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EUR ANP, VOLUME I, BASIC ANP

PART IV

COMMUNICATIONS, NAVIGATION AND SURVEILLANCE (CNS)

RECORD OF AMENDMENTS

Note: A consolidated text of this section, containing the following approved amendments to the EUR ANP, will be officially disseminated on an annual basis. This document is produced solely as reference material to assist States in the preparation of proposals for amendment to the EUR ANP.

AMENDMENTS

P. f. Amdt. Serial No.	Originator	Date Approved	Date Entered
05/20-CNS	EANPG	06/11/05	10/05/06
04/02-CNS	EANPG	27/12/06	05/03/07
06/11-CNS	EANPG	01/08/07	09/08/07
10/03-CNS	EANPG	16/06/10	16/06/10

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BASIC AIR NAVIGATION PLAN

PART IV

COMMUNICATIONS, NAVIGATION AND SURVEILLANCE (CNS)

GENERAL

1. Communications, Navigation and Surveillance (CNS) facilities and services should meet the requirements of those other components of the air navigation system which they are intended to serve.

2. In planning for those other components, economy and efficiency should be taken into account in order to ensure that the requirements for the provision of CNS facilities and services can be kept to a minimum.

3. CNS facilities and services should fulfil multiple functions whenever this is feasible.

COMMUNICATIONS

AERONAUTICAL FIXED SERVICE (AFS)

Basic requirements

4. The aeronautical fixed service (AFS) should satisfy the communication requirements of ATS, ATFM, AIS, MET and SAR, including specific requirements in terms of system reliability, message integrity and transit times, with respect to printed as well as digital data and speech communications. If need be, it should, following agreement between individual States and aircraft operators, satisfy the requirements for airline operational control.
[Annex 3, 11.1; Annex 11, 6.2; Annex 12, 2.4; Annex 15, Chapter 9; Annex 10, Volume II, Chapter 4]

5. To meet the data communication requirements, a uniform high-grade aeronautical network should be provided, based on the aeronautical telecommunication network (ATN), taking into account the existence and continuation of current networks. This network is hereafter referred as the EUR-ATN Network.
[Annex 10, Volume III, Part I]

Existing network

6. Pending future development of the EUR ATN, the current requirements should be met by the use of:

a) Aeronautical Fixed Telecommunication Network (AFTN);

b) Common ICAO Data Interchange Network (CIDIN) and CIDIN COM centres;

c) ATS message handling systems (AMHS), AMHS COM centres and gateways;

d) dedicated networks of ATS providers;

e) Operational meteorological information (OPMET) circuits and centres;

f) ATS speech networks and circuits;

g) ATS computer-to-computer data networks and circuits; and

h) the Satellite distribution system for information relating to air navigation (SADIS).

7. All possible arrangements should be made to ensure that, in case of breakdown of a communications centre or circuit, at least high-priority traffic continues to be handled by appropriate means.

8. Emergency procedures should be developed to ensure that, in case of a centre breakdown, all the parties concerned are promptly informed of the prevailing situation.

9. AFS planning should permit flexibility in detailed development and implementation.

The EUR-ATN network

10. The EUR-ATN Network should have sufficient capacity to meet the basic requirements for data communications for the services mentioned in 4. above.

11. The EUR-ATN Network should be able to:

a) support applications carried by the existing network as listed in 6 above;

b) support gateways enabling inter-operation with existing networks; and

c) support ground communications traffic associated with air-ground data link applications.

Note. — A requirement for the EUR-ATN Network to carry digital speech may have to be considered as and when this becomes practicable and cost effective.

12. The EUR-ATN Network should make optimum use of dedicated bilateral aeronautical links and other communication means commensurate with the operational quality of service (QoS) requirements.

13. The plan for the implementation of the EUR-ATN Network should take into account the need for cost-effective evolution in terms of network capacity and allow for a progressive transition from existing ground communication networks and services to a uniform, harmonised and integrated communications infrastructure.

14. In case means other than dedicated bilateral links are used by the EUR-ATN Network, implementation priority, high availability, priority in restoration of service and appropriate levels of security should be ensured.

15. The EUR-ATN Network should provide for interregional connections to support data exchange and mobile routing within the global ATN.

16. In planning the EUR-ATN Network, provisions should be made, where required, for interfacing with other international networks.

Network services

17. The Transmission Control Protocol/Internet Protocol (TCP/IP) communication protocol should be used for the initial implementation of AMHS.
[EANPG 44/45].

18. The migration of flight data exchange (OLDI) from X.25 to TCP/IP should be planned.

19. The migration of international or regional ground networks to the EUR-ATN network based on internet protocol (IP) to support AFS communication requirements, while reducing costs, should be planned.

Network management

20. A centralised off-line network management service is provided to participating AFTN/CIDIN/AMHS centres in the EUR Region.
[EANPG 45/10].

Specific ATS requirements

21. Where ATS speech and data communication links between any two points are provided, the engineering arrangements should be such as to avoid the simultaneous loss of both circuits.

22. Special provisions should be made to ensure a rapid restoration of ATS speech circuits in case of outage.

23. The direct access speech capability provided between ATS units should permit contact to be established as rapidly as necessary commensurate with the functions of the unit concerned.
[Annex 11, 6.2]

24. Data circuits between ATS systems should provide for both high capacity and message integrity.

25. The OLDI application, which provides functionalities equivalent to ATS Interfacility Data Communication (AIDC), is used for automated exchange of flight data between ATS units.

Specific MET requirements

26. In the transmission of operational meteorological information on the EUR-ATN Network the specified transit times should be met on at least 95 per cent of occasions.
[Annex 3, 11.1.11]

27. The increasing use of the GRIB and BUFR code forms for the dissemination of the upper wind and temperature and significant weather forecasts and the planned transition to the BUFR code form (or table driven code form) for the dissemination of OPMET data should be taken into account in the planning process of the EUR-ATN Network.

28. In planning the EUR-ATN Network, account should be taken of changes in the current pattern of distribution of meteorological information resulting from the increasing number of long-range direct flights and the trend towards centralized flight planning.

Note. — Specific requirements concerning ATFM and AIS have still to be developed.

Multinational System Addressing

29. The EU addressing indicator is reserved in ICAO Doc 7910 for use by multinational systems in the ICAO European Region to allow multinational systems to retain the same addressing indicator, irrespective of which State or States the service is operated from. This enables the physical location of the service to be independent of the address used. The ICAO EUR/NAT Regional Director is the focal point for proposals for changes to the EU entry in Doc 7910.

30. The use of the EU indicator needs to be carefully managed to ensure that the primary purpose of the addressing indicator, which is to enable the AFTN addressing system, is not compromised. Therefore, the following basic rules should be applied:

- i) only State groupings within the EUR Region that are providing multinational services can be considered as being eligible to use EU;
- ii) there must be clear operational and/or institutional needs for an allocation;
- iii) there must be an assessment of implications, and
- iv) assignments are to be formulated in accordance with the requirements of Doc 7910. The 3rd and 4th letters of an EU allocation will identify the function of the system. The 5th to 8th letters will be assigned in accordance with the requirements of Doc 8585, in close co-ordination with the EANPG COG.

31. The ICAO Regional Director of the EUR/NAT Office should consider a request for an EU allocation in ICAO Doc 7910 only when the above requirements are met.

AERONAUTICAL MOBILE SERVICE (AMS)

32. Air-ground communications facilities should meet the agreed communication requirements of the air traffic services, as well as all other types of communications which are acceptable on the AMS to the extent that the latter types of communications can be accommodated.

33. To meet the air-ground data communication requirements, a high-grade aeronautical network should be provided based on the ATN, recognising that other technologies may be used as part of the transition. The network needs to integrate the various data links in a seamless fashion and provide for end-to-end communications between airborne and ground-based facilities.

34. Whenever required, use of suitable techniques on VHF or higher frequencies should be made.

35. Operation on HF should only be employed when use of VHF is not feasible. When HF is used, the single side-band technique should be employed.
[Annex 10, Volume III, Part II, Chapter 2.]

36. Aerodromes having a significant volume of International General Aviation (IGA) traffic should be provided with appropriate air-ground communication channels.

Air-ground communications for ATS

37. Air-ground communications for ATS purposes should be so designed that they require the least number of frequency and channel changes for aircraft in flight compatible with the provision of the required service. They should also provide for the minimum amount of coordination between ATS units and for optimum economy in the frequency spectrum used for this purpose. Basic elements for the determination of the need for air-ground communication channels and their economic use are given in Attachment A to Part V.II – ATS of the EUR FASID.
[Annex 11, 6.1 and Attachment B]

38. In addition, uniform values of designated operational range and height of VHF air-ground communication channels should be used for identical ATS functions in accordance with the table contained in Attachment B to Part V.I – ATS of the EUR FASID. Deviations from these values at specific locations or for specific functions should only be made in those cases where adequate operational justification for such a deviation is provided by the State(s) concerned.
[Annex 11, 6.1 and Attachment B]

39. In order to achieve optimum economy in the use of the radio frequency spectrum used commonly for inter-national and national ATS air-ground communications (VHF), the above criteria should also be applied to national planning in the field of VHF air-ground communications.

Air-Ground Data Link Communications

40. The following Strategy was developed for the harmonised implementation of the data link communications in the ICAO EUR Region (Conclusions EANPG 50/18 and 49/19 refer):

a) Any additional aircraft implementation of Automatic Dependent Surveillance - Contract (ADS-C) should either;

    i) utilise without change the existing DO-258A/ED-100A[1] (FANS-1/A) ADS-C, or

[1] *RTCA/EUROCAE Interoperability Requirements for ATS Applications Using ARINC 622 Data Communications (FANS 1/A INTEROP Standard)*

ii) move to the full implementation of the internationally agreed common technical definition that will be defined based on relevant provisions and guidance material (*Manual of Air Traffic Services Data Link Applications* (Doc 9694)) developed by ICAO and its technical bodies

Partial or divergent aircraft data link evolutions should not be pursued, as they will continue to promote divergent paths to the detriment to the broader community. Interim steps or phases toward full implementation of the common technical definition in ground systems should only be pursued on a regional basis, after coordination between all States concerned.

b) Any additional aircraft implementation of Controller-Pilot Data Link Communications (CPDLC) should either:

i) utilise without change the existing DO-258A/ED-100A (FANS-1/A) or DO-280B/ED-110B[2] (ATN) CPDLC for ACM/ACL/AMC[3] data link services, or

ii) move to the full implementation of the internationally agreed common technical definition, based on *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444), and other operational material as appropriate

Partial or divergent aircraft data link evolutions that result in excluding messages from aircraft systems should not be pursued, as they will continue to promote divergent paths to the detriment to the broader community. Interim steps or phases toward full implementation of the common technical definition in ground systems should only be pursued on a regional basis, after coordination between all States concerned.

Harmonization of operational procedures for implementation of the above packages is considered essential. States, planning and implementation regional groups, air navigation services providers and other ATS coordinating groups should adopt common procedures to support seamless ATS provision across flight information region boundaries, rather than each State or Region developing and promulgating unique procedures for common functions.

41. Controller Pilot Data Link Communications (CPDLC) based on ATN VDL2 implementation is an agreed strategy for deployment of air-ground data link communications in the ICAO EUR Region.

Required Communication Performance (RCP)

42. The RCP concept characterizing the performance required for communication capabilities that support ATM functions without reference to any specific technology should be applied wherever possible.

43. The States should determine, prescribe and monitor the implementation of the RCP in line with the provisions laid down in the ICAO RCP Manual (Doc 9869).

NAVIGATION

General

44. Planning of navigation services associated with the ATS route network should be done on a total system basis, taking full account of the navigation capabilities as well as cost effectiveness. The total system composed by station-referenced navigation aids, satellite based navigation systems and airborne capabilities should meet the performance based requirements for navigation guidance of all aircraft using the system and should form an adequate basis for the provision of positioning, guidance and air traffic services.

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2 *RTCA/EUROCAE Interoperability Requirements Standard For ATN Baseline 1 (ATN B1 INTEROP Standard)*

3 Air traffic control communications management/Air traffic control clearances and information/Air traffic control microphone check.

45. Account should be taken of the fact that certain aircraft may be able to meet their long-range and short-range navigation needs by means of self-contained aids, thus eliminating the need for the provision of station-referenced aids along routes used by such aircraft, as well as the need to carry on board excessive redundancies.

46. The Global ATM Operational Concept, endorsed by ICAO 11th Air Navigation Conference (AN-Conf/11) and published as ICAO Doc 9854, provides the framework for the development of all regional ATM concepts. AN-Conf/11 also endorsed a number of technical recommendations affecting navigation, including the harmonization of air navigation systems between regions, frequency planning, the transition to satellite based air navigation, curved RNAV procedures, and the use of multiple GNSS signals and the rapid implementation of approaches with vertical guidance.

47. The ICAO Performance Based Navigation (PBN) Manual was developed in direct response to an AN-Conf/11 recommendation.

48. In September 2007, the ICAO 36th General Assembly issued Resolution 36-23 urging States to:

a) Complete PBN implementation plans by 2009;

b) Implement RNAV and RNP operations (where required) for en route and terminal areas; and

c) Implement approach procedures with vertical guidance (APV) (Baro-VNAV and/or augmented GNSS) for all instrument runway ends, either as the primary approach or as a back-up for precision approaches, by 2016 (with 30 per cent by 2010 and 70 per cent by 2014).

49. The following PBN Implementation Roadmap addresses and supports this Resolution whereby States and Planning and Implementation Regional Groups (PIRGs) should complete a PBN implementation plan by 2009.

THE EUR PBN IMPLEMENTATION ROADMAP

50. Recognizing the benefits to be derived from the PBN concept, the EUR Region States shall ensure that all RNAV and RNP operations and procedures are in accordance with the PBN concept as detailed in ICAO Doc 9613 thereby ensuring a globally harmonized and coordinated transition to PBN avoiding unnecessary costs to operators in achieving certification and operational approvals for worldwide navigation application.

51. The EUR PBN Regional Roadmap is designed to provide guidance to air navigation service providers, airspace operators and users, regulating agencies, and international organizations, on the expected evolution of the regional navigation system in order to allow planning of airspace changes, enabling ATM systems and aircraft equipage.

52. The PBN Implementation Roadmap for the ICAO European Region exists within the context of the EUR region operating environment. This includes the Navigation Application and Infrastructure Planning Strategy for the EUR.

53. Given the requirement for interoperability this Roadmap represents the parent source of the strategic regional planning context and strong links are forged with the sub-regional programmes, e.g. SESAR.

54. The following are key driving factors to the development of the Roadmap:

a) Move towards GNSS becoming the prime positioning source for all phases of flight using Galileo/GPS/GLONASS, GBAS and SBAS;

b) SBAS (Satellite-Based Augmentation System) becomes available for suitably equipped aircraft to enable increased access to medium and smaller airports in the time frame until about 2013;

c) GBAS (Ground-Based Augmentation System) becomes available using GPS L1 for some users in particular operating environments in the time frame until about 2013;

d) A mandate for the carriage of GNSS is envisioned for application in certain parts of the EUR by 2015;

e) Evolution of improved low visibility operations using GBAS to support CAT II and III operations with GPS L1 then with multi constellation GNSS;

f) 4D trajectory management is foreseen beyond 2020;

g) Advanced RNP with an initial Required Time of Arrival (RTA) capability is a step towards 4D trajectory management;

h) Extended use of RNAV1/P-RNAV for approach as a means of transitioning from permanent routes through Conditional Routes to 4D Business/Mission Trajectories;

i) The continued provision of DME as a backup to GNSS is consistent with safety targets;

j) Replacement of Conventional Non-Precision Approaches by approaches with vertical guidance up to 2016;

k) The progressive decommissioning of VORs and NDBs made possible by the GNSS evolution.

Principles of PBN Implementation

55. The broad principles for PBN Implementation derived from the operational requirements of the EUR Region and the concepts and strategies discussed above are:

a) The Navigation Application and Infrastructure Strategy is required to meet the requirements detailed in the ICAO Global ATM Operational Concept. As such, the Roadmap lays the foundations for achieving the goals of User Preferred Trajectories together with improved access, safety and reduced environmental impact targets;

b) GNSS becomes the primary and potentially a sole means of navigation, to the degree that this can be demonstrated to be safe and cost effective; and

c) Given that satellite-based Navigation increasingly co-exist with satellite-based Surveillance and Communication services, the Roadmap takes due account of all ATM/CNS components.

56. The application of these principles shall:

a) identify and evolve from the needs and priorities of both users and providers of the navigation systems and/or services;

b) provide tangible and early benefits for the users;

c) safeguard capital investments, necessary to maintain the existing infrastructure and future rationalisation plans;

d) take due account of sub-regional institutional arrangements and regulations;

e) accommodate geographical differences in capabilities, performance requirements and infrastructure;

f) enable coherent development plans within the EUR region and ensure an appropriate interface to the adjacent regions; and

g) Accept the continued operations of aircraft with lower navigation capabilities for as long as operationally feasible.

Benefits

57. The following are the benefits expected to be derived by implementation of PBN:

a) Improved safety, efficiency and reduced environmental impact through the implementation of continuous and stabilized descent procedures using vertical guidance accompanied by the gradual elimination of Non-Precision Approaches by 2016;

b) Implementation of more flexible and precise approach, departure, and arrival paths that will reduce dispersion and will enable improved airspace design fostering increased capacity;

c) Flight efficiency by the extension of RNAV applications allowing for more optimised trajectories;

d) Increased capacity through implementation of additional parallel routes and additional arrival and departure points in terminal areas;

e) Increase capacity through reduction of lateral and longitudinal separation enabled by RNAV and RNP;

f) Reduced environmental impact resulting from savings in fuel and through noise reduction by the improved placement of routes using RNAV and RNP;

g) Mission effectiveness improved through the accommodation of aircraft with lower navigation capability for as long as operationally feasible;

h) Improved airport access through provision of APV and RNP APCH or RNP AR APCH;

i) Decrease ATC and pilot workload by utilizing RNAV/RNP procedures and airborne capability and reduce the needs for ATC-Pilot communications and radar vectoring; and

j) Interoperability with other ICAO regions.

PBN APPLICATIONS

En-Route Operations

58. For En-Route operations the application of RNAV 5 is mandated in designated parts of the ICAO EUR. [Doc 7030]

59. The ICAO EUR Region is characterized by diverse air traffic volumes and densities, operational requirements and CNS/ATM capabilities. Partly this emanates from the fact that the Region includes high-density continental and low density remote continental areas. Therefore a single RNAV/RNP navigation specification may not meet operational requirements of the whole Region and different navigation applications may be applied by different homogeneous ATM areas.

TMA Operations

60. Requirements for TMA operations have their own characteristics, taking into account the applicable separation minima between aircraft and between aircraft and obstacles. It also involves the diversity of aircraft, including low-performance aircraft flying in the lower airspace and conducting arrival and departure procedures on the same path or close to the paths of high-performance aircraft.

61. The mix of traffic differs remarkably between airports. This together with airspace restrictions which can prevent the introduction of special RNAV/RNP routes is likely to result in the capability of an airport to introduce RNAV or RNP operations being constrained by the lower capability of aircraft using that airport. It is consequently possible that airports within a single TMA could have differing capability for introduction of PBN operations.

62. As a result, the States should develop their own national plans for the implementation of PBN in TMAs, based on the PBN Manual, seeking the harmonization of the application of PBN and avoiding the need for multiple operational approvals and applicable aircraft separation criteria.

63. The following PBN strategy was agreed in the ICAO EUR Region:

a) Implementation of any RNAV or RNP application shall be in compliance with ICAO PBN Manual (Doc 9613);

b) Recognizing that B-RNAV/P-RNAV can be regarded as equivalent to RNAV5/RNAV1, as defined in the ICAO PBN Manual, their use will be continued for en-route and terminal applications at least until 2015;

c) The target date for the completion of implementation for the Approach procedures with vertical guidance (APV) (APV/Baro-VNAV and/or APV/SBAS) for all instrument runway ends is 2016;

d) Replacement of RNAV5/RNAV1 (B-RNAV/P-RNAV) specification by RNP specifications (e.g. Basic RNP-1 and advanced-RNP) for the use in the en-route and terminal airspace to commence by 2015.

e) ICAO PBN Manual compliant terms, e.g. RNAV 1 and RNAV 5, shall be implemented for all new aeronautical information publications and as an update to existing publications until 2014. (EANPG/Conclusion 50/14 refers)

Instrument Approaches

64. States should introduce PBN approaches that provide Vertical Guidance to enhance safety. These should be based on APV, Baro-VNAV and/or Space Based augmentation Systems (SBAS) where possible. Conventional approach procedures and conventional navigation aids should be maintained to support non-equipped aircraft during the transitional period.

65. With the expected reduction and subsequent removal of VOR and NDB it is expected that conventional NPAs will have to be withdrawn until 2025. The States should make clear their own individual plans in order to assist operators in their planning for the transition to PBN.

NAVIGATION INFRASTRUCTURE

66. The navigation infrastructure requirements address all phases of flight from take off to final approach and also the precision approach and landing.

En route and TMA

2010-2015

67. Transition to a total RNAV environment takes place that requires enhancing DME coverage and/or ensuring the safety of GNSS signals in space and improving the quality of service for en route and terminal operations. This should be achieved mainly by deploying additional DMEs and certifying GNSS service providers in part of the Region. Repositioning some of the existing facilities might be required, as enabled by decommissioning of VOR.

68. RNAV infrastructure assessment guidance material is available at http://www.paris.icao.int/documents_open/subcategory.php?id=48 and can be used to aid in assessment of DME-DME network requirements.

69. Decommissioning of NDBs and reduction of VOR takes place due to a progressive reduction of conventional routes and procedures, while leaving a sufficient backbone of conventional navigation aids to continue supporting reducing non-RNAV routes at lower flight levels and supporting remaining conventional approach procedures and their associated missed approaches, and enable ATC to re-route aircraft in the event of individual aircraft RNAV failure.

70. In the European Union the European Aviation Safety Agency (EASA) is expected to become competent for oversight of the providers of GNSS signals in space. Equipped aircraft will be authorized to take advantage of European Geostationary Navigation Overlay Service (EGNOS), after the certification of the relevant Navigation Service Provider (NSP), within its area of coverage and within the limits of its declared performance.

2015-2020

71. The transition to a total RNAV environment requires generalised use of GNSS in those areas where suitable DME coverage cannot be achieved, such as low flight levels in terrain constrained areas.

72. GNSS Sensors might be required for all General Air Traffic (GAT) operations. Dual RNAV with DME/DME and GNSS sensors, or other solutions ensuring a level of safety commensurate to the type of operations, may be foreseen to overcome loss of GNSS signal in order to meet the operational requirements in respect of the risk of loss of navigation capability on Air Transport operations. Alternate equipage using ground based navigation aids could be planned.

73. Galileo and enhanced GPS should become available in the 2015-2020 timeframe allowing increased reliance on GNSS once dual constellation and dual frequency equipment is installed in aircraft and experience is built up on Galileo operation.

74. The existence of a total RNAV environment should allow further removal of VOR and NDB, as well as further removal of unnecessary avionics.

Post 2020

75. In this time frame, it is expected to have a multi-constellation and multi frequency GNSS environment that will provide an adequate level of GNSS service in terms of robustness and performance.

76. These GNSS enhancements should reduce significantly the probability of having a GNSS failure and would reduce the extent of an alternative reversion, allowing for a reduced DME network to support the back-up requirement.

77. The existence of a total RNAV environment should allow an almost total removal of any remaining VOR.

Approach and Landing

2010-2015

78. Instrument Landing System (ILS) remains the prime source of guidance for precision approaches and landings in the EUR and continues to support all categories of airspace users.

79. Cat I GLS (GBAS/GPS) becomes available. ILS will probably remain the only means for Cat II/III operations. However, toward the end of the period, depending on Research and Development results, there may be a limited availability of Cat II/III GLS capability (using a GPS/GBAS capability augmented by on-board systems) at runways with Cat II/III lighting. This might increase the rate of take up of GBAS based landing as a back up to ILS to cater for maintenance/system failures.

80. The gradual elimination of NPAs (both conventional and RNAV) should take place in accordance with the decisions of the 36th ICAO Assembly to be replaced by Approaches with Vertical Guidance (APV) either based on SBAS or Baro-VNAV. This is expected to be completed early in the period 2015-2020 with the provision of APV to all IFR runway ends, including those mainly used by general aviation.

81. Runways presently not equipped with Precision Approach and Landing system may consider SBAS (e.g. LPV down to 200 ft DH) or Cat I GLS (GBAS/GPS) systems with airport lighting system upgrades as needed.

82. Some CAT I ILSs may be replaced by SBAS APV or CAT I GLS. Business case for such changes depends upon the certification of the EGNOS NSP, number of procedures published in AIP, nature of traffic, capability of SBAS to serve multiple runway directions at a single aerodrome and availability of aircraft with certified GNSS based approach and landing systems.

83. Where a business case can be made (e.g. improved capacity) MLS Cat II/III may be equipped as an alternative or replacement to ILS.

2015-2020

84. ILS remains the prime source of guidance for precision approaches and landings in the EUR. MLS, Cat I GLS and LPV 200 continue to be introduced or maintained where required.

85. As Cat II/III GLS (GBAS/Multi-constellation Dual Frequency) becomes available and with the increased equipage of aerodromes with GBAS ground station and aircraft with GLS capability, GLS procedures should be increasingly used.

86. Users not approved for RNP APCH/LPV approaches, may suffer operational limitations when conventional NPA procedures are removed and associated navigation aids are decommissioned. RNP AR APCH should have increasing application where RNP operations cannot be undertaken using RNP APCH procedures.

BEYOND 2020

87. ILS should remain a significant source of guidance for precision approaches and landings in Cat II/III.

88. MLS, Cat I GLS and LPV 200 should continue to be introduced where required.

89. Increased equipage of GLS aircraft capability together with the provision of GLS GBAS procedures (Cat I/II/III) at more airports should take place. This is expected to be accompanied by extensive decommissioning of ILS CAT I systems, where the Business and Safety Case can be established.

90. ILS Cat II/III should be retained to provide backup to GLS to address GLS availability issues (deliberate jamming and solar activity) where and when justified.

91. Requirement for RNP APCH/LPV/GBAS for RNAV approach should be established if ILS is not available.

92. Increased equipage of aircraft with combined GPS/Galileo/SBAS reception will lead to the introduction of LPV procedures to all IFR runway ends, including for use by general aviation.

93. RNP AR APCH should continue to have increasing application where RNP operations cannot be undertaken with RNP APCH procedures.

Transition Strategy

94. During transition to PBN, sufficient ground infrastructure for conventional navigation systems must remain available. Before existing ground infrastructure is considered for removal, users should be given reasonable transition time to allow them to equip appropriately to attain equivalent PBN-based navigation performance. States should approach removal of existing ground infrastructure with caution to ensure that safety is not compromised. This could be guaranteed by performance of safety assessments and consultations with the users.

95. States should cooperate on a multinational basis to implement PBN in order to facilitate seamless and inter-operable systems and undertake coordinated R&D programs on PBN implementation and operation.

96. States are encouraged to consider catering for traffic according to navigation capability and granting benefits to aircraft with better navigation performance, taking due consideration of the needs of State/Military aircraft.

97. States should encourage operators and other airspace users to equip with PBN-capable avionics. This can be achieved through early introductions of RNP approaches, preferably those with vertical guidance.

Safety Documentation & Monitoring Requirements

Need for safety documentation

98. To ensure that the introduction of PBN applications is undertaken in a safe manner, in accordance with relevant ICAO provisions, implementation shall only take place following conduct of a safety documentation that would demonstrate that an acceptable level of safety will be met. Additionally, ongoing periodic safety reviews should be undertaken where required in order to establish that operations continue to meet the target levels of safety.

Use of specific navigation aids

99. Where, within a given airspace, specific groups of users have been authorized by the competent authorities to use special aids for navigation, the respective ground facilities should be located and aligned so as to provide for full compatibility of navigational guidance with that derived from the internationally agreed and ICAO Annex 10 compliant systems.

100. States should ensure and oversee that Navigation Service Providers (i.e. providers of the navigation signals in space) take appropriate corrective measures promptly whenever a significant degradation in the accuracy of navigation aids (either space based or ground based or both) is detected.

SURVEILLANCE

Planning Considerations

101. The ICAO European Region is currently characterized by the use of the following surveillance systems:

a) Secondary Surveillance Radars (SSR) Mode A, C and S in terminal and en-route continental airspace;

b) Primary Surveillance Radars (PSR) primarily in terminal airspace;

c) Automatic Dependent Surveillance – Broadcast (ADS-B) and Wide Area Multilateration (WAM) in some parts.

Automatic Dependent Surveillance – Contract (ADS-C) in some parts of the oceanic and remote continental airspace.

102. In order to meet the anticipated future operational requirements by 2020 in an evolutionary manner, the following guiding principles to the development of surveillance infrastructure were agreed in the EUR Region:

a) An independent surveillance system to track non-cooperative targets where and when required. This will be provided by PSR unless and until an alternative solution is required and developed;
b) An independent surveillance system to track co-operative targets. This can be enabled by SSR Mode A/C or SSR Mode S or Wide Area Multilateration;
c) Dependant co-operative surveillance based upon ADS-B providing positional data of suitable quality. The common, internationally agreed technical enabler for this type of surveillance is 1090 MHz Extended Squitter based ADS-B data link. ADS-C in remote and oceanic areas only;

d) Since aircraft will have the necessary Mode S and ADS-B equipage, the choice of Cooperative surveillance technology (Mode S, ADS-B, Multilateration) remains flexible with the service provider determining the best solution for their particular operating environment, based on cost and performance;

e) An increasing use of ADS-B and/or Airport Multilateration at aerodromes is also foreseen and, particularly, the use of the Advanced Surface Movement Guidance and Control System (A-SMGCS). Surface Movement Radars will provide the Independent Non-Cooperative airport surveillance; and

f) The increasing use of surveillance data onboard of 'ADS-B In' equipped aircraft to support Air Traffic Situational Awareness (ATSAW) and spacing applications and later separation applications. This also allows for increased delegation of responsibility for separation to the flight crew.

FREQUENCY MANAGEMENT

Planning Considerations

General

103. Frequency assignment planning in the EUR region should be carried out in accordance with the provisions of Annex 10 supplemented, as necessary, by regional recommendations and technical criteria developed for this purpose. Detailed guidance on frequency assignment planning for AMS and radio navigation aids are contained in ICAO EUR Frequency Management Manual Doc 011.

AMS

104. Frequencies should be assigned to all VHF AMS facilities, taking into account:

a) agreed geographical separation criteria based on 8.33 kHz interleaving between channels for the area where this channel spacing is applicable;

b) agreed geographical separation criteria based on 25 kHz interleaving between channels;

c) agreed geographical separation criteria for the implementation of VDL services;

d) the need for maximum economy in frequency demands and in radio spectrum utilization; and

e) A deployment of frequencies which ensures that international services are planned to be free of interference from other services using the same band.

105. The priority order to be followed in the assignment of frequencies to service is:

a) ATS channels serving international services (ACC, APP, TWR, FIS);

b) ATS channels serving national purposes;

c) channels serving international VOLMET services;

d) channels serving ATIS and PAR; and

e) channels used for other than ATS purposes.

106. The criteria used for frequency assignment planning for VHF AMS facilities serving international requirements should, to the extent practicable, also be used to satisfy the need of national VHF AMS facilities.

107. Special provisions should be made, by agreement between the States concerned, for the sharing and the application of reduced protection of non-ATC frequencies in the national sub-bands, so as to obtain a more economical use of the available frequency spectrum consistent with operational requirements.

108. It should be ensured that no air/ground frequency is utilized outside its designated operational coverage.

109. It should be ensured that the stated operational requirements for coverage of a given frequency can be met for the transmission sites concerned, taking into account terrain configuration.

Radio navigation aids

110. Frequencies should be assigned to all radio navigation facilities taking into account:

a) agreed geographical separation criteria based on assignments of 50 kHz-spaced frequencies to ILS localizer and VOR, X and Y channels to DME and 25 KHz space frequencies to GBAS;

b) the need for maximum economy in frequency demands and in radio spectrum utilization; and

c) a deployment of frequencies which ensures that international services are planned to be free of interference from other services using the same band.

111. The principles used for frequency assignment planning for radio navigation aids serving international requirements should, to the extent possible, also be used to satisfy the needs for national radio aids to navigation.

112. The following planning criteria for MLS frequency planning in the EUR region should be applied, aimed at allowing the maximum number of MLS-associated DME frequencies on X and Y channels so as to minimize the possible use of W and Z channels:

a) the height above which guidance signal need not be protected should be 10 000 feet;

Note.- Signal protection to a height greater than 10 000 ft to meet special operational requirements shall be met on a case-by-case basis through technical (frequency) coordination among those States affected.

b) double channel pairing of ILS and MLS with the same DME channel (frequency tripling) is not required; and

c) the same channel (frequency) may exceptionally be assigned to both approach directions of a dually equipped runway in those cases where this is operationally acceptable.

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