

PERSPECTIVES OF AIR TRAFFIC MANAGEMENT SYSTEM IN RUSSIA

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Abstract

The present ATM system of the Russian Federation obtains several significant disadvantages that create some problems for air space users. Development of Russian air navigation system is directed for insurance of national interests at the area of air space application and management as well as the interests of all the users of the Russian Federation air space; and it is based on the clauses of the Global exploitation concept of ICAO air traffic management as well as on transfer to air traffic management with CNS/ATM technology application, harmonization and further integration of Russian Air Navigation System ANS into the world aeronautical system.

- Present system incapacity for embedding of the perspective technologies basing on application of automatic on-line interaction of on-board, ground and satellite units and air navigation systems;
- Significant differences in the Russian Federation regulations from international standards and ICAO recommended practices that make difficult in integration of European union ATM and corresponding interacting systems into world-wide air navigation system;
- Inability of air space users live access to required air navigation information and full-value quality control of air navigation information provided by the state;
- Non-sufficient quantity of aircraft flight meteorological servicing units.

1 Limitations of the Present ATM System of the Russian Federation

At present time the modern ATM system of the Russian Federation is characterized by the following:

- Principal of air space strict division into areas of military and civil bodies responsibility which participate at the process of air space application that restricts the possibility of its effective and flexible use. As a result of the above-mentioned division, the users suffer from significant economical losses, and there is also a negative influence on flight safety aspect;
- Application of traditional flight service systems the most of part of which have exhausted their service life and are subject to change;

2 Russian Air Navigation System Development Perspectives

There is realized the stage-by-stage reforming of EU ATM systems and corresponding interacting systems with the purpose of development of Russian perspective air navigation system, elimination of the exist defects and realization of the national interests at the area of air space use and management as well as with the purpose of achieving the advantages out of ICAO CNS/ATM systems embedding.

Air navigation system development is oriented at insurance of national interests at the area of air space application and control as well as at the interests of all the users of the Russian Federation air space; and it is based on clauses of the Global exploitation concept of ICAO air traffic organization as well as on transfer to air

traffic management with CNS/ATM technology application, harmonization and further integration of Russian Air Navigation System ANS into the world aeronautical system.

The perspective ANS system should include the on-board, ground and satellite units and systems as follows:

- communication units, navigation, landing and monitoring systems;
- searching and rescuing systems;
- aeronautical information units;
- metrological servicing systems;
- technical maintenance service which also includes the qualified staff realizing air space management and air navigation servicing of air space users of the Russian Federation in accordance with fixed regulations and procedures.

The future ANS system is to be developed on the base of the unique technical architecture which ensures the system functional and organizational (if possible) integrity and all its units' integration while observing the corresponding international standards and ICAO recommended practices as well as the Russian Federation regulations. The system is to insure the organizational and informational technical compatibility as well as multy-level interaction with corresponding ATM systems of air space users including interplay with automated systems. Besides, ANS system is to interact with various associated structures involved to the process of air space use and air traffic management (i.e. state aeronautical bodies, meteorological agencies etc.) for the reason of air space use management and aeronautical servicing of the users.

Air navigation system development is to ensure the opportune access to the required air space and services for all the users. It also allows creation of the conditions for arrival and departure schedule support including insurance of general-purpose aviation flights for all the aircraft operators. ANS system is to provide all the users with the possibility of preferable flight route choice, to guarantee the required level of air traffic safety. The above-mentioned system development is to be realized on the base of

international standards and recommended practices taking into account ICAO methods of air navigation planning.

3 Strategic Directions of Russian Air Navigation System Development

3.1 Control Units Structure Development

Reforming of EU ATM system and interacting units which participate at air space users' air navigation servicing is to insure the stage-by-stage transfer to organizational and functional ANS system structure with the unique civil/military bodies of air space use management and air navigation servicing of its users.

ANS system which has been formed on the base of the present EU ATM and interacting units is to guarantee the unite guidance, functional integration and coordinated development of all air navigation servicing components.

3.2 Russian Federation Air Space Use Optimization

Air space of the Russian Federation is the state resource under ANS system management and it is used in the interests of the citizens, economics and national security of the Russian Federation. Any restrictions on air space management should be temporary.

The principal task of ANS system at this direction is implementation of the Russian Federation air space classification and air traffic servicing methods for each concrete class of air space which will satisfy the international standards and ICAO recommended practices.

Introduction of flexible methods of the Russian Federation air space use is to insure the transfer to application of the zonal navigation principals on the route and at the airdrome areas. The possibility of autonomy flight on the optimal trajectory at the airspace intended for "free flights" is to be realized at the future.

Perspective ANS system is to allow on-line decision about optimal flight route and level from the point of view of fuel economy on the base of ANS system automated interaction with aircraft operators and airport services.

3.3 Insurance of Air Traffic Safety

In accordance with international standards and ICAO recommended practices there is to be implemented the air traffic safety control system in the Russian Federation. There should be provided the conditions when the aircraft accidents rate connected directly or marginally with ANS system operation does not increase versus flight intensity increase but possibly come down.

Analysis of air traffic safety and development of the concrete actions scheme for safety insurance is to be realized on the systematical base. Each introduced ANS system unit both as a separate element and as an entire component of the system should be analyzed in order to define its impact on safety.

3.4 Technical Maintenance Units Development

There is to be carried out the unified technical politics that anticipates for ATM systems and units modernization in order to provide all the aeronautical operations with domestic equipment and which will satisfy domestic and international standards and to comply with nation interests of the Russian Federation.

Taking into account the new principals of ANS system operations based on integration of perspective ground, on-board and satellite units and ANS systems there is to be developed and introduced the technical architecture, which is coordinated by the all concerning bodies, in order to determine the functional interaction of perspective ground, on-board and satellite units and ANS systems, to define the protocols of their interactions and to guarantee the harmonious development of above-mentions systems and units.

Directions of ANS systems technical base development shall correspond with ICAO CNS/ATM concept.

3.5 Air Traffic Management Development Directions

There is to be developed the air traffic servicing systems with high-level of automation which

will include artificial intellect application and to insure conflict situation detections and these situation elimination.

In air traffic intensity increasing conditions, the above-mentioned systems will decrease the dispatchers loading up to the normal level and assist in preferable optimal trajectories flights realization at account of flexible air traffic management as well as improving of informational support and automated interaction with all the principal units of ANS system.

Multy-level system of air space use planning and air traffic organization shall be developed. This multy-level system operation is to be realized with on-line interaction with air traffic management system as well as with aircraft arrival and departures management systems. Principals of “gate-to-gate” air traffic servicing and ANS systems handling capacities control are to be realized as a result.

There should be envisaged the information and technical compatibility of ATM systems with automated systems of corresponding ATS units of air space users as well as with other automated control systems applying air navigation system information.

3.6 On-board Systems Development

Perspective on-board complexes which allow optimization of aircraft flight regimes, insure zonal navigation application and necessary information exchange on the data transfer “ground-board” and “board-to-board” channels are to be implemented. These on-board complexes shall include the systems of autonomous separation and flights realization in accordance with “free flight” technologies.

3.7 Aeronautical Meteorological Support Systems Development

Automated systems of monitoring, metrological data (including on-board environment weather) acquisition, processing, storage and distribution, and the systems for wake vortex and wind shear detection which are compatible with ANS systems and technical support units on exploitation characteristics are to be developed

and implemented. There are to be elaborated the unified protocols of interaction between ATM automated systems and units and air navigation meteorological servicing units.

3.8 Air Navigation Information Systems Development

Automated systems of air navigation data acquisitions, processing, storage and distribution which will provide ANS systems and the Russian Federation air space users with navigation information at any time, at any place, at any coordinated format, both in electronic and paper view are to be created. There will be set up the organization mechanisms providing the timely registration of on-board and ground subsystems changes in reference air navigation documentation.

3.9 Normative Legal Base Improving

Normative legal base of ANS system shall to the maximum comply with international standards and ICAO recommended practices, aeronautical servicing principals and complementary regional regulations.

3.10 Investigations and Developments Further Grow

In accordance with stated plans of air navigation systems development the purposes and taking into account the international standards and ICAO recommended practices the priority investigations and development directions are to be the following:

- ANS system development forecasting and air navigation planning;
- air traffic safety management;
- effective air space use;
- perspective communication units and information technologies, connection with the data transfer channels application, ATN network creation in accordance with ICAO standards and recommended practices;

- perspective system on the CNS/ATM technologies base development;
- electronic air navigation data base creation;
- air navigation meteorological servicing;
- crew awareness about on-board environment situation;
- human factor aspects at the new concepts of CNS/ATM technologies application.

4 Expected Results on Russian Air Navigation System Development

Air navigation system development will allow the following:

- effective state regulation of the Russian Federation air space use;
- elimination of departmental disassociation between ATM military and civil bodies;
- coordination of ground flight systems and on-board flight-navigation complexes development;
- implementation of perspective technologies of air navigation and metrological data provision;
- optimization of air navigation systems management processes taking into account the national interests at the area of air space use and management and on the base of the Russian Federation economics development;
- the Russian Federation air navigation technical support units modernization and ATM centers consolidation;
- Aircraft air navigation servicing with the use of perspective equipment and technologies basing on “gate-to-gate” method taking into account development tendencies of the Russian Federation airdrome network;
- Reduction of users unproductive losses, air traffic safety level increase, air space economical effectiveness increase including the flights over Siberia, the Far East and the Far North regions.
- Reduction of the negative impact of gas emission, engine noises and

electromagnetic emission from ground flight support units on environment;

- Attraction and flexibility level increase for domestic and foreign air space uses;
- Speeding-up the integration of domestic ANS system into the world one.

The principal criteria for ANS system development are as follows:

- insurance of the Russia Federation air space users interests realization and performance of the national interests at the area of air space management and use;
- air traffic safety;
- ANS system handling capacity;
- ANS system efficiency;
- aviation safety at the field of air navigation;
- environmental protection;
- ANS systems compatibility.

5 ANS Development Stages

ANS development stipulates for several stages:

The following actions should be taken in a short-term perspective (up to 2008):

- forming of organizational-functional structure of the ANS system with the unite civil and military board;
- processing of legal regulations at the field of aeronautics;
- realization of potential possibilities for the present technical systems and technologies;
- air space classification elaboration including the change of air space structure and connection of the Russian Federation air routes with transit air traffic channels network through the Russian Federation air space;
- implementation of aeronautical service procedures on the base of international standards and ICAO recommended practices in order to increase safety level and economical effectiveness of air space use;
- implementation and quality control and certification procures of air navigation data creation, processing and transfer;

- activities on aeronautical service harmonization with analog systems of the other states.

The following actions should be taken in a mid-term perspective (up to 2015):

- transfer from the traditional to perspective ATM systems;
- modern monitoring, search and rescuing systems, air navigation information preparation and distribution systems, meteorological service systems;
- air navigation system operation effectiveness at the conditions of predicted air traffic increase;
- ANS system integration into the European and world ANS systems.

The following actions should be taken in a long-term perspective (up to 2025):

- total transfer to perspective technical units and technologies;
- automated interaction of all the main functional components of aeronautical system;
- creation of integrated system of air traffic security insurance on the base of ground and on-board systems of emergency detection and solution;
- wide implementation of “free flight” method; integration into the European and world aeronautical system.