ISSN 2181-3187

RELATIONSHIP BETWEEN ATM SYSTEM REQUIREMENTS, PERFORMANCE-BASED TRANSITION GUIDELINES AND GLOBAL PERFORMANCE

Rasulberdiyev Javkharbek Jamshidovich
The 2-year master of Tashkent State Transport University
Shukurova Sabokhat Muratdjanovna
Scientific supervisor

Abstract:

The evolution and enhancement of the ATM system will be directly related to the ATM community's ability to clearly define performance expectations, set a relevant performance framework, set achievable targets and implement change cost-effectively, based on capabilities at any particular time along the planning horizon.

This document aims to define high-level requirements (hereafter referred to as ATM system requirements), supporting the OCD, and is to be used in conjunction with the OCD from which the requirements were derived. The ATM system requirements shall be applied in developing Standards and Recommended Practices (SARPs) to realize the concept. These requirements will also be used by the planning and implementation regional groups (PIRGs) as well as States to develop transition strategies and plans at regional and State levels. The ATM system requirements will generally be stable over time; that is, they represent the fundamental characteristics/attributes required of the ATM system.

ATM system performance will not progress as the direct result of the requirements; rather, the system is performance-driven, and levels of performance will differ in response to the demands of differing operating environments, in particular, a State, group of States, or regions.

ISSN 2181-3187

DESCRIPTION OF THE ATM SYSTEM REQUIREMENTS

An ATM system requirement is a statement of functionality and/or operating characteristics necessary to fulfil the expectations and deliver the benefits envisioned in the application of the OCD. The characteristics of ATM system requirements are:

a) Each requirement uses the words shall or will for “base” elements of the OCD.

b) Each requirement uses the word should for “desirable” elements of the OCD.

Note. — In this context, “base” refers to elements of the OCD that are necessary to ensure coherent performance across the entire global ATM system. Their level of effect on the performance of the ATM system in a particular State, region or other operating area may vary, depending on the expected performance outcomes agreed collaboratively.

c) The requirements were generated as an extraction of the OCD.

Note 1. — The level of detail is expected to be finer than the OCD, but coarser than what would be found in a SARP or global system design document.

Note 2. — The words “will” and “should” have imperative status only when written in requirement statements and not when included in the explanatory texts accompanying a requirement statement.

d) Elements of the extraction that are not directly evident in the OCD will only be those that are logical derivatives (e.g. the OCD inclusion of a timely action will clearly be dependent on the delivery, in a timely manner, of information to support the action).

e) The scope of qualifiers (for example “all”) will not exceed those contained in the OCD.

f) The scope and extent of the requirements are intended to be comprehensive in addressing the elements and components of the OCD. However, the requirements are neither intended to provide a complete system specification nor to imply that a design

ISSN 2181-3187

choice has been made. Further, the requirements will provide guidance for development of SARPs. SARPs will be progressively developed or amended through the transition period to achieve enhanced ATM system performance and global harmonization, as envisaged in the OCD.

SAFETY

Safety is a key and constant performance expectation of the ATM system. To meet this expectation, the ATM system shall:

a) be based on the principle that the safety of the ATM system, or its components and parts, is evidence based;

b) define common safety indicators to be used by all States;

c) ensure that safety data will be recorded, processed and analyzed centrally within a State, region or group of States, taking into account the experience of existing State incident reporting schemes; furthermore, safety data will be shared globally;

d) ensure a consistent approach to the collection, evaluation and review of safety-related data, including the understanding of causes and effects that can be applied over time and across segments of the community for the purpose of making informative comparisons. This does not mean that all community members use the same approach but, rather, that they can communicate by sharing a wide, diverse, and yet common set of models, assumptions, definitions, and so on.

e) support system safety with lead indicator and causal factor analysis, in addition to traditional lag indicator statistical analysis in the ongoing monitoring of safety;

f) ensure application of the system safety approach to all life-cycle phases of the ATM system and its elements, supported by safety cases;

g) ensure that all safety practices and processes are explicit and that they comply with the safety requirements and standards of ICAO, State regulatory authorities and

ISSN 2181-3187

other appropriate parties. ATM system performance requirements should be based on the key understanding that the ATM system is a collective integration of parts, including humans, information, services and technology. When contemplating or undertaking a change to a particular part of the ATM system, whether at the local, State, regional or global level, one must give due consideration, through a safety case, to the potential effect on adjacent parts of the system. The decision regarding the level of assessment will be made pragmatically, but transparently. In establishing safety management systems, determining safety targets and conducting safety cases, the accumulated effect, on safety, of those parts — in addition to the individual effects — should be taken into account.

h) ensure that ATM system safety is maintained during any transition;

i) establish contingency plans at all levels of operation to deal with anomalies/disruptions and to ensure safety and an appropriate level of operations;

j) be designed so that the operation and continued evolution of the ATM system incorporates mechanisms so that information and/or actions concerning emergency and/or unexpected events involving any of the airborne or ground-based ATM community members can be communicated to all ATM system participants who need to respond to or be aware of the event or actions. An enhanced capability will be provided to disseminate information regarding emergency situations to appropriate ATM community members so that the necessary response actions and intervention can be initiated more effectively.

k) accommodate the determination of levels of safety and risk which may be expressed in various manners. There is no single and universally valid way of expressing the level of safety or risk. It is however desirable to express safety and risk in a manner that provides reference over time despite system changes.

l) ensure that the target level of safety is the minimum level of safety to be achieved. The ATM system recognizes that absolute safety cannot be achieved;

ISSN 2181-3187

however, it should always be a desired goal. In the evolution of the ATM system, safety targets will be established reflecting a continuing desire to improve current levels of safety. In setting safety targets from time to time, each organization, State, region, or global group should generate a better safety outcome than the previous target within practicable limits; that is, all components of the ATM system should strive to reduce incidents and accidents and increase positive safety indicators.

m) recognize that there are three safety risk bands: intolerable, as low as reasonably practical (ALARP), and broadly acceptable.Explanatory text: The safety industry generally recognizes that there are situations in which the continuous range of possible levels of safety cannot be divided into only two bands, “intolerable” and “broadly acceptable”. There is a third, intermediate region between these two levels. Where such an intermediate region exists, the question becomes how to make decisions if the level of risk falls within that region. To make such decisions, the safety industry generally uses the so-called ALARP. This means that measures to reduce risk must be taken until the cost of further risk reduction would be grossly disproportionate to the reduction in risk that would be achieved, hence, the “ALARP region”.

n) ensure that safety risk is calculated with scientific rigour; however, also accommodate the determination of safety risk acceptability by value judgement. A distinction should be made between both activities (safety risk calculation and acceptability determination) and their respective boundaries and logic.

o) be designed so that the human is never in doubt as to the ongoing status of the ATM system or the flight environment as appropriate to the human task undertaken; and

p) be designed so that collision avoidance systems remain a safety net independent from separation provision.

Performance of the ATM system depends on security related to both the internal elements of the ATM system — including personnel, infrastructure and data — and the

ISSN 2181-3187

external expectations of the broader community, including national security interests. To meet these expectations, the ATM system shall:

a) be based on the principle that the operation of the ATM system will not compromise the sovereignty of any State;

b) ensure appropriate levels of security;

c) recognize that the requirements associated with security may vary from time to time and according to location; and

d) coordinate these requirements through strategic, pre-tactical and tactical collaborative decision making to allow agreed performance parameters to be met by ATM system partners.

INFORMATION MANAGEMENT AND SERVICES

Managing information and providing information services are critical to the development of the ATM system envisioned in the OCD. These activities ensure cohesion and linkages between the various ATM components described in the OCD as well as performance expectation areas described in previous sections of this document. To meet the expectations for the ATM system regarding information services, the ATM system shall:

a) implement system-wide information management;

b) provide a global, common aviation data standard and reference system to allow fusion and conflation and provide comprehensive situational awareness and conflict management;

c) establish information exchange protocols and procedures to ensure that appropriate performance can be achieved within the agreed rules;

Explanatory text: These “agreed rules” would be determined through collaborative decision making.

ISSN 2181-3187

d) provide to the ATM community accredited, quality-assured and timely information meeting the identified standards of performance, including quality of services. It is essential that information does not change character or value as it travels through various systems. It is assumed that information may be combined, segregated or reformatted in accordance with the needs of the end user; however, the content (character, data values, and so on) should not change the context (the environment from which the information originated). In summary, received information content is exactly the same as the information from the originator.

The differences brought about by evolution in technology are not expected to have any impact on the efficient transmission of the information among the ATM community members. The requirements of seamlessness and interoperability dictate that systems — whether proprietary or not — conform to openly available standards regarding the format and character of transmitted or transferred information. It is intended that there will be development of fully interoperable information systems capable of seamless information transfer throughout the ATM system. e) provide information systems that identify the nature of the information in terms of timeframe — historical, current or planned;

f) ensure that a relevant validity period of ATM system information is evident to the user of that information. Explanatory text: Information that is expected to change over short intervals must have a validity period that is evident to the user of the information. Conversely, information elements that are not expected to change except after system design changes should not need to be repeated at short intervals. The information management system is expected to explicitly reveal the validity period for the demanded information.

n) make available, to the ATM system, flight parameters and aircraft performance characteristics;

AERODROME OPERATIONS

ISSN 2181-3187

As an integral part of the ATM system, the aerodrome must provide the needed ground infrastructure including, inter alia, lighting, taxiways, runways and precise surface movement guidance to improve safety and to maximize aerodrome capacity in all meteorological conditions. The ATM system will enable the efficient use of the capacity of the aerodrome airside infrastructure.

In considering the need for a service facility, such as a control tower, careful thought should be given to the volume and complexity of traffic. Where required, such facilities should enable direct or individual visual monitoring and/or control. However, increasing needs for (vertically) higher visual control rooms to enable direct sighting requirements may lead to alternative methods of surveillance or control. Cost efficiency of services may also become an influencing factor. This may lead to implementation of procedures, such as pilot autonomy (e.g. self-separation) rather than establishment or refurbishment of a facility.

At all aerodromes, a common, collaboratively agreed-to target level of safety will be established, which is subsequently non-negotiable by an individual party. It must be accepted that though performance may be measured on an individual basis, the relationship between each aerodrome will result, by necessity, in a compromise. Performance criteria may be established at the regional or local level; however, consideration should be given to the impact of aerodrome performance on the ATM system as a whole. The freedom of the performance level to termination per aerodrome may be constrained by the performance level of the overall ATM system. It may be easier to consider aerodrome operations within an “en-route to en-route” 2 perspective in determining their role within the ATM system. It is intended that sufficient airside infrastructure be provided so as to optimize the efficiency of the ATM system and provide predictability.

Precise surface movement guidance will be required in all conditions. This may not necessarily be met by high-level technology but should be appropriate to the operations (traffic volume, complexity of traffic movements, traffic mix and so on).

ISSN 2181-3187

Information on the position, to an appropriate level of accuracy, and intent of all aircraft and vehicles operating on the ground will be available to the appropriate ATM community members. Any activities that take place on the movement area can have a direct influence on the ATM system.

As is the case across the whole ATM system, in relation to aerodrome operations, the availability and exchange of information will facilitate management by trajectory. It is expected that the collaborative exchange process and respective facilities will allow for efficient management of air traffic flow through use, on a system-wide basis, of information on air traffic flow, weather and assets. This process will also allow, for example, allocation of entry/exit times for aerodromes and subsequent dynamic changes to mitigate any imbalance. Planned ATM system optimum throughput should be maintained through meteorological conditions that do not present safety limitations and have been agreed by the affected ATM community members. Through the ATM system, aerodrome operations should contribute to the protection of the environment by considering all environmental impact areas to the extent that safety is not compromised. It is expected that in the design of terminal area procedures, responsible authorities will work closely with local agencies to mitigate, to the extent possible, the effect of aviation on communities located within the terminal area of an airport. In so doing, all parties should strike an appropriate balance between the need to mitigate the effects of aviation on the environment, and the significant economic benefit to States of promoting a healthy aviation industry. It is expected that airspace users, in determining and executing user-preferred trajectories, will incorporate requirements to ameliorate unnecessary gaseous emissions. The ATM system should recognize and accommodate such trajectories wherever practicable to reduce the environmental impact. Meteorological information, both current and forecast, will be an important contributing factor in managing environmental issues. It is expected that while aerodrome operations will not be responsible for determining environmental constraints, they will comply with local and national requirements. As one of the sources of environmental pollution, aerodrome layouts and operations will, through

ISSN 2181-3187

collaboration, alleviate environmental concerns. (For example, reduced holding will assist aerodromes in complying with emission controls as will reduced taxiing times.)

It is expected that landside operations will become an integral part of this process. Although not directly part of the ATM system, landside operations will have an impact on aerodrome operations, and a downstream effect on other parts of the ATM system. Data on such areas as modal transportation systems, customs, security, baggage handling, fuel supply, and so on, shared through collaborative information exchange, will optimize operations. Real-time data, together with system trends and forecasts, fused with a range of automated decision support or decision-making tools, will enable optimization of services. A common understanding of the needs and capabilities of all parties will instigate a better response to a given situation. Gate management will benefit from the ability to tactically and collaboratively modify sequences to optimize aerodrome operations. It is expected that those ATM community members interfacing with landside operations will manage/mitigate the effects of landside operations so that impacts on the ATM system are minimized or eliminated.

It is expected that, increasingly, law enforcement agencies will require flight identification and trajectory data as well as general information concerning traffic at aerodromes. Data exchange will be subject to agreement between interested parties and may be influenced by commercial and regulatory factors. It is noted that, in some instances, access to certain areas may be restricted to those willing to provide a minimum level of information (e.g. specific aircraft flying into certain aerodromes and airspace).

Literatures:

1. ICAO Doc9882 - Manual on Air Traffic Management System Requirements
2. Vysotskiy V.Z. Scientific Bulletin of MSTU GA №99 – 2006
3. Guidelines for the organization of air traffic in the Republic of Uzbekistan (PSK / TSUAN / OVD-01).
4. Flight operations manual Tashkent.

ISSN 2181-3187

5. Doc 9976 Flight Planning and Fuel Management Manual (First Edition) – 2015
6. WWW.SKYBRARY.AERO