

ESSENTIAL REQUIREMENTS

I Description of the essential requirements¹

Introduction

1. As already described in the main text of the Opinion, the Basic Regulation defines, as one of the Agency's tasks, the provision to the Commission of the necessary technical support, as well as the development and adoption of Opinions on which the Commission bases its own legislative proposals concerning safety of civil aviation. This implies in particular that safety objectives are specified by the legislator. These safety objectives are defined in the essential requirements.
2. The Agency underlines that protecting the safety of citizens through essential requirements approved by the highest political institutions is a well established principle for regulating product safety. The same philosophy has been adopted by the European legislator for all safety critical services in aviation, covered so far by the EASA system. Such a "new approach" has also been implemented when establishing the Single European Sky (SES) framework when it comes to the interoperability regulation of the European ATM network. The same approach has been recently accepted by stakeholders for the regulation of the safety of aerodrome operations.
3. In the following paragraphs the background and the justification for the development of the essential requirements will be given. The main objectives are to explain:
 - what essential requirements are;
 - the process of hazard mitigation used to develop them;
 - how they enable compliance with ICAO standards and recommended practices, as well as with SES Regulations and ESARR's;
 - how they allow embedding existing safety regulations within the EASA system.
4. As their name indicates, essential requirements are the conditions to be fulfilled by a service, a product, a person or an organisation to ensure that the public is not unduly affected by their operations or activities. They therefore address the means by which risks associated to a specific activity, whenever reasonably probable, shall be eliminated or reduced to an acceptable level. To achieve this goal, hazards and associated risks have been identified and analysed, in order to determine the requirements that are essential to mitigate unacceptable risks. In this context, it must be made clear that certification processes are not mitigating measures; they are the verification that a mitigating measure is being implemented. As far as mitigating measures are concerned, it is also important to insist that they must be proportionate to the safety objective. This means that they must not go beyond what is necessary to achieve the expected safety benefit, and must not create undue restrictions that are not justified by that objective. To validate the results of such a "top down" approach, a "bottom up" review was made to examine why particular essential requirements were imposed; which risk such requirements were mitigating; and whether the means used were proportionate to the safety objective.
5. In this context, the Agency undertook work to assess safety hazards related to the interaction between aircraft, on the ground and in all phases of flight. The mitigating

¹ For information purposes only.

criteria that were introduced in the essential requirements, when the associated risk appeared unacceptable, allow compliance with relevant ICAO Annexes and SES legislation, as well as Eurocontrol ESARRs insofar as related to the safety and global interoperability requirements. The resulting essential requirements were structured under logical sections, aiming also to offer, as far as practicable, consistency with the structure and contents of the five other sets of essential requirements included in the Basic Regulation for the other fields of aviation safety. This consistency is one element of the total system approach, aiming to ensure that detailed safety rules in all fields of aviation safety will be developed along similar principles and will cover all planned safety objectives, without gaps which could potentially be detrimental to the level of safety. The sections of these essential requirements are:

- Use of the airspace
- Services
- Systems and constituents
- Qualification of air traffic controllers
- Service providers and training organisations

6. As explained in NPA 2007-16, the essential requirements have been drafted with the view to allowing alternative implementation means, which could vary depending on the type of the regulated service, product, person or organisation. They create the legal mandate needed for further implementing rules or for direct enforcement. It would be possible, therefore, to develop implementing rules building on material already developed in the context of ICAO, SES and EUROCONTROL, or to introduce other forms of regulation depending on the answers to the questions raised in this document.

Mitigation of the risks related to the use of the airspace

7. The starting point for the safe conduct of air traffic in a given airspace is to ensure that operating rules and procedures exist and that all aircraft comply with them. Situations such as operating a controlled flight without obtaining appropriate air traffic clearances can adversely affect safe separation from other controlled flights, which could, in the worst case scenario, lead to a collision between aircraft. In the ICAO context, Annex 2, which contains rules of the air, as well as other Annexes and some other ICAO documents, such as PANS ATM (Doc 4444) and PANS Aircraft Operations (Doc 8168), contain numerous such operating rules and procedures. The purpose of paragraph 1.a of the essential requirements is to mandate the compliance with common rules and procedures which are safety critical and which are related to safe interaction between aircraft. This principle, as regards ATM/ANS safety regulation of airspace users, is fully consistent with ICAO Annex 6. Although neither SES rules nor ESARR's contain specific provisions on aircraft operations, requirements for air operations are contained in EU-OPS. This paragraph creates the basis for such detailed implementing rules. It also has to be underlined that this safety objective does not in any way aim to creating new or unnecessary rules or procedures within uncontrolled airspace (class G). Furthermore, as a clarification to some concerns expressed in the consultation, such safety rules must cover the whole movement area, irrespectively of who controls and/or manages its traffic. Lastly, pilot competency and training issues, including the ones with regard to airspace use, has deliberately not been addressed by this ER, as it is already covered by the Basic Regulation.
8. Furthermore, a flight should not take place without proper functioning appliances (equipment) on board the aircraft, including of course those needed for ATM/ANS purposes. The absence, misuse or dysfunction of such appliances could lead to the pilot lacking references in certain meteorological conditions, or air traffic control not being able to receive aircraft identity and position information. This could result in the loss of

orientation, the loss of control, damage to the aircraft or some of its equipment, or even collision with other aircraft or the ground. Moreover, the growing volumes of air traffic and emerging capacity constraints create needs for new operational concepts, which in most cases require carriage of new ATM/ANS equipment on an aircraft. For this reason, point 1.b was developed; to impose that appropriate safety related equipment in a given airspace is on board and operative. Technical specifications of ATM/ANS related equipment on board are contained mainly in the ICAO Annexes 6 and 10, but the requirements related to their mandatory carriage are part of the ICAO Regional Air Navigation agreements. Although neither SES rules nor ESARR's contain generic provisions on aircraft operations, requirements for air operations are contained in EU-OPS. However, specific implementing rules for the interoperability Regulation (EC) No 552/2004 may be adopted, containing requirements for the aircraft ATM equipage. This ER will enable this practice to continue. The text of the draft ER has now been slightly amended to clearly refer just to those appliances relevant in a given airspace.

Mitigation of the risks related to ATM/ANS services

Aeronautical information services

9. ATM services are dependant on the quality and timeliness of the provision of aeronautical information. Incorrect information given to flight crew could create significant safety risks for a flight. Indeed, there have been past incidents mainly caused by such mistakes in the source data of national AIPs, for example. Traditionally all aeronautical documentation and information available to flight crew has been in a paper format. Most of this information is now available in electronic format. The importance of high-quality aeronautical information increases significantly by implementing new methods and technologies. This has been the case with computer based airborne navigation systems and with sharing information via modern data link systems. It is therefore obvious that the quality of information can not be guaranteed without also assuring the quality of the data used as a source for it. This is the reason for the development of paragraph 2.a.1. This requirement is in accordance with ICAO Annex 15, but goes further by aiming to cover needs emerging from the rapid development of data based technology and new developing concepts, such as aeronautical information management (AIM). In the SES context, paragraph 1 of Annex IV of Commission Regulation (EC) No 2096/2005 provides specific requirements for the quality of source data. This ER covers this issue. Also in this context the tasks of the Agency are limited to those with safety relevance.
10. As explained above, aeronautical information has to be based on qualified source data and has to be kept up-to-date. This is, however, not enough in itself. Its quality has to be maintained in all phases of its provision. This assumes that aeronautical information has to be processed properly and provided in a format understandable to all flight crews, allowing all the relevant details to be found therein. If the user cannot understand the data, it cannot convey the necessary information. This would lead to risks similar to a situation where there is no data at all, or even worse, to a situation in which the data may be misinterpreted, creating an unsafe situation. These principles, stated in paragraph 2.a.2, are again consistent with ICAO Annex 15, but have been extended to cover all forms of modern data based technologies used for aeronautical information management. In the SES context, Commission Regulation (EC) No 2096/2005, Annex IV provides specific requirements for the provision of aeronautical information service. This paragraph will enable the safety aspects of this regulation to be integrated into the EASA system.
11. To complement the framework for aeronautical information described above, it is also essential to establish ways and means for its communication to take place expeditiously and without altering its contents. The hazard created by having erroneous data or receiving such data too late is evident from what is stated above. The purpose of

paragraph 2.a.3 is to ensure expeditious and incorruptible transmission of data and is in line with ICAO Annex 15, which however seems to be limited mainly to the traditional applications in this field. In the SES context, the Commission Regulation (EC) No 2096/2005, Annex IV provides specific requirements for the provision of aeronautical information service, but which does not cover totally the purpose of this ER, for example when it comes to the provision of electronic data for aircraft avionics. This issue has been raised by the Air Safety Committee, which has adopted a change to EU-OPS introducing a new paragraph 1.873, which will soon be published and will enter into force during the summer of 2008. This ER is in compliance with this provision. The text of the draft ER has been amended by replacing 'incorruptible' by 'protected from interference and corruption', to increase clarity.

Meteorological services

12. Safety of an aircraft can be significantly affected by adverse meteorological conditions in any phase of flight. A flight entering adverse meteorological conditions could suffer loss of control, fatal damage to the aircraft or controlled flight into terrain, any of which could lead to the loss of the aircraft. To avoid such situations taking place, the pilot must have available, when planning the flight and during its execution, all the expected meteorological information - such as surface and upper winds, visibility, present and forecasted weather conditions, cloud types and their height, and atmospheric pressure - along the planned route, as well as on the take-off and destination aerodromes. As already stated above for aeronautical information, the quality of meteorological information can not be guaranteed without also assuring the quality of the data used as a source for it. Although ICAO Annex 3, Part I contains information relating to the mitigation means ensuring the quality of source data for aeronautical meteorological information, it doesn't provide the necessary regulatory implementation means. In the SES context, Commission Regulation (EC) No 2096/2005, Annex III provides specific requirements for the provision of meteorological services, including the quality of source data. This ER allows the safety aspects to be transferred to the EASA system. Paragraph 2.b.1 establishes the necessary legal basis in this respect.
13. Here again, the quality of aeronautical meteorological information has to be ensured in all phases of its provision, meaning that it has to be processed properly, including forecasting, as well as provided in a format understandable to pilots, who have to be able to find all the relevant details therein. Safety risks related to misunderstanding of meteorological data are exactly the same, if not even worse, as if there were no data at all, potentially leading to pilots taking dangerous decisions due to misinterpreted information. The timely provision of meteorological information is also paramount. A severe incident may occur if a SIGMET message (to warn aviators of significant hazardous weather phenomena) has been promulgated too late, allowing an aircraft with no airborne weather radar to fly into a heavy thunder storm. Paragraph 2.b.2 creates a mandate to specify the quality, timeliness and format of aeronautical meteorological information and is based on ICAO Annex 3, Parts I and II. Commission Regulation (EC) No 2096/2005, Annex III provides specific requirements for the provision of meteorological services. As above, this ER allows the safety aspects to be transferred to the EASA system.
14. To close the loop in guaranteeing the quality of aeronautical meteorological information received by airspace users, paragraph 2.b.3 mandates that the communication and promulgation of meteorological information takes place on time and without altering its contents. Safety risks here are very similar to the ones mentioned in the previous paragraph. This principle comes also from Annex 15, but it is again an issue of emerging new technologies, which will improve the quality, availability and promulgation of meteorological information. Regulatory means should therefore be adapted to allow the deployment of such emerging methods and technologies. In the SES context, the Commission Regulation (EC) No 2096/2005, Annex III provides

specific requirements for the provision of meteorological services. Also here, this paragraph allows the safety aspects to be transferred to the EASA system. The draft ER has now been amended for reasons of clarity to refer to MET services and to cover all safety related users. Also, a similar change as to the previous ER has been made in relation to the need to adequately protect the data dissemination.

Air traffic services (ATS)

15. ATS rely heavily on exchanges of data. Flight and advisory information and ATC commands are of an operational nature, presenting new or changed circumstances to the pilot-in-command in cases that have an impact on his/her decisions for the safe conduct of flight. In order for such information or commands to be safely implemented by the pilot, they must be based on source data that is correct, complete and current. Unacceptable safety risks related to the incorrect source data can be various and of different natures, such as an ATC clearance given to depart at a specific time from a given flight level based on incorrect information about other air traffic. Such situations would clearly lead to a reduction in anticipated safety margins, a loss of separation or even a risk of collision with other aircraft. A responsibility to ensure the quality of the data used as a source for any air traffic services is imposed by paragraph 2.c.1. This essential requirement is in line with the principles provided by ICAO, mainly in Annexes 11 and 2 as well as in PANS-ATM Doc 4444, but which however do not address clearly the responsibilities related to ensuring the quality of the source data. This requirement is already covered by Regulation (EC) No 552/2004, Annex II, Part B, par. 3.1.1, 3.2.1 & 3.3.1, as well as Paragraph 4 of ESARR 6. This ER transfers the safety aspects to the EASA system. The wording of the initial draft ER has been simplified to refer to ATS, without specifically mentioning advisory services.
16. In a similar manner as above, ATC service (or air traffic advisory service) has to be able to maintain a sufficient level of quality and timeliness. For example, a loss of separation could be caused by an aircraft being unintentionally advised to go into the area of another ATS unit in an uncoordinated manner. This would clearly lead to a reduction in anticipated safety margins. Mitigation of such risks clearly demands proper processing of air traffic services provided. Paragraph 2.c.2 aims to mitigate inadequate processing of any air traffic services, including human factors related errors therein. As above, this also allows compliance with Annex 11. In the SES context, the Commission Regulation (EC) No 2096/2005 refers in general to ICAO Annex 11. Therefore, this ER doesn't introduce any new obligations. A similar change to the one mentioned in the paragraph above has been made to this draft ER.
17. Also when automated tools are used to provide information or advice for airspace users, the quality and timeliness of that service has to be ensured. If a message for automatic terminal information service (ATIS) is not prepared in a timely manner, it could contain false information on the runway surface conditions and could therefore lead to a loss of control or overrun of the landing aircraft. A similar safety risk could take place if the ATIS equipment would not operate appropriately due to any technical reasons related to its design, manufacturing or maintenance. This is the purpose of paragraph 2.c.3, which generally supports the objectives laid down by ICAO. As an example, Chapter 8 of ICAO Annex 14, Volume I, establishes principles for proper design, manufacturing and maintenance for certain air navigation facilities. SES interoperability Regulation (EC) No 552/2004 also establishes a legal basis for such measures, but without any explicit reference covering the fitness for purpose of these automated tools. ESARR 4 also covers this issue in general terms. Therefore, this paragraph provides an adequate basis for the transposition of these requirements.
18. The purpose of ATC, as regards safety, is to prevent any collision between aircraft, and between aircraft and any obstacle on the ground, as well as providing advice and information useful for the safe conduct of flights. ATC service is a complex combination

of determination of the relative positions of known aircraft in the area of responsibility, issuance of information and clearances for the purpose of safe separation and coordination of clearances with other relevant ATC service providers in adjacent areas. Loss of ATC separation is as such an obvious hazard to flight safety. To mitigate such unacceptable safety risks it is required that sufficient personnel is available for the anticipated level of service and the procedures used are adequate for their intended purpose. Also, in ATC there is always a strong aspect of local operational elements such as volume and nature of traffic, aerodrome design and meteorological conditions, which all have to be addressed through standard operating processes. These aspects related to planning and human factors in ATC are mitigated by paragraph 2.c.4 stemming again from principles of ICAO Annex 11 and PANS-ATM Doc 4444. Again, in the SES context, no such specific requirements exist, but a legal basis for their imposition has been established by a generic reference to ICAO Annex 11 in Commission Regulation (EC) No 2096/2005, Annex II, and to seamless operations in the Regulation (EC) No 552/2004, Annex II, Part A. This ER contains the mandate needed to develop more detailed implementing rules. The draft ER has been amended to also address separation from obstacles and other airborne hazards, as well as to emphasize the coordination with adjacent volumes of airspace.

19. Even if the ATC instructions or clearances are correct as such and take into account the specific local environment, it is still possible that the pilot does not understand them or misperceives the information given, due to interference, unclear phraseology or an absence of read-back procedures. This could lead, for example, to a pilot misperceiving a clearance given to another aircraft with a same type of call sign, to leave the runway-holding position and take the aircraft onto the active runway which is just receiving a landing aircraft, or to commence a climb to a flight level to which it has not been cleared. Such an error would always cause a serious incident and could even lead to a catastrophic accident. Paragraph 2.c.5 requires that mitigation is provided to ensure clear, correct and unambiguous communication, using proper phraseology and read-back procedures, between ATC and aircraft. This is again fully in line with Annex 11 and respective PANS-ATM documents. As regards SES, the interoperability Regulation (EC) No 552/2004 creates a legal basis for implementing rules covering this area, as does this paragraph. Based on the comments received during the consultation, the text of the draft ER has been modified to clearly contain also ground-ground ATC communication (procedures and phraseology). Similarly, the ER has been amended to refer to 'protection from intrusion' instead of the stronger wording 'free from intrusion'.
20. Technical problems on an aircraft may cause the aircraft to crash or to make an emergency landing in an inhospitable area, where it may not be immediately found, thus causing an extra risk to the safety of passengers and crew. That is why paragraph 2.c.6 imposes the requirement to establish appropriate means to monitor such situations and, in the case of an emergency, to alert a coordinated search and rescue activity for finding and saving those persons in distress. These mitigation means are fully in line with what is required by ICAO, when it comes to alerting services, as described in Annex 11, Chapter 5, and as far as relevant in relation to search and rescue, as provided for in Annex 12. As regards SES, Commission Regulation (EC) No 2096/2005 makes a generic reference to ICAO Annex 11, which includes alerting services. This draft ER is limited to alerting services, and does not include the implementation of search and rescue action.

Communication services

21. Safety of air traffic is very largely based on two way mobile communications between aircraft and ground ATS services and on two way communications between different ground ATS services. These communications can be implemented through digital data communication or traditional voice communication. In all cases, the performance capabilities of the communication services have to be ensured as regards availability,

integrity, continuity and timeliness of this service. For instance, if aircraft in a dense traffic environment suddenly and without any pre-warning fail to receive ATC communications, they would have to ensure the safe separation from each other by themselves, leading to a very unsafe situation. Paragraph 2.d.1 addresses the performance requirements for communications as a fundamental element of the safety of air traffic. This is fully in line with communications' performance criteria laid down by ICAO in Annex 10 and in Annex 11 – Chapter 6, both of which, however, do not address consistently the ground-ground communications needed in air traffic services. The issue of communication services also has to take into account emerging modern technologies, such as digital data links, potentially enabling to communicate, for example, directly to aircraft flight management systems. In the SES context, communication services are covered by the interoperability Regulation (EC) No 552/2004, Annex II, Part B, paragraph 4.1. The Agency believes that the wording of the draft ER allows addressing all safety aspects of communication services, irrespectively whether taking place by voice or by data, and covers also ground-ground communications.

Navigation services

22. Modern aviation is highly dependent on radio navigation aids providing precise positioning and timing information for aircraft in different phases of flight. Within the past decade, the introduction of different area navigation (RNAV) applications has enabled aircraft operations on very precise flight paths and has thus improved the available airspace capacity and air traffic performances. Such a performance based navigation method is usually dependent on the defined airspace concept, on the airborne equipment, on the navigation aid infrastructure and on the aircrew qualifications. Failure in navigation services has, in most cases, immediate consequences on the level of safety. An aircraft in basic area navigation suddenly losing its ability for the defined track-keeping accuracy creates an incident and causes a potential risk of losing the specified separation minima with another aircraft or any segregated airspace. This becomes even more critical when such a situation occurs at the highest point of the air traffic control work load. Paragraph 2.e.1 therefore mitigates hazards related to the performance of navigation services based mainly on different radio navigation aids. This is fully in line with the principles provided by ICAO in Annexes 6 and 10, as well as with its corresponding navigation documents and regional navigation plans. On top of what has already been done by ICAO, it is however to be noted that a vast amount of emerging new navigation technologies and methods will be introduced in the future on board an aircraft, on ground and as regards satellite based navigation systems, and will most likely also affect the safety regulatory activities needed. Navigation services are already covered by the interoperability Regulation (EC) No 552/2004, Annex II, Part B, paragraph 5.1. This important safety issue is adequately covered by the proposed ER. Based on the comments received, the Agency accepted to delete the too limiting wording of the draft ER referring just to radio based navigation services and, on the other hand, accepted clarifying its purpose, not only in absolute positioning but also in providing relative positioning, which can be called guidance.

Surveillance services

23. Safety of air traffic in controlled airspace and at airports requires that the exact locations of aircraft in the air and of other aircraft and ground vehicles on the airport surface are known by air traffic control and in some cases by pilots, when controlling the safe separation by themselves. Air traffic control instructions and clearances, as well as control actions in self separation, have to be based on precise surveillance data, produced by ground radars, ground receivers measuring the aircraft position or aircraft itself transmitting to ground their satellite based position data. Safety of aircraft may be directly affected by the quality of this location data. Misperceiving the exact location of an aircraft in controlled airspace may lead the air traffic control not to take corrective

action in case of an aircraft unintentionally getting too close to an active military training area, hence degrading the safety margins planned for such activities. The purpose of paragraph 2.f.1 is to mitigate safety risks related to different types of surveillance services, taking into account the technological developments imminent in this field too. These mitigation means are also in compliance with ICAO SARPs, coming mainly from Annex 10, Volume 4, on radar surveillance and collision avoidance systems. In the SES context, surveillance services are covered by the interoperability Regulation (EC) No 552/2004, Annex II, Part B, paragraph 6.1, which is also the aim of this paragraph.

Air traffic flow management (ATFM)

24. Overloading the capacity of an ATC unit or any of its sectors or the capacity of an airport to receive traffic may affect negatively the level of safety of air traffic. ATFM services have been established to prevent this overloading to take place. They provide precise and current information of the planned air traffic affecting different service providers and undertake to coordinate and negotiate rerouting or delaying traffic flows, in order to prevent these overloading situations from occurring. Such flow management services have been organised both through one single centralised operating unit and through local or regional units. The tasks of the centralised unit are regarded as a regulatory function performed by the European Commission, through delegation to other organisations; therefore the related safety requirements must be defined in the articles of the Basic Regulation. On the other hand, the local or regional ATFM services are comparable to service provision, and their safety requirements are imposed through appropriate essential requirements. Paragraph 2.g.1 was developed to cater for the hazards caused by too heavy demands of service provision which are related to such local or regional units, operating independently or as a part of an ATS service provider. In the ICAO context, ATFM has been recognised and addressed e.g. in Doc 4444 – PANS-ATM and in regional air navigation plans. As regards the SES context, a draft implementing rule is in preparation through a EUROCONTROL mandate process.

Airspace management (ASM)

25. The purpose of ASM service is to define temporary airspace structures, manage their allocation for specific airspace user needs, monitor their use and provide for precise and current information on their planned and actual availability for general air traffic. ASM service must ensure effective coordination and timely exchange of accurate information between relevant air traffic control units, with military users, with ATFM and with other airspace users whenever appropriate. Accuracy of information on the status of these airspace structures, as well as its timely distribution and effective coordination between relevant airspace and service providers, has a direct effect on the safe conduct of flights. Notifying wrong information, in terms of time or flight levels, on the daily availability of a conditional route may lead air traffic control to give a clearance for an aircraft to use this conditional route passing an active danger area. This would be a severe incident that could have catastrophic consequences. ASM has been organised specifically on a strategic, pre-tactical and tactical level. ASM strategic level tasks are regarded as regulatory functions organised by the Member States, and therefore the related safety conditions must be imposed through specific provisions in the Basic Regulation. On the other hand, the pre-tactical and tactical level of ASM could be regarded by Member States as service provision; their safety requirements should therefore be imposed through appropriate essential requirements. This is the object of paragraph 2.h.1 (in addition to the generic organisational ER's), stemming directly from the ASM concept described by ICAO, and complying with the SES implementing rules on the flexible use of airspace (FUA). However, the ER also mandates developing further implementing rules to mitigate different safety risks related to this activity.

Mitigation of the risks related to systems and constituents

General

26. ANS/ATM services are based on a complex network of different systems and constituents forming the technical infrastructure of the concept of operations. These systems and constituents are installed either on aircraft or on the ground or are part of a space-based constellation. They altogether contribute to providing a service that must be safe. Therefore, the proposed essential requirements stipulate in paragraph 3.a.1 that systems and constituents must be properly designed, manufactured, maintained and operated to ensure fitness for their intended purpose. If this is not the case, there would be a potential risk of an essential service being partly or totally lost. In the SES context, systems and constituents are covered by the Regulation (EC) No 552/2004 establishing a legal basis for further implementing rules aiming to ensure interoperability within the whole EATMN, but without detailed safety objectives. The ERs proposed in point 3. and described in this paragraph and the ones below improve legal certainty by creating a clearer legal basis for the development of detailed implementing rules. The draft ER has been amended, based on the comments received, to contain also installation of systems in order to cover critical supporting infrastructures, which are essential to the provision of ATM/ANS services, and secondly to limit their applicability to those related to ATM/ANS information. As a general clarification, it should be noted that operating procedures have been covered by other essential requirements related to services and service providers. Secondly, the term 'fitness for intended purpose' is used here in order to cover also the intended functionality, which is also of safety relevance.

System and constituent integrity, performance and reliability

27. Paragraph 3.b.1 builds on the previous essential requirement, refining that the systems and constituents must meet their expected level of performance for all their foreseeable operating conditions and for their whole operational life. Radars have to function according to their specifications in all foreseen meteorological circumstances; for example, the antenna rotation must not be altered when installed in northern altitudes, where the antenna may be covered by snow, or when installed on coastal sites affected by heavy winds. Based on comments received, the drafting of the ER has been amended to make it more consistent and to limit it to safety related performance objectives, in order to clarify that other performance objectives are not covered. It is also clarified that the fitness for purpose shall be demonstrated.

Design of systems and constituents

28. A proper functioning of systems and constituents can be guaranteed only if experienced deficiencies in their design, leading to hazardous features, are not left unattended, leaving the door open for these events taking place again. Therefore paragraph 3.c.1 requires that, where appropriate, the design of systems and constituents has to be based on quality control, ensuring that experience of hazardous features always leads to corrective design activities.
29. Experience has shown that it is not enough to ensure that the design of systems or constituents is adequate as a single object. A hazardous feature of an aircraft transponder might occur only when it and its antenna are installed in the aircraft, or when it is affected by numerous interrogations in a real traffic environment. The purpose of paragraph 3.c.2 is to require that the design of systems and constituents assesses them properly as a part of a total system or concept. The draft ER has been slightly amended based on the comments received,

30. One of the most important design aspects of systems and constituents is the compatibility with human capabilities and performance in all modes of operations. For instance, the design of air traffic controllers' workstations including multi-modal techniques must be compatible with the controllers' practices and they must be designed so that the controller trained to use them can safely perform the associated tasks as well as manage the errors that may occur. The paragraph 3.c.3 mitigates such hazards by adding this compatibility with human factors as an additional condition to the systems and constituent design.
31. A proper functioning of systems and constituents is often dependant on external elements, such as the source of energy or external cooling, or might be affected negatively by human activities. Mitigation of such hazards may in some cases necessitate specific facilities or arrangements for their monitoring and control. Paragraph 3.c.4 establishes a legal mandate to impose this, when made necessary by the nature of activity. In order to remove any ambiguity with respect to the distinction between safety and security aspects, the reference to 'dangerous interactions' has been replaced by 'unintended harmful interactions'.
32. It is obvious that systems and constituents can not provide for the expected service if not installed, operated and maintained properly. Paragraph 3.c.5 creates an obligation on the responsible organisation to ensure that appropriate information for these purposes will be provided. As a point of clarification, this obligation does not cover responsibilities of users and may not cover all the information related to the intended operating environment.

Continuing level of service

33. In most safety critical cases the systems and constituents have to be monitored to ensure that the level of service is not negatively altered. Such is the case, for example, with some navigation systems, whose integrity, reliability and stability of operations has to be continuously monitored. Absence of such measures could lead to a situation of deterioration of the provided signal in space, which in turn could lead to a potential risk of aircraft infringing the required separation minima due to a navigational problem. That was the reason for developing paragraph 3.d.1, based on similar principles as defined by ICAO Annex 10, to ensure continuous monitoring of the most safety critical systems and constituents. Based on the consultation, the purpose of the monitoring has been expressly defined as covering safety and integrity related performance of the systems and, where appropriate, their constituents.

Modification of systems and constituents

34. Paragraph 3.d.2 determines that the modification of the design of systems and constituents must be executed in a proper manner. A modification or a reconfiguration of the flight data processing system used in ATC service provision, if not carried out properly, could lead to the total loss of essential air traffic service in a significant volume of airspace causing a major safety risk to all controlled aircraft in this airspace. The object of paragraph 3.e.1 is to mandate that any change, modification or reconfiguration must be introduced in a controlled manner.

Mitigation of the risks related to the qualification of air traffic controllers

General

35. It is obvious that a safe ATS service provision is an essential pillar for the safety of air traffic. This can only be achieved by ensuring the competence of air traffic controllers. It is generally agreed that the first competence needed is theoretical knowledge. As insufficient maturity to assimilate training of a demanding nature is seen as a significant

hazard, there is a need to provide protection against such a risk. Setting a minimum age would be an option, but such requirement is relatively inflexible and does not take into consideration the various types of training, or the different levels of maturity among individuals of the same age. It has therefore been preferred to define a qualitative requirement that can then be appropriately developed through implementing rules if necessary. This general principle is provided for in paragraph 4.a.1, which complies fully with ICAO Annex 1 on personnel licensing. It can also be noted here, in a more general sense, that this whole section of the draft essential requirements, on qualification of air traffic controllers, provides a consistent regulatory framework, which would allow addressing necessary qualification requirements of other personnel, if so decided, in a modern and continuously changing ANS/ATM environment. Moreover, the draft essential requirements developed in this area are compliant with the Directive 2006/23/EC on a Community air traffic controller licence.

Theoretical knowledge

36. Inadequate theoretical knowledge can prevent an air traffic controller from perceiving the air traffic environment or understanding how his/her activities would affect it. An important basic aspect not to be forgotten when developing the essential requirements is that they have to be proportionate to the safety objective. Therefore, the extent of this theoretical knowledge has to be balanced with the complexity of the functions exercised and proportionate to the risks associated with the type of service in question. This is the basic principle of paragraph 4.b.1, allowing implementing rules to be developed taking into account the different needs by different personnel in different environments.
37. The level of theoretical knowledge needed can only be reached through proper training. Inadequate or inappropriate training of air traffic controllers could lead to providing wrong information or instructions to aircraft, to different practices making the interaction with aircraft difficult or, in some cases, even to a loss of essential service. For these reasons, it is of vital importance to ensure the quality of training, by continuous assessment during training or by appropriate examinations, and that the theoretical knowledge has been properly acquired and upheld. Paragraph 4.b.2 concentrates on providing the legal basis for requiring such training methods.
38. Whatever the level of competence, it can deteriorate through time. If this reduction of competence is significant, it can constitute a risk to the quality of service provided and could be detrimental to the safety of aircraft. Therefore, there is a clear need to demonstrate by regular assessments or examinations that competence has not deteriorated. Indeed, paragraph 4.b.3 establishes the need for maintaining theoretical knowledge and introduces a concept of experience in this area. The draft essential requirement also allows the adjustment of the period between checks to the complexity of the functions exercised and to adapt it to the risks associated with the type of service provided for. The more complex the functions exercised, taking also into account the operating environment, the shorter the period between the checks would be.

Practical skill

39. Practical skill is the second crucial competence that an air traffic controller must have. As stated above in the case of the required theoretical knowledge, the demand for practical skill has to be proportionate to the safety objective and depends upon the complexity of the functions exercised and of the risks associated with the type of service. Paragraph 4.c.1 establishes the need to acquire and maintain the appropriate level of practical skills. The draft essential requirement also specifies five key areas for

which practical skills must be developed and possessed, without, however, being limited only to the items listed.

40. Furthermore, one can only be certain that the necessary practical skill is properly acquired and upheld when this is demonstrated to a third party, regarded as an assessor. This basic principle is the reason for paragraph 4.c.2.
41. It goes without saying that, in the case of practical skill, the demonstration of compliance must take place by regular assessments or examinations, thus ensuring that competence has not deteriorated through time. Here again the period between checks may vary in relation to the complexity of the functions exercised and the level of risk associated with the tasks performed. Further details on the content and scope of training standards and frequency of assessments will be defined by the related implementing rules. Paragraph 4.c.3 creates a legal mandate to cover requirements for regular assessments of such skills. The proposed draft ER has been slightly amended to state that the frequency of the regular assessments could be proportionate not only to the level of risk associated, but also to the complexity of the tasks performed.

Language proficiency

42. As is already internationally accepted throughout the aviation community and enshrined as a requirement in ICAO Annex 1, as well as provided for by the EU directive on a Community air traffic controller licence, it must be ensured that air traffic controllers can demonstrate the ability to speak and understand English to a satisfactory standard. The use of a common language is vital for flight safety. Paragraph 4.d.1 sets the legal basis for air traffic controllers to demonstrate proficiency to communicate effectively in English.
43. Since it is authorised for pilots to use a local language in certain volumes of airspace, it is for safety reasons unavoidable to impose a similar local language proficiency requirement for air traffic controllers serving such airspace. This is the reason for establishing paragraph 4.d.2.

Synthetic Training Devices

44. Synthetic training devices are used more and more in modern aviation training and in demonstration of practical skills. The Agency has found it therefore necessary to have the possibility to impose qualitative requirements on the level of their performance, where necessary and as appropriate to the training being provided. Paragraph 4.e.1 mandates this objective.

Training Course

45. A very basic principle of proper training is that it must be executed through a training course. This way, an adequate level of uniform training standards is ensured. The significance of training methods in relation to safe services has made it necessary to require this at the level of an essential requirement, through paragraph 4.f.1.
46. The absence of necessary elements in the training programme could produce air traffic controllers unable to handle critical situations, thus creating hazards. For this reason, the draft essential requirements include in paragraph 4.f.1 the need for a training plan.

Instructors

47. The quality of a training course is not the only criteria in good training. The qualifications of the instructor are also a significant factor in the overall instruction. This naturally includes the appropriate knowledge in the field where instruction is to be

given, as well as the capability of using appropriate instructional techniques. Paragraph 4.g.1 addresses this issue. It is based, again, on ICAO Annex 1 and is already implemented in the Directive on air traffic controller licences. The content of the draft ER has been clarified based on the comments received by imposing that the instructor must also have demonstrated his/her ability to use such instructional techniques.

48. It goes without saying that qualification criteria have been designed to apply not only to theoretical instruction, but also to instruction on practical skills. However, training on practical skills requires, by its nature, other types of qualifications too. It is widely accepted that the instructor must know, and have experience of, the environment and the procedures in which instruction will be given. The instructor must also receive refresher training to ensure that the instructional standards are maintained up to date. Paragraph 4.g.2 introduces a legal mandate to regulate the qualifications for instruction on practical skills. As in the case of theoretical instruction, the draft ER has been clarified based on the comments received by imposing that the instructor must also have demonstrated his/her ability to use such instructional techniques.
49. Paragraph 4.g.3 requires the instructor to be or have been entitled to act as an air traffic controller. It goes without saying that an instructor, when supervising a trainee controller on-the-job, has to execute immediate and proper actions if the trainee makes a misjudgement and allows a situation to develop to an unsafe point. This is again in line with ICAO Annex I and with the EU Directive.

Assessors

50. As described above, there is a need for assessment or examination on practical skills, in order to verify that appropriate competence has been acquired and is maintained. This common principle has, again, already been established, and experience shows that these checks can only be efficient if the assessors (or examiners) are properly qualified themselves. Paragraph 4.h.1 sets out qualification criteria that must have been demonstrated by these assessors so that they can evaluate the skill of an air traffic controller in a proper and harmonised way. The obligation to demonstrate the capability to assess has been added to the ER based on comments received.
51. As already explained in the case of instructors, the assessor must also be or have been entitled to act as an air traffic controller. This requirement, provided for in paragraph 4.h.2, goes further than what is required by ICAO or by the EU Directive; however, this is felt to be necessary by the Agency, based on safety related experience acquired, showing that only a peer can properly judge an air traffic controller competence.

Medical fitness of an air traffic controller

52. It is evident that all persons providing ATC services must be physically and medically fit, taking into account the safety critical nature and specific requirements typical of such functions. This is the basic principle laid down as the medical criteria for air traffic controller in paragraph 4.i.1.
53. Detailed requirements to demonstrate such fitness will then be provided for in the respective implementation rules. These must detail how the demonstration of the absence of any disease or disability, which makes the person providing an ATC service unable to execute the necessary tasks properly, or to perform assigned duties at any time or to perceive correctly his/her environment, must be made. The latter criteria are meant also to address situations of personnel being unfit to discharge their duties due to the use of any psychoactive substances. Paragraph 4.i.1 therefore provides the legal basis for the assessments and examinations necessary to demonstrate the ability of a person providing a safety critical service to execute his/her functions.

54. Moreover, paragraph 4.i.2 allows deviations when appropriate mitigation measures can be implemented to ensure that the level of safety is maintained. A person may be unfit to exercise some of the functions of an air traffic controller and still, under certain conditions, such as adapted procedures or equipment, or a limitation of the tasks that can be exercised, pose no risk to air traffic. This is important, as declaring a person whose capacities are only slightly diminished completely unfit would lead that person to lose his/her profession unnecessarily.

Mitigation of the risks related to service providers and training organisations

General

55. As demonstrated by various hazards in this field, safety of air traffic in many cases is dependant on a proper provision of defined ATM/ANS services, which in turn assumes that an ineffective organisation of work within a service provider may lower the level of safety and may consequently contribute to the development of these hazards. Therefore, it is indispensable to ensure that the organisations in question have adequate means to deliver the intended services. Requirements presented in section 5.a have been designed to establish conditions to be met by these organisations and to ensure that they fulfil their obligations. Commission Regulation (EC) No 2096/2005, Annex I already imposes general requirements on the organisation of regulated service providers. The proposed ERs under point 5 clarify essential safety objectives in this domain that will serve as a basis for the development of detailed implementing rules.
56. ATM/ANS service providers and ATC training organisations have to be able to provide services in a safe, continuous and sustainable manner, consistent with a reasonable level of the overall demand. The complex nature of their functions and a strong need for interaction and careful coordination requires that bodies involved must put in place and maintain high performance management systems covering relevant systems and constituents, facilities, management structure, personnel, documentation of tasks, responsibilities and procedures, access to relevant data and record keeping, so as to promote a real safety culture. A provider of ATC services not having defined management structures and therefore not being able to systematically give priority to safety would be very vulnerable to blurred responsibilities in service provision, which in turn would clearly be a contributing factor for safety hazards. This is the reason for paragraph 5.a.1 requiring the establishment of appropriate management structures. This is consistent with the ICAO SARP's in Annex 11 and with the certification scheme developed through the SES implementation regulation laying down common requirements for the provision of air navigation services, as well as with the EU Directive on a Community air traffic controller licence when it comes to the provision of air traffic controller training. The draft ER has been complemented by inserting a direct reference to power systems, which do have an essential role as enabling ATM/ANS service provision taking place. This was requested in several comments received by the Agency.
57. Again, the complexity and volume of operations in ATM/ANS service provision requires the organisation to operate in a standardised manner to provide for a comparable level of safety in all circumstances and through all services provided. To reach this objective, their operations must be carried out according to management and operations manuals, so that all personnel is able to work in the same consistent manner at all times, and communication with other organisations involved in service provision, as well as with different airspace users, is facilitated. Poor communication leads to misunderstandings that can be the cause of an accident or incident. This is why paragraph 5.a.2 imposes the establishment of appropriate organisational manuals, in a very similar manner as required by the ICAO safety management manual, and as required by the SES common requirements.

58. The main obligation of ATM/ANS service providers and ATC training organisations is to ensure that the services provided comply with the relevant essential requirements of this Attachment. If for any reason, as an example, flight information provided to air traffic becomes non-compliant, the service provider must ensure remedial action is taken or necessary mitigating measures are put in place. This is to avoid the hazards created to the operation of aircraft based on a critical service that no longer complies with the relevant mitigating measures defined. Moreover, a systematic risk assessment and mitigation has to be conducted for any changes to the elements in the chain of safety critical service provision, to ensure the continuous compliance with essential requirements and fully allow the benefits of pro-active improvement brought by a risk based management system. This basic principle of the implementation of a risk based management system is laid down in paragraph 5.a.3. Similar provisions are contained in the SES implementing rule 2096/2005 and in EUROCONTROL ESARR 3.
59. As has already been explained in the paragraphs related to regulated professions, it is clear that the competence of a person executing safety critical tasks related to ANS/ATM service provision is essential to flight safety. This principle can be imposed as an organisational responsibility to maintain the professional qualifications of personnel in safety critical tasks, through the implementation of training and checking programmes. A person's level of competence can deteriorate through time, and the knowledge base used in initial training may go out of date in relation to changes in the concept of operations; this may constitute a safety risk in service provision, in the form of a wrong instruction to a pilot, or as an inability to control properly a dense traffic situation. That is why paragraph 5.a.4 introduces the need for organisations to ensure the ability of persons in safety critical tasks to execute their duties properly and to maintain such competency. This fully complies with organisational responsibilities established by ICAO SARP's, by SES common requirements for the provision of ANS and in ESARR 5, paragraph 5.1.2.
60. The safe execution of ANS/ATM services consists of several functions and interactions by a chain of different organisations and persons. The ANS/ATM service provider is one of these actors, whose own operations have to be safe, but which also have to be interfaced and coordinated in a safe way with other relevant parties in a service chain. This is very true, for example, in the case of ATC service for aerodrome traffic, which definitely must have clear and unambiguous interactions with those in charge of controlling the use of various vehicles on the movement area of an aerodrome. If there were no such interaction, it would cause a potential safety risk of collision between any vehicle and aircraft. The significance of coordination in relation to safe service provision has made it necessary to require this on the level of an essential requirement, as is the case in paragraph 5.a.5. This has been one of the overriding principles also for ICAO when imposing requirements to the various actors within aviation. Coordination and formal interfaces between different actors have been covered in the SES implementing rule 2096/2005 and in ESARR 3, paragraph 5.2.6. The draft ER has been slightly amended for editorial reasons.
61. It is an essential part of the safe ANS/ATM service provision that emergency situations and events of disruption of services are proactively planned and implemented through formal contingency planning. If an area control centre suddenly loses its flight data processing capabilities, it must have formal and written procedures on how to coordinate the situation with aircraft under its control, with neighbouring area control centres, as well as with approach and tower control units within the FIR. It is therefore essential to mitigate related risks with emergency measures planned beforehand. The implementation and establishment of contingency plans are mandated in paragraph 5.a.6 and they reflect provisions in Chapter 2 and Attachment D, as regards air traffic services, of ICAO Annex 11. Again, Commission Regulation (EC) No 2096/2005 provides a requirement for contingency planning by the affected organisations. The draft ER has been amended for editorial reasons.

62. A system for occurrence reporting and analysis is one of the cornerstones for the management of aviation safety. This is not contested by anyone and it is already legally imposed by the Community legislation in other areas of aviation safety, as well as in ATM through the SES common requirements. These very same grounds are shared by ICAO and stated in its safety management manual. This broad and consistent basis needs to be enhanced by further complementary implementation measures in relation to ATM/ANS service provision and ATC training. Such is the background for paragraph 5.a.7. Such objectives are covered in the SES context for ATS service providers in Regulation (EC) No 2096/2005 and in ESARR 3, paragraph 5.3.2.
63. As regards technical systems and constituents in ATM/ANS service provision, the safety regulatory means should impose minimum performance requirements vital to safe operation of air traffic, instead of regulating their technical implementation. It is then for the service provider to ensure that these performance criteria are continuously met or, when this is not the case, to implement appropriate mitigating measures. This is the purpose of paragraph 5.a.8. ESARR 3, paragraph 5.3.2 establishes equivalent provisions. The draft ER has been amended for clarity reasons and to further specify that its effect is limited to safety related performance requirements.

ATC service provision

64. ATC services have a principal safety objective to prevent collisions between aircraft and between aircraft and any obstruction on the ground. The significant nature of these services makes it necessary to impose specific mitigation means for organisations in charge of these services. Requirements presented in section 5.b have been developed to establish specific conditions to be met by these organisations and to ensure that they fulfil the requirements imposed. Equivalent provisions are contained in ESARR 3. The Agency has maintained its view in limiting these ER's to the ATC service provision, even though some comments received suggested extending it to cover ATS service provision. The draft ER has, however, been slightly amended for editorial reasons.
65. Nobody contests that air traffic controllers are key players to ensuring the safety of air traffic in case of controlled flights, especially as regards those parts of airspace used by high volumes of aircraft. As shown by experience and indicated by various safety occurrences, ATC personnel can only execute their tasks if they are not fatigued. Fatigue is a potential cause of reduced performance, from which there is no certainty that a person can be aroused in a demanding situation. It is therefore important that measures are taken to manage fatigue and ensure appropriate limitation to duty periods and duty time as well as ensure sufficient rest before a duty is undertaken again. That should be done through an appropriate rostering system. Such is the objective of paragraph 5.b.1 that covers also the intent of SARP's in ICAO Annexes related to this subject.
66. It is also commonly recognised that other human factors, such as stress, may affect a person's abilities to execute their duties properly. This should be regarded as a safety hazard in working environments as ATC, which requires a high level of judgement and comprehension. Therefore, paragraph 5.b.2 mandates the development of necessary programmes to be implemented by the ATC service providers to mitigate such risks.
67. As a continuation to the two paragraphs above, it is well recognised also in this field that the cognitive judgement of personnel can be impaired because of other reasons, such as the influence of any psychoactive substances. The intent of paragraph 5.b.3 is to ensure that the ATC service providers have appropriate procedures to address such risks where appropriate.

68. It has been established in the first section of this Annex that, in order to prevent safety risks caused by insufficient service provision capacity, means must be established to ensure that air traffic volumes do not exceed the maximum airspace design capacity. In line with this, it is necessary to impose that ATC service providers take all technical and operational constraints, as well as human factors, into account in their planning of operations. Such constraints naturally must contain the established maximum values, as well as planning and implementation of appropriate means to limit entry of traffic into the airspace due to safety reasons. Paragraph 5.b.4 establishes these principles. Based on the comments received, and in order to clarify the meaning of this ER as an organisational requirement, the latter part of it, referring directly to maximum values of allowed air traffic and to the means of its control, has been removed.

Communication, navigation and surveillance service provision

69. Provision of ATC is highly dependent on communication, navigation and surveillance services providing appropriate means for exchanging information between ATS services and air traffic, providing accurate positioning data for aircraft and giving precise data for the ATC units on the position of air traffic. For example, a loss of communication capability of an ATC unit would cause a total loss of an essential service related to safety of air traffic. It is therefore necessary to establish an organisational requirement for the communication, navigation and surveillance service providers to keep all relevant parties informed on a timely basis of the operational status of their services. This is imposed in paragraph 5.c.1, which is fully in line with the principles of ICAO SARP's in Annexes 10 and 11.

Training organisations

70. The ATC training provision has been regarded as an important factor contributing to the quality of ATC service provision and therefore being an aspect of safety relevance. A high and uniform level of ATC provision is significant, not only in relation to single service providers, but especially at the interface between different service providers. This is also the line taken in the EU Directive on Community air traffic controllers' licence. For these reasons, paragraph 5.d.1 establishes that ATC training providers have appropriate means and management structures to ensure a high level of ATC training.

II. Essential requirements for air traffic management and air navigation services

1. Use of the Airspace

- 1.a. All aircraft, in all phases of flight or on the movement area of an aerodrome, shall be operated in accordance with common general operating rules and any procedure specified for the use of that airspace in accordance with the applicable concept of operations.
- 1.b. All aircraft must be equipped with the appliances required by the applicable concept of operations and operated accordingly. Appliances, when used in the ATM/ANS system, shall also comply with the requirements in point 3.

2. Services

- 2.a. Aeronautical information and data to airspace users for the purpose of air navigation;
 - 2.a.1. The data used as a source for aeronautical information must be of sufficient quality, complete, current and provided in a timely manner.
 - 2.a.2. The resulting aeronautical information must be accurate, complete, current, unambiguous and in a suitable format for users.
 - 2.a.3. The dissemination of such aeronautical information to airspace users must be timely, of adequate integrity and using sufficiently secure and expeditious communication means protected from interference and corruption.
- 2.b. Meteorological information
 - 2.b.1. The data used as a source for aeronautical meteorological information must be of sufficient quality, complete and current.
 - 2.b.2. The resulting aeronautical meteorological information must be sufficiently precise, complete, current and unambiguous to meet the needs of airspace users.
 - 2.b.3. The dissemination of such aeronautical meteorological information to airspace users must be timely, of adequate integrity and using sufficiently secure and expeditious communication means protected from interference and corruption.
- 2.c. Air traffic services
 - 2.c.1. The data used as a source for the provision of air traffic services must be correct, complete and current.
 - 2.c.2. The resulting air traffic services must be sufficiently precise, complete, current, and unambiguous to meet the needs of users.
 - 2.c.3. Automated tools providing information or advice to users must be properly designed, manufactured and maintained to ensure fitness for their intended purpose.

- 2.c.4. Air traffic control services and related processes must provide for sufficient separation between aircraft, obstacles and other airborne hazards; and must ensure prompt and timely coordination with all relevant users and adjacent volumes of airspace.
- 2.c.5. Communication between air traffic control and aircraft and between relevant air traffic control units must be timely, clear, correct, unambiguous, protected from intrusion and commonly understood and acknowledged by all actors involved.
- 2.c.6. Means must be in place to detect possible emergencies, and, when appropriate, to initiate an effective search and rescue action. Such means must, as a minimum, comprise of appropriate alerting mechanisms, coordination measures and procedures, means and personnel to efficiently cover the area of responsibility.

2.d. Communication services

- 2.d.1. Communications must achieve and maintain sufficient performance capability, including criteria for availability, integrity, continuity and timeliness of the service. They must be secure, protected from corruption and expeditious.

2.e. Navigation service

- 2.e.1. Navigation service must achieve and maintain a sufficient level of performance with regard to guidance, positioning and, when provided, timing information. The performance criteria include accuracy, integrity, availability and continuity.

2.f. Surveillance service

- 2.f.1. Surveillance service must determine the respective position of aircraft in the air, and of other aircraft and ground vehicles on the airport surface, with sufficient performance, including criteria for its accuracy, integrity, continuity and probability of detection.

2.g. Air traffic flow management

- 2.g.1. The tactical management of air traffic flows at Community level shall use and provide sufficiently precise and current information of the volume and nature of the planned air traffic affecting service provision and shall coordinate and negotiate rerouting or delaying traffic flows in order to prevent overloading situations occurring in the air or at the aerodromes.

2.h. Air space management

- 2.h.1. The designation of specific volumes of airspace for a certain use shall be monitored, coordinated and promulgated in a timely manner in order to prevent any loss of separation between aircraft in all circumstances.

3. Systems and Constituents

3.a. General

- 3.a.1. Systems and constituents providing ATM/ANS related information to and from the aircraft and on the ground must be properly designed, manufactured, installed, maintained and operated to ensure fitness for their intended purpose.

3.b. System and constituent integrity, performance and reliability

- 3.b.1. The integrity and safety related performance of systems and constituents, considered collectively, separately and in relation to each other, whether on aircraft, on the ground or in space, must be demonstrated to be fit for their intended purpose. They must meet the expected level of performance required by the concepts of operations for all their foreseeable operating conditions and for their whole operational life.

3.c. Design of systems and constituents

- 3.c.1. Systems and constituents must not have design features or details that experience has shown to be hazardous.
- 3.c.2. Systems and constituents, considered collectively, separately and in relation to each other, must be designed in such a way that an inverse relationship exists between the probability of any failure and the severity of its effect on the service.
- 3.c.3. Systems and constituents, considered individually and in combination with each other, must be designed taking into account limitations related to human capabilities and performance.
- 3.c.4. Systems and constituents must be designed in a manner that protects them from unintended harmful interactions with external elements.
- 3.c.5. Information needed for the manufacturing, installation, operation and maintenance of the systems and constituents as well as information concerning unsafe conditions must be provided to personnel in a clear, consistent and unambiguous manner.

3.d. Continuing level of service

- 3.d.1. Means must be provided to allow integrity and safety performance monitoring and reconfiguration of systems and constituents, as necessary to maintain the level of service.

3.e. Modification of systems and constituents

- 3.e.1. When systems and constituents are modified, they must continue to comply with the essential requirements in this section. When modifications are implemented during operations, a change process must be developed so as to ensure that a minimum level of service is maintained.

4. Qualification of air traffic controllers

4.a. General

- 4.a.1. A person undertaking training as an air traffic controller must be sufficiently mature educationally, physically and mentally to acquire, retain and demonstrate the relevant theoretical knowledge and practical skill.

4.b. Theoretical knowledge

- 4.b.1. An air traffic controller must acquire and maintain a level of knowledge appropriate to the functions exercised and proportionate to the risks associated with the type of service.
- 4.b.2. The acquisition and retention of theoretical knowledge must be demonstrated by continuous assessment during training, or by appropriate examinations.
- 4.b.3. An appropriate level of theoretical knowledge must be maintained. Compliance must be demonstrated by regular assessments or examinations. The frequency of examinations must be proportionate to the level of risk associated with the type of service.

4.c. Practical skill

- 4.c.1. An air traffic controller must acquire and maintain the practical skills as appropriate to exercise his/her functions. Such skills must be proportionate to the risks associated to the type of service and must cover at least, if appropriate to the functions exercised, the following items:
 - i Operational procedures
 - ii Task specific aspects
 - iii Abnormal and emergency situations
 - iv Human factors
 - v Threat and error management
- 4.c.2. An air traffic controller must demonstrate the ability to perform the associated procedures and tasks with a level of competence appropriate to the functions exercised.
- 4.c.3. A satisfactory level of competence in practical skill must be maintained. Compliance must be demonstrated by regular assessments or examinations. The frequency of these assessments must be proportionate to the complexity and the level of risk associated with the type of service and the tasks performed.

4.d. Language Proficiency

- 4.d.1. An air traffic controller must have demonstrated proficiency to speak and understand English to the extent he/she is able to communicate

effectively in voice-only (telephone/radiotelephone) and in face-to-face situations with flight crews and other related personnel on concrete and work-related topics, including in emergency situations.

- 4.d.2. Whenever it is necessary in a defined volume of airspace for ATC service provision purposes, a person providing an ATC service must also have proficiency to speak and understand the local language(s) to the extent described above.

4.e. Synthetic Training Devices

- 4.e.1. When a STD is used for practical training on situational awareness and human factors, or for demonstration that skill is acquired or maintained, it must have a level of performance that allows adequate replication of the working environment and operational situations appropriate to the training being provided.

4.f. Training Course

- 4.f.1. Training must be executed through a training course, which may comprise theoretical and practical instruction, including synthetic training, if applicable;
- 4.f.2. A training plan must be defined and approved for each type of course.

4.g. Instructors

- 4.g.1. Theoretical instruction must be given by appropriately qualified instructors. They must:

- i have appropriate knowledge in the field where instruction is to be given; and
- ii have demonstrated the ability to use appropriate instructional techniques.

- 4.g.2. Instruction on practical skills must be given by appropriately qualified instructors, who have the following qualifications:

- i meet the theoretical knowledge and the experience requirements appropriate for the instruction being given;
- ii have demonstrated the ability to use appropriate instructional techniques;
- iii have practiced instructional techniques in those procedures in which it is intended to provide instruction;
- iv have demonstrated the ability to instruct in those areas in which instruction is to be given; and
- v receive regular refresher training to ensure that the instructional competences are maintained

- 4.g.3. Instructors on practical skills must also be or have been entitled to act as an air traffic controller.

4.h. Assessors

- 4.h.1. Persons responsible for assessing the skill of air traffic controllers must:
- i have demonstrated the ability to assess the performance of, and conducting tests and checks on air traffic controllers;
 - ii have demonstrated the ability to assess in those areas in which assessment is to be made; and
 - iii receive regular refresher training to ensure that the assessment standards are maintained up to date
- 4.h.2. Assessors on practical skills must also be or have been entitled to act as an air traffic controller.

4.i. Medical fitness of an air traffic controller

4.i.1. Medical criteria

- 4.i.1.i. All air traffic controllers must periodically demonstrate medical fitness to satisfactorily execute their functions. Compliance must be shown by appropriate assessment taking into account the possible mental and physical degradation due to age.
- 4.i.1.ii. Demonstration of medical fitness, comprising physical and mental fitness, shall include the demonstrated absence of any disease or disability, which makes the person providing an ATC service unable:
- i to execute properly the tasks necessary to provide air traffic control service; or
 - ii to perform assigned duties at any time; or
 - iii to perceive correctly his/her environment
- 4.i.2. Where medical fitness cannot be fully demonstrated, mitigation measures that provide equivalent safety may be implemented.

5. Service providers and training organisations

5.a. Service provision must not be undertaken unless the following conditions are met:

- 5.a.1. The service provider must have, directly or indirectly through contracts, the means necessary for the scale and scope of the service. These means comprise, but are not limited to, the following: systems, facilities, including power supply, management structure, personnel, equipment and its maintenance, documentation of tasks, responsibilities and procedures, access to relevant data and record keeping;
- 5.a.2. The service provider must develop and keep up-to-date management and operations manuals relating to the provision of its services and operate in accordance with those manuals. Such manuals must contain all necessary instructions, information and procedures for the operations, the management system and for operations personnel to perform their duties;

- 5.a.3. The service provider must implement and maintain a risk based management system to ensure compliance with the essential requirements in this Annex and aim for continuous pro-active improvement of this system;
 - 5.a.4. The service provider must use only suitably qualified and trained personnel and implement and maintain training and checking programmes for the personnel;
 - 5.a.5. The service provider must establish formal interfaces with all the other contributors to the service provision to ensure compliance with these essential requirements;
 - 5.a.6. The service provider must establish and implement a contingency plan covering emergency and abnormal situations that may occur in relation to its services;
 - 5.a.7. The service provider must establish and maintain an accident prevention and safety programme including an occurrence reporting and analysis programme, which must be used by the management system in order to contribute to the aim of continuous improvement of safety; and
 - 5.a.8. The service provider must make arrangements to verify that the safety performance requirements of any system and constituent they operate are met at any time.
- 5.b. ATC service provision must not be undertaken unless the following conditions are met:
- 5.b.1. The prevention of fatigue of personnel providing an ATC service must be managed through a rostering system. Such a rostering system needs to address duty periods, duty time and adapted rest periods. Limitations established within the rostering system must take into account relevant factors contributing to fatigue such as, in particular, sleep deprivation, disruption of circadian cycles, night hours, cumulative duty time for given periods of time and also the sharing of allocated tasks between personnel.
 - 5.b.2. The prevention of stress of personnel providing an ATC service must be managed through education and prevention programmes.
 - 5.b.3. The ATC service provider must have in place procedures to verify that the cognitive judgement of personnel providing ATC services is not impaired or their medical fitness insufficient.
 - 5.b.4. The ATC service provider must take into account operational and technical constraints as well as human factor principles in their planning and operations.
- 5.c. Communication, Navigation and/or Surveillance service provision must not be undertaken unless the following conditions are met:
- 5.c.1. The service provider must keep relevant airspace users and ATS units informed on a timely basis of the operational status (and changes thereof) of their services provided for ATS purposes.
- 5.d. Training organisations

- 5.d.1. A training organisation providing training for personnel providing an ATC service must meet the following requirements:
- i have all the means necessary for the scope of responsibilities associated with their activity. These means comprise, but are not limited to, the following: facilities, personnel, equipment, methodology, documentation of tasks, responsibilities and procedures, access to relevant data and record-keeping;
 - ii implement and maintain a management system relating to safety and the standard of training, and aim for continuous improvement of this system; and
 - iii establish arrangements with other relevant organisations, as necessary, to ensure continuing compliance with these essential requirements