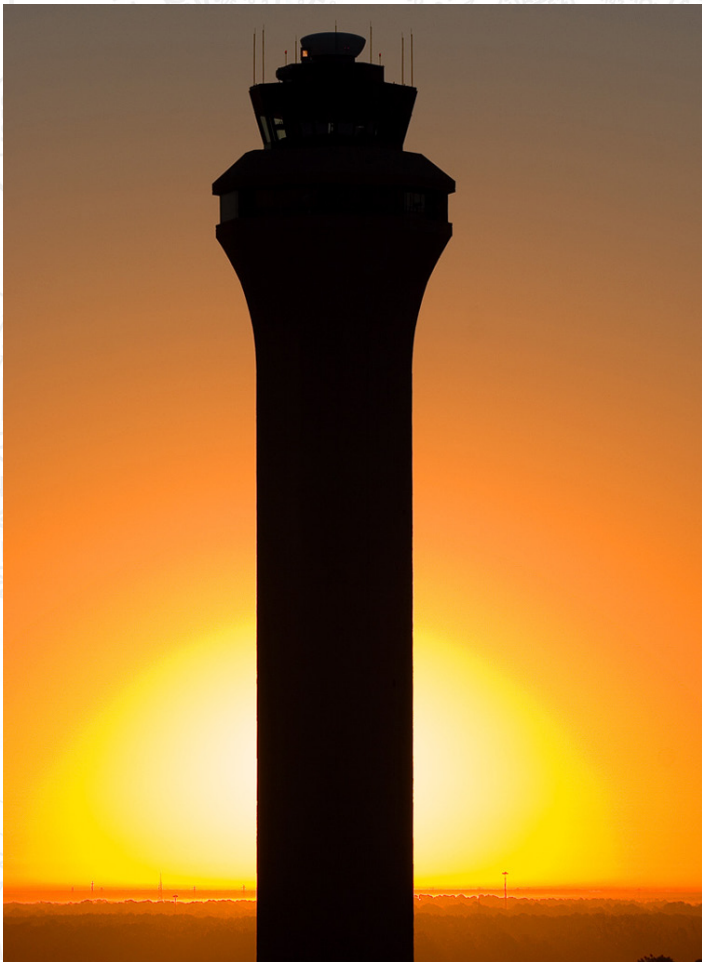
IFALPA played an active role in the development of the International Civil Aviation Organisation (ICAO) ATM Operational Concept (Doc 9854) which set out to create *"a comprehensive concept of an integrated and global ATM system, based on clearly established operational requirements"* This concept has set the framework for developing ATM systems that are able to cope with future challenges. As traditional methods and technologies must change to accommodate expected traffic levels, a paradigm shift is considered necessary and was endorsed by the 11th Air Navigation Conference in 2004. The 11th Air Navigation Conference called for an integrated and collaborative air traffic management system that is based on clear performance objectives. ICAO has since developed a Manual on ATM System Requirements (Doc 9882) and a Global ATM Performance Manual (Doc 9883) and is continuing to provide additional guidance for implementing the necessary changes.

Government roles

Around the world, political leaders have accepted the need for changes to the air transport system and, through legislation are making it possible for air navigation service providers (ANSP) to make the changes that are needed to make the vision a reality. However, the challenge remains that politicians and government officials often lack the detailed knowledge of aviation needed to make informed decisions while also having to take into account the challenges posed by environmental, economic and other issues. In many countries there is the drive to reduce government spending by consolidation of responsibilities. We must guard against that as in certain cases in the ATM environment, there is clear evidence that a separation of service provision from regulation brings significant safety benefit.

ICAO Doc 9854 contains the following Vision Statement:

"To achieve an interoperable global air traffic management system, for all users during all phases of flight, that meets agreed levels of safety, provides optimum economic operations, is environmentally sustainable and meets national security requirements".



Regional/national ANSP roles

In the regions where traffic levels are at their highest, ANSPs have embarked on work to implement new concepts in ATM, the SESAR programme in Europe and the United States' NextGen programme are good examples of this work. It is interesting that while it's stated that each of these initiatives have as a goal, a harmonisation of future system development, this aim has been revealed as one that is fraught with parochial interests and localised political pressures. Accordingly, it is clear that these developments need a firm hand capable of global leadership.

The aviation industry's role

The aviation industry (airlines and operators, manufacturers and suppliers) are working to exploit these technologies and the opportunities they bring. It is developing, or at least promising, even newer technologies at a fast pace. However, it is not always certain that in this work they take into account the needs of the end user – specifically, pilots. This situation is

Air transport is a global activity and it is essential that flight operations work within a common set of standards and procedures all over the world. It is essential that the resulting system is seamless, with the "right" systems (that is hardware, software and new or enhanced technologies) being used in the "right" way in order that a total air navigation system can deliver a logical, efficient and above all, safe, system.

aggravated by the fact that many of the initiatives and research and development programmes have progressed without any (or even worse incorrect) operational input that brings a realistic perspective of day to day flight deck operation.

IFALPA's role

The Federation recognises the need to help guide development of the ATM system to ensure that the pilot perspective is adequately taken into account. Set out below are a series statements that are intended to influence the direction of current and future enhancements. They outline, on a functional level, how IFALPA would like to see the Air Navigation System develop from these précis and become detailed polices positions and specifications.

Global considerations

A single air navigation system

Air transport is a global activity and it is essential that flight operations work within a common set of standards and procedures all over the world. It is essential that the resulting system is seamless, with the "right" systems (that is hardware, software and new or enhanced technologies) being used in the "right" way in order that a total air navigation system can deliver a logical, efficient and above all, safe, system.

One set of procedures worldwide

For an integrated and collaborative air navigation system that is performance based and capable of meeting the needs of aviation in the 21st century, it is of the utmost importance that local procedures are in line with the ICAO provisions (found in the relevant Standards & Recommended Practices (SARPs), PANS and other guidance material) to ensure that pilots are able to safely use common procedures for the same function (in terms of Communication, Navigation and Surveillance) in a truly global and harmonized ATM environment. Clearly, the implementation of new capabilities will need to be deployed initially in the most complex and demanding airspaces and adopted by aircraft with appropriately advanced equipment while the system continues to accommodate less capable aircraft in less stringent requirements. The goal is to provide the best service for the best equipped global operators rather than seeking to maximise efficiency by backward compatibility.

Performance Orientation

The air navigation system should deliver the performance standards that have been set out and agreed by the aviation community.

Safety is the most important perfromance indicator

While air transport has enviable accident rates, the fact remains that if the accident rate does not fall as traffic rises then the number of accidents and casualties will increase. Therefore, a proportional improvement in safety levels must be sought if the risk to the travelling public is to be avoided. Accordingly, safety enhancement is the most important performance parameter in any air navigation system and as such should never be sacrificed. In fact, the calculated safety level required should not be seen as a target to be reached but a threshold that must be exceeded.

As part of the safety matrix, a high level of security is a pre-requisite; accordingly the ATM system must be protected from all security threats. While there is no such thing as a zero risk operation, risk must be managed as far as possible at a strategic level. At the heart of this is the application of risk management tools like Safety Management Systems (SMS).

ATM must serve the needs of the users, and continue to be "safe" and "efficient" movement from departure to arrival.

System Considerations

Capacity, efficiency (acceptable delays, costs, etc.), environmental impact and other performance parameters might need to be balanced carefully to achieve the best overall compromise, satisfying most of the expectations of the global aviation community.

Air Traffic Management (ATM) Considerations

ATM will still be a "Service"

ATM must serve the needs of the users, and continue to be "safe" and "efficient" movement from departure to arrival. Traffic management will continue to focus on synchronizing traffic flows and providing separation where required. As in the early days of Air Traffic Control, when pilots needed a better tool than their eyes to safely operate with ever increasing traffic, the ATM function must continue to facilitate safe and efficient aircraft movements. How air traffic of the future and traffic conflicts will be managed will change from current practices, but the decisive factor is the airspace user's desire for access to the airspace with as little modification of the user preferred trajectory as possible. ***The system must be designed to satisfy user demand***.

Scenario 2025: *If the cost of providing the necessary capacity becomes too high, the users will reduce their demand. It should however be recognized that at national/regional levels political decisions might be taken to limit capacity due to environmental considerations. Aerodrome Infrastructure must be provided with sufficient capacity to accommodate user requirements.*

Airspace will have to be organised (and provided with all the services necessary to accommodate the user preferred trajectories) in a way that provides the best overall efficiency. As airspace is a limited resource, there is a need to optimise the performance of the ATM system. Since commercial air transport is a competitive business, a "network efficiency function" should provide the best overall system efficiency and arbitrate between competing requests from all airspace users for airspace usage. Airspace users will include not only the air transport segment but also general and business aviation, unmanned aircraft, space based and others. The network efficiency function needs to be designed into the system to prevent unsafe competitive practices by rogue aircraft (those not complying with the network efficiency function).

Capacity/Flow Management and Collaborative Decision Making (CDM)

Where and when traffic capacity is limited (resulting in the need to modify a user preferred trajectory), the system shall offer a number of alternatives for the airspace user to choose his preferred alternate trajectory. This requires a high level of Collaborative Decision Making (CDM). The user community should be involved in pre-defining the above mentioned alternatives. Flow management units (FMU) should accommodate the needs of airspace users and offer the required flexibility.

CDM should encompass airport operations to ensure seamless gate-to-gate or enroute-to-enroute operations. Airports should be designed "pilot-friendly" to reduce risk on a strategic level (runway incursions and excursions; RESA/EMAS; Surface Surveillance). ***A pilot-friendly airport is an airport where the operations are instinctively logical to the user*** (i.e. simple, globally standardized; no specific ops procedures to compensate bad design). No matter how advanced surface control technologies become, they will never completely eliminate the hazards and inefficiencies of poor airport design.

Planning vs. Flexibility

Proper and complete planning is necessary to maximise the usability of the available airspace. A badly designed system might eliminate the necessary flexibility of the system to accommodate normal and extraordinary occurrences (e.g. contingencies). Strategic and tactical planning must therefore ensure adequate flexibility within the ATM system.

Separation Responsibility and Collision Avoidance

The ATM system must provide a clear role and clear responsibilities for the separators in case of the necessity of tactical intervention. Current overlaps between separation provision and collision avoidance (TCAS) need to be eliminated. Within the overall responsibility for the safety of flights, pilots have a collision avoidance responsibility and use air traffic control's separation provision, onboard automation and decision support as tools to avoid collision.

Environmental Requirements

Environmental requirements and considerations will have to be taken into account whenever implementing new procedures. ***However, changes in present and future ATM systems must not degrade existing safety levels in order to satisfy environmental needs***.

Technology Requirements

As the system will to a large degree depend on technology, it is paramount that the role of the human as the "master" of the automation is respected and the roles of pilots and controllers be clearly specified. Cockpit technology, especially the information displays, should have globally standardised depictions for an application, yet able to accommodate individual preferences. There should only be a single and standardized display and supporting avionics for an application. Mixed equipage issues in an operator's fleet should be minimized for aircraft types.

CNS/ATM technology requirements:

▶ *Communication*

A reliable, secure, redundant communication system should be available to pilots globally that meets or exceeds agreed communications performance requirements (RCP) for the airspace where the aircraft is operating. Communications will be a mix of voice and data link providing a link between the aircraft, Air Traffic Control, Air Operations Centre (AOC), and flight information services.

Scenario 2025: *Communications will be provided by a combination of terrestrial and space based systems resulting in direct communications with flight crews, the controllers, or other appropriate agencies.*

▶ *Navigation*

A reliable, secure, redundant navigation system must meet or exceed the required navigation performance standards for a given airspace anywhere in the world. The high accuracy of the actual navigation performance from the GNSS and other navigation systems must not affect negatively safety levels and help prevent controlled flight into ground.

Scenario 2025: *for space based navigation systems, an augmentation is required; to reduce collision risk due to the high accuracy of satellite navigation systems an Advanced Strategic Offset Concept according to IFALPA's Policy on Embedded Default Lateral Offset is needed.*

▶ *Surveillance*

A reliable, secure, redundant surveillance system should be available globally to allow direct control of a flight and may be provided by a combination of space based and terrestrial technologies. The surveillance system must be secure, accurate and timely to give not only the air traffic controller the needed information to support their flight management but shared with the flight crews allowing them to make better decisions concerning their flights. The airspace and application will drive the required surveillance performance (RSP) for that operation which may limit or expand the capability of that aircraft operation. Improved surveillance technologies should then allow for changes in the separation standards and collision avoidance. These Airborne Separation Assurance Systems (ASAS) shall be designed to support the human operators' needs.

Scenario 2025: *A flight will be under positive control by a controller from pushback to gate arrival no matter the location globally or the airspace to be flown through.*

Air transport is a highly dynamic undertaking in a complex environment, therefore it requires flexibility. This capability is the stronghold of humans and must be central in human-machine interfaces.

Role of the Human vs Automation

The role of the human will be by initial design and not a compromised result of available technology. Air transport is a highly dynamic undertaking in a complex environment, therefore it requires flexibility. This capability is the stronghold of humans and must be central in human-machine interfaces. The future ATM system should therefore be designed to make best use of the strengths of the system operators (e.g. pilots and air traffic controllers/managers), while supporting them with appropriate tools, such as automation or decision support. The human should however always be in control and be regarded as the ultimate safeguard of system safety. The level of automation and operational flexibility needs to go hand-in-hand. ***The human shall remain the final decision maker as to what level of automation is appropriate and what level of flexibility is needed to execute a specific task*** (e.g. ASAS applications). A change management process will be necessary and will affect recruitment, training and skill requirements in order for the human/pilot to remain the ultimate decision maker. Current UAS technology is not capable of replacing human capabilities, particularly in complex and safety-critical situations. UAS even if they are very sophisticated must always be under the command of a human operator.

Automation

The future ATM system will see a high level of automation, with adequate decision support tools. Humans will remain central in the future air navigation system and will be the manager of the automation and act as decision maker. Automation needs to be designed to support the human decision makers. The cooperation of all the human and automated elements (this includes also Unmanned Aircraft in non-segregated airspace) needs to be ensured. Strengths of the human and automation will be maximized. System functions and operator functions need to be clearly separated.

The Pilot in Command must remain in control maintaining responsibility for the safety of the flight even when certain functions are delegated to automation, e.g. uplinked ATC instructions. Under no circumstances shall future automation inhibit the pilot in command's capability to remain the ultimate decision maker and final authority for the safe operation of aircraft. Therefore, initiatives attempting to establish a form of "aircraft remote control" of civil air transport operations are unacceptable to IFALPA.

Where humans will have to delegate the execution of tasks to automation they shall be made aware of the status of such automated tasks.

Legal considerations

Aviation regulations (Aviation Law) should always be developed and drafted to ensure the safety of the operation. Any increase in the level of automation must ensure that there are adequate legal protections for all operating personnel. In addition, it should be recognised that the ultimate responsibility and authority for the safe operation of a flight still rests with the pilot in command and therefore any new regulations should reflect that.

The legal considerations also need to reflect the increase in data networking which will include sensitive data being transmitted from air to ground and back again. This data, which will be recorded – voice and data, air and ground – needs to be securely protected by law to ensure that it is used correctly. Legal considerations will also need to ensure that all regulations rely upon a culture that has a rational, logical and objective response to mistakes made in a safety system with a constructive attitude to dealing with human fallibility.

Operational considerations (incl. training)

A well structured and in depth training program should develop confidence in and proficiency with the human operators' automated functions. The training program should be required and defined by the national authority, so that every operator becomes familiar and competent with a new system.

Communications should always be appropriate for the phase of the operation and not distract human operators from other safety-critical tasks. A common language – English – should continue to be mandated with proficiency requirements for spoken as well as written messages. UAS operations must have a designated commander (PiC) and be operated under positive control at all times. The flight must be operated under Rules of the Air and state regulations. All approaches should have vertical guidance. The effect of wake turbulence should be taken into account for all separation standards.