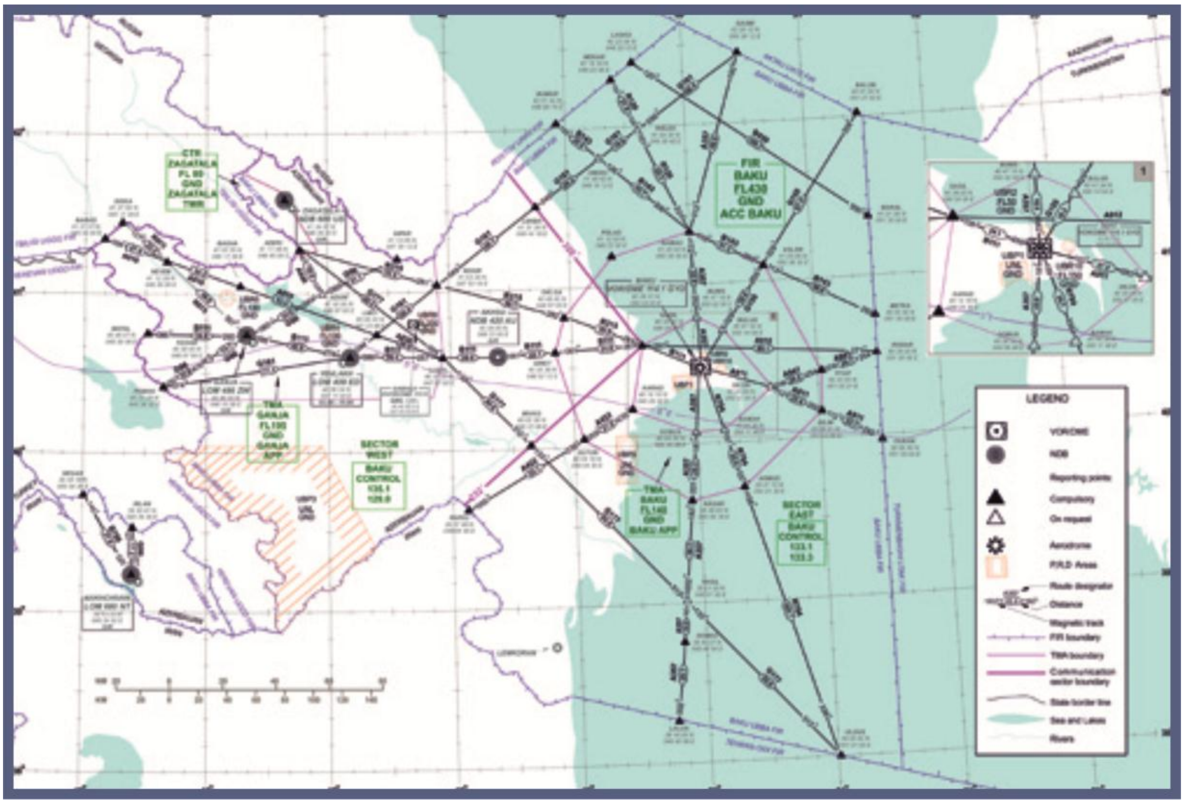
PBN Implementation Plan Azerbaijan

Version 1



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ACRONYMS

The following is a list of acronyms used in this document:

4DT	Four Dimensional Trajectory
AAR	Azerbaijan Aviation Rules
ADS-C	Automatic Dependent Surveillance – Broadcast
ADS-C	Automatic Dependent Surveillance – Contract
ANSP	Air Navigation Service Provider
APCH	Approach
APV	Approach Procedures with Vertical Guidance
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Service
AWS	Automated Weather Station
Baro-VNAV	Barometric Vertical Navigation
CAA	Civil Aviation Authority
CDO	Continuous Descent Operations
CFIT	Controlled Flight into Terrain
CNS/ATM	Communication Navigation Surveillance/Air Traffic Management
CPDLC	Controller Pilot Data Link Communications
CTA	Controlled Airspace
DME	Distance Measuring Equipment
ETS	Emissions Trading Scheme
FANS	Future Air Navigation System
FMS	Flight Management System
GNSS	Global Navigation Satellite System
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
ILS	Instrument Landing System
INS	Inertial Navigation System
IRU	Inertial Reference Unit
NDB	Non Directional Beacon
OCA	Oceanic Control Area
PBN	Performance Based Navigation
PSR	Primary Surveillance Radar
RAIM	Receiver Autonomous Integrity Monitoring
RCP	Required Communication Performance
RSP	Required Surveillance Performance
RNAV	Area Navigation
RNP	Required Navigation Performance
RNP AR	Required Navigation Performance Authorisation Required
SID	Standard Instrument Departure
STAR	Standard Instrument Arrival
TMA	Terminal CTA
VOR	VHF Omni-directional Radio-range
WAM	Wide Area Multilateration

1. INTRODUCTION

Azerbaijan is signatory of the Convention of International Civil Aviation; the Chicago Convention. The convention is administrated by International Civil Aviation Organization (ICAO), an entity of the United Nation. ICAO Assembly Resolution A36-23 resolved that each state to develop a national PBN implementation plan. Azerbaijan Republic Performance Based Navigation (PBN) Implementation plan details the framework within which the ICAO PBN concept will be implemented in the Azerbaijan for the foreseeable future. Azerbaijan Republic Performance Based Navigation (PBN) Implementation plan is guided by ICAO Doc. 9613 and relevant SARPs and uses a template developed by the ICAO for use by ICAO Contracting States. The primary driver for this plan is to maintain and increase safety, air traffic demand and capacity, and services and technology in consultation with relevant stakeholders. The Azerbaijan Republic Implementation Plan also supports national and international interoperability and global harmonization.

Both the ICAO Global and Regional PBN implementation plans provide a framework for the development of a National PBN Implementation Plan to enable a coordinated and cohesive global implementation programme for the aviation industry. This plan will enable the use of RNAV and RNP capabilities that will, when harmonised with ATM systems, deliver more efficient routes and predictability of service for the air transport industry, together with greater access to limited airspace resources for general and sport aviation. A PBN environment will deliver significant safety, economic and environmental benefits to all stakeholders. This is especially important as Azerbaijan and the rest of the world faces challenges from difficult economic conditions, volatile aviation fuel prices and climate changes driven by global warming.

1.1. OBJECTIVES OF AZERBAIJAN PBN IMPLEMENTATION PLAN

The Azerbaijan PBN implementation is based on the following strategic objectives:

a) Provide a high-level strategy for the evolution of the navigation applications to be implemented within Azerbaijan airspace in the short term (2012-2013), medium term (2013-2016) and long term (beyond 2017). This strategy is based on the concepts of PBN, Area Navigation (RNAV) and Required Navigation Performance (RNP), which will be applied to aircraft operations involving instrument approaches, standard departure (SID) routes, standard arrival (STAR) routes, and ATS routes in continental areas in accordance with the implementation goals in the ICAO Assembly resolution 36-23;

b) Ensure that the implementation of the navigation portion of the CNS/ATM system is based on clearly established operational requirements;

c) Avoid unnecessarily imposing the mandate for multiple equipment on board or multiple systems on the ground;

d) Avoid the need for multiple airworthiness and operational approvals for intra- and inter-regional operations;

e) Prevent commercial interests from outdoing ATM operational requirements, generating unnecessary costs for the Azerbaijan as well as for airspace users.

1.2. INTENT OF THE AZERBAIJAN PBN IMPLEMENTATION PLAN

The PBN Implementation Plan was developed by the Azerbaijan CAA in consultation with the stakeholders concerned and is intended to assist the main stakeholders of the aviation community plan a gradual transition to the RNAV and RNP concepts. The main stakeholders of the aviation community that benefit from this PBN Implementation Plan, and were therefore included in the development process are:

- Airspace operators and users
- Azerbaijan Air navigation service provider - AZANS
- Azerbaijan Civil Aviation Administration
- National and international organizations

The Azerbaijan PBN Implementation Plan is intended to assist the main stakeholders of the aviation community plan the future transition and their investment strategies. For example, airlines and operators can use this Azerbaijan PBN Implementation Plan to plan future equipage and additional navigation capability investments; air navigation service providers can plan a gradual transition from ground infrastructure to space based Navigation.

Azerbaijan Civil Aviation Administration will be able to anticipate and plan for the criteria that will be needed in the future as well as the future regulatory workload and associated training requirements for their work force.

1.3. PRINCIPALS APPLIED IN THE DEVELOPMENT OF THE AZERBAIJAN PBN IMPLEMENTATION PLAN

The implementation of PBN in the Azerbaijan is based on the following principles:

a) Continued application of conventional air navigation procedures during the transition period, to guarantee availability by users that are not RNAV- and/or RNP-equipped;

b) Development of airspace concepts, applying airspace modeling tools as well as real-time and accelerated simulations, which identify the navigation applications that are compatible with the aforementioned concept;

c) Conduct of cost-benefit analyses to justify the implementation of the RNAV and/or RNP concepts in each particular airspace;

d) Conduct of pre- and post-implementation safety assessments to ensure the application and maintenance of the established target levels of safety.

e) Must not conflict with the regional PBN implementation plan.

2. BACKGROUND

The continuing growth of aviation places increasing demands on airspace capacity and emphasizes the need for the optimum utilization of the available airspace.

Growth in scheduled and General Aviation aircraft is expected to increase point-to- point and direct routings. The increasing cost of fuel also presents a significant challenge to all segments of the aviation community. This anticipated growth and higher complexity of the air transportation system could result in increased flight delays, schedule disruptions, choke points, inefficient flight operations, and passenger inconvenience, particularly when unpredictable weather and other factors constrain airport capacity. Without improvements in system efficiency and workforce productivity, the aviation community and cost of operations will continue to increase. Upgrades to the air transportation system must leverage current and evolving capabilities in the near term, while building the foundation to address the future needs of the aviation community stakeholders. These circumstances can be partially alleviated by efficiencies in airspace and procedures through the implementation of PBN concepts.

In setting out requirements for navigation applications on specific routes or within a specific airspace, it is necessary to define requirements in a clear and concise manner. This is to ensure that both flight crew and ATC are aware of the on-board area navigation (RNAV) system capabilities and to ensure that the performance of the RNAV system is appropriate for the specific airspace requirements.

The early use of RNAV systems arose in a manner similar to conventional ground-based routes and procedures. A specific RNAV system was identified and its performance was evaluated through a combination of analysis and flight testing. For domestic operations the initial systems used VOR and DME for their position estimation. For oceanic operations, inertial navigation systems (INS) were employed.

These ‘new’ systems were developed, evaluated and certified. Airspace and obstacle clearance criteria were developed on the basis of available equipment performance. Requirements specifications were based upon available capabilities and, in some implementations, it was necessary to identify the individual models of equipment that could be operated within the airspace concerned.

Such prescriptive requirements result in delays to the introduction of new RNAV system capabilities and higher costs for maintaining appropriate certification. To avoid such prescriptive specifications of requirements, the PBN concept introduces an alternative method for defining equipage requirements by specification of the performance requirements. This is termed Performance Based Navigation (PBN).

3. PERFORMANCE BASED NAVIGATION

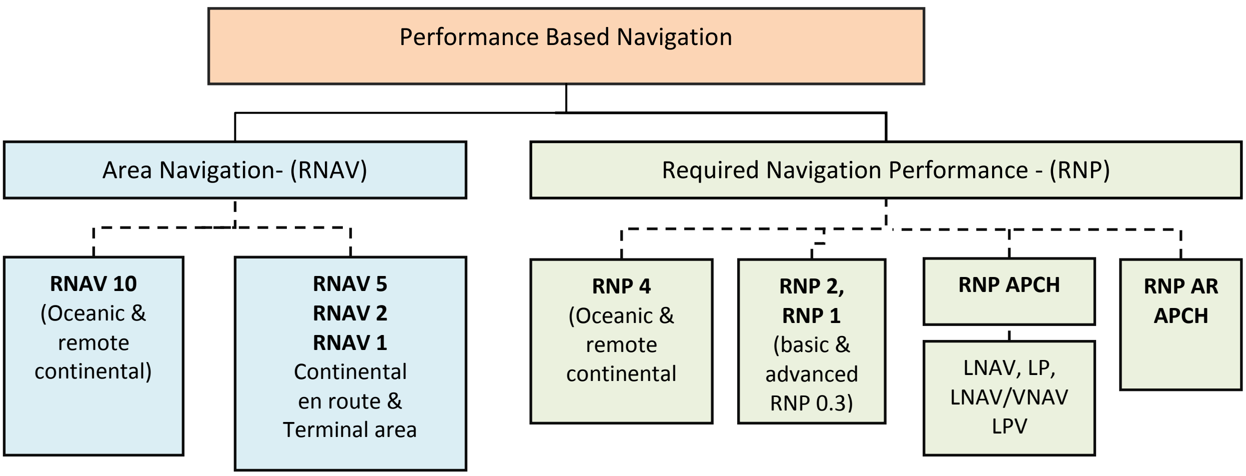
Performance based navigation (PBN) is a concept that encompasses both area navigation (RNAV) and required navigation performance (RNP) and revises the current RNP concept. Performance based navigation is increasingly seen as the most practical solution for regulating the expanding domain of navigation systems.

Under the traditional approach, each new technology is associated with a range of system-specific requirements for obstacle clearance, aircraft separation, operational aspects (e.g. arrival and approach procedures), aircrew operational training and training of air traffic controllers. However, this system-specific approach imposes an unnecessary effort and expense on Azerbaijan airlines and Azerbaijan air navigation sevice provider - AZANS.

Performance based navigation eliminates the need for redundant investment in developing criteria and in operational modifications and training. Rather than build an operation around a particular system, under performance based navigation the operation is defined according to the operational goals, and the available systems are then evaluated to determine whether they are supportive.

The advantage of this approach is that it provides clear, standardized operational approvals which enables harmonized and predictable flight paths which result in more efficient use of existing aircraft capabilities, as well as improved safety, greater airspace capacity, better fuel efficiency, and resolution of environmental issues.

The PBN concept specifies aircraft RNAV system performance requirements in terms of accuracy, integrity, availability, continuity and functionality needed for the proposed operations in the context of a particular Airspace Concept. The PBN concept represents a shift from sensor-based to performance-based navigation. Performance requirements are identified in navigation specifications, which also identify the choice of navigation sensors and equipment that may be used to meet the performance requirements. These navigation specifications are defined at a sufficient level of detail to facilitate global harmonization by providing specific implementation guidance for operators.



Under PBN, generic navigation requirements are defined based on the operational requirements. Operators are then able to evaluate options in respect of available technologies and navigation services that could allow these requirements to be met. The chosen solution would be the most cost effective for the operator, rather than a solution being imposed as part of the operational requirements. Technologies can evolve over time without requiring the operation itself to be revisited, as long as the requisite performance is provided by the RNAV system. As part of the future work of the ICAO, it is anticipated that other means for meeting the requirements of the Navigation Specifications will be evaluated and may be included in the applicable Navigation Specifications, as appropriate.

ICAO's Performance Based Navigation (PBN) concept aims to ensure global standardization of RNAV and RNP specifications and to limit the proliferation of navigation specifications in use worldwide. It is a new concept based on the use of Area Navigation (RNAV) systems. Significantly, it is a move from a limited Statement of required performance accuracy to more extensive Statements for required performance in terms of accuracy, integrity, continuity and availability, together with descriptions of how this performance is to be achieved in terms of aircraft and flight crew requirements.

3.1. RNAV

RNAV is the less capable of the two families of PBN navigation specifications. RNAV is suited to current and legacy aircraft operations however as a stand-alone specification it is insufficient to support many of the new Air Traffic Management (ATM) applications envisaged in strategic plans (eg: 3D, 4D ATM concepts).

The RNAV Specifications are:

- RNAV 10: intended for use in Oceanic airspace (no plan to use this specification in Azerbaijan airspace)
- RNAV 5 (alrady implemented above FL 195)
- RNAV 2: intended for use in Domestic Enroute airspace
- RNAV 1: intended for use in Terminal airspace

RNAV specifications do not require on board navigation performance monitoring and alerting. RNAV tracks (e.g.: RNAV 5, RNAV 2, RNAV 1) will normally require monitoring by ATC surveillance systems to achieve desired performance and separation safety standards. This requirement implies near universal surveillance coverage for RNAV specifications. Over Caspian sea this surveillance is provided by ADS-B and by a network of radar systems (PSR & MSSR).

3.1.1. RNAV CURRENT STATUS IN AZERBAIJAN

RNAV 5 specification have been implemented within upper (above FL195) airspace of Azerbaijan. RNAV Approaches are not implemented yet at any aerodrom within Azerbaijan.

RNAV, ATS routes, SIDs, STARs and approaches

Airspace	Navigation Specification
En Route	RNAV-5
TMA Arrival/Departure	
UBBB	nil
UBBG	nil
UBBL	nil
UBBQ	nil
UBBN	nil
UBBZ	nil

3.1.2 FLEET EQUIPAGE

As at December 1 2012 there are 45 aircraft with PBN capability of Aircraft Registered in Azerbaijan. This is a significant proportion of the IFR capable fleet. The following table indicates the state of PBN technical capability of aircraft registered in Azerbaijan:

Aircraft Type	Number of Aircraft	RNAV 5	RNAV 2	RNAV 1	RNP APCH
A340	2	100%	100%	100%	100%
A320	7	100%	100%	100%	85%
A319	4	100%	100%	100%	100%
B 747	3	100%	100%	100%	70%
B757	4	100%	100%	100%	50%
B767	5	100%	100%	100%	100%
B727	1	100%	100%	100%	100%
GLF550	1	100%	100%	100%	100%
GLF450	1	100%	100%	100%	100%
GLF200	1	100%	100%	100%	100%
ATR	4	100%	75%	75%	0%
IL76 DC	9	100%	0	0	0
AN12	3	100%	0	0	0

In December 2012 number of DEP/ARR operration in Azerbaijan was 3960 from which 2060 operation was made by Azerbaijan Airlines (AZAL, Silkway, Azalcargo) other 1700 was made by major scheduled carriers other than Azerbaijan Airlines and 200 by non-scheduled carriers. Main scheduled carriers other than Azerbaijan Airlines are:

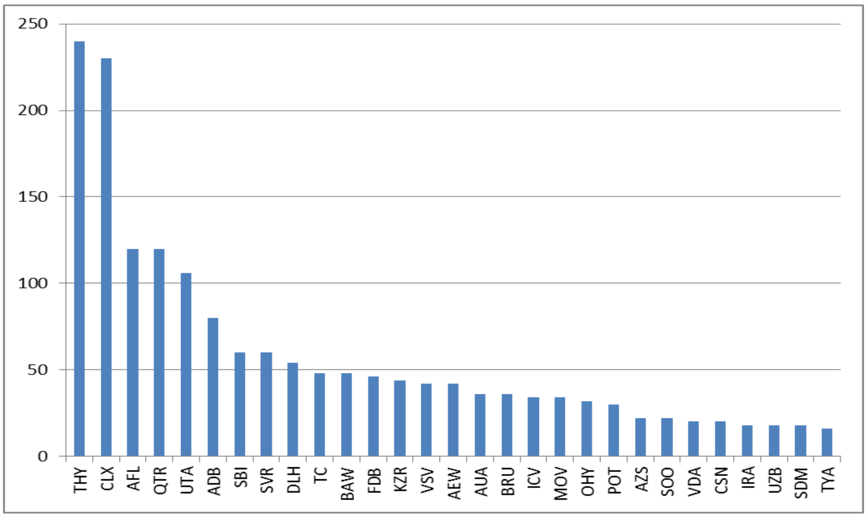


Fig 2 and 3 shows that major scheduled carriers flying to Azerbaijan airports are equipped with RNAV5 100 %, RNAV 5 with GNSS only for 94%, RNAV 2 - 32%, RNAV1 - 81%, RNP APRCH 40%.

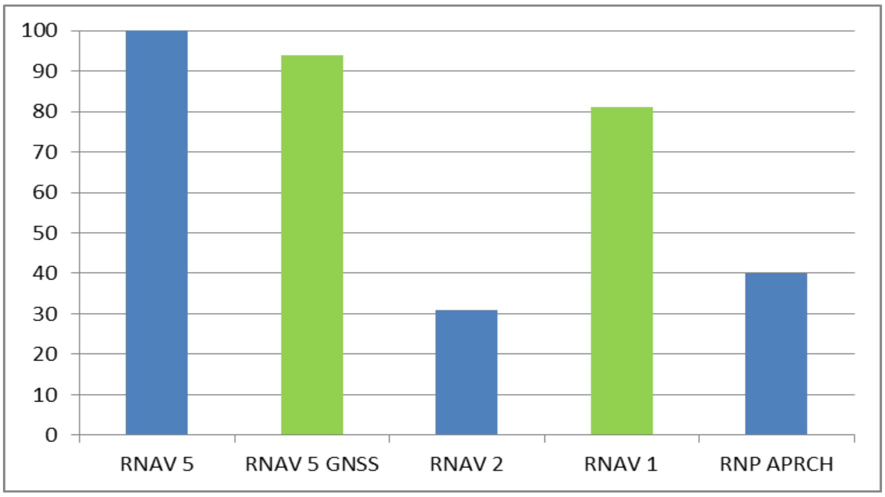


Figure 2.

3.2 BENEFITS OF PBN AND GLOBAL HARMONIZATION

PBN offers a number of advantages over the sensor-specific method of developing airspace and obstacle clearance criteria. These include:

- Reduces need to maintain sensor-specific routes and procedures, and their associated costs. For example, moving a single VOR ground facility can impact dozens of procedures, as that VOR can be used on routes, VOR approaches, as part of missed approaches, etc. Adding new sensor specific procedures will compound this cost, and the rapid growth in available navigation systems would soon make system-specific routes and procedures unaffordable.

- Avoids need for development of sensor-specific operations with each new evolution of navigation systems, which would be cost-prohibitive.
- Allows more efficient use of airspace (route placement, fuel efficiency, noise abatement).
- Clarifies the way in which RNAV systems are used.
- Facilitates the operational approval process for operators by providing a limited set of navigation specifications intended for global use.

RNAV and RNP specifications facilitate more efficient design of airspace and procedures, which collectively result in improved safety, access, capacity, predictability, operational efficiency and environmental effects. Specifically, RNAV and RNP may:

- Increase safety by using three-dimensional (3D) approach operations with course guidance to the runway, which reduce the risk of controlled flight into terrain.
- Improve airport and airspace access in all weather conditions, and the ability to meet environmental and obstacle clearance constraints.
- Enhance reliability and reduce delays by defining more precise terminal area procedures that feature parallel routes and environmentally optimized airspace corridors. Flight management systems (FMS) will then be poised to save operators time and money by managing climb, descent, and engine performance profiles more efficiently.
- Improve efficiency and flexibility by increasing use of operator-preferred trajectories airspace-wide, at all altitudes. This will be particularly useful in maintaining schedule integrity when convective weather arises.
- Reduce workload and improve productivity of air traffic controllers.

Performance- based navigation will enable the needed operational improvements by leveraging current and evolving aircraft capabilities in the near term that can be expanded to address the future needs of aviation stakeholders and service providers.

3.3 STAKEHOLDERS

Coordination is critical with the aviation community through collaborative forums. This will assist aviation stakeholders in understanding operational goals, determining requirements, and considering future investment strategies. This, in turn, enables the aviation stakeholders to focus on addressing future efficiency and capacity needs while maintaining or improving the safety of flight operations by leveraging advances in navigation capabilities on the flight deck. RNAV and RNP have reached a sufficient level of maturity and definition to be included in key plans and strategies, such as this Azerbaijan PBN Implementation plan.

The stakeholders who will benefit from the concepts in this PBN Implementation plan include airspace operators, Azerbaijan air navigation service provider- AZANS, Azerbaijan Civil Aviation Administration, and standards organizations.

As driven by business needs, airlines and operators can use the Azerbaijan PBN Implementation plan to plan future equipage and capability investments. Similarly, air navigation service provider- AZANS can determine requirements for future automation systems, and more smoothly modernize ground infrastructure. Finally, regulators and standards organizations can anticipate and develop the key enabling criteria needed for implementation.

This plan is a work in progress and will be amended through collaborative EUR Region States, industry efforts and consultations that establish a joint aviation community/government/industry strategy for implementing performance-based navigation. Critical initiative strategies are required to accommodate the expected growth and complexity over the next two decades. These strategies have five key features:

- Expediting the development of performance-based navigation criteria and standards.
- Introducing airspace and procedure improvements in the near term.
- Providing benefits to operators who have invested in existing and upcoming capabilities.
- Establishing target dates for the introduction of navigation mandates for selected procedures and airspace, with an understanding that any mandate must be rationalized on the basis of benefits and costs.
- Defining new concepts and applications of performance-based navigation for the mid term and Long term and building synergy and integration among other capabilities toward the realization of the EUR Region PBN goals.

4. CHALLENGES

4.1. SAFETY – RISKS ASSOCIATED WITH MAJOR SYSTEM CHANGE

During the transition to a mature PBN environment the government and industry will face significant challenges. The government challenges will include support of Civil Aviation Rule changes and associated preparatory work. The industry challenges will involve resourcing and managing a diverse range of navigation systems with equally diverse requirements. Some of the key identified challenges are:

- Adoption of supporting Civil Aviation Rules
- PBN capability register and aircraft minimum equipment lists (MEL)
- Mixed fleet/system operations
- Safety monitoring of ATM system
- Approach naming and charting conventions
- Navigation database integrity and control
- GNSS system performance and prediction of availability service
- Continued involvement in CNS/ATM and PBN development
- Resources of the CAA, Airways and industry to implement PBN
- Education and training of personnel employed by the CAA, Airways and aircraft

4.2. INCREASING DEMANDS

4.2.1. EN ROUTE

Air traffic flow in the airspace of the Republic of Azerbaijan is characterized by prevalence of overflight traffic. Main direction of overflight traffic is from Europe/USA to Far East /South Asia – from West to East and vice-versa. The following seasonal flows are added to the main flow:

- Summer season, from Kazakhstan and state of the Middle Asia to the resort of Turkey and vice-versa;
- Winter season, from Russia to the resort of the Persian Gulf and the Indian Ocean and vice-versa.

The overflight traffic in the Republic of Azerbaijan has increased over last number of years (Table 1) and compared with 2011 figures, rached 6% in (overflights increased by 7 %, DEP/ARR increased by 4 %) average growth until end of October 2012. Figure 3 shows overflight movements and Figure 4 shows number of ARR/DEP in Baku FIR.

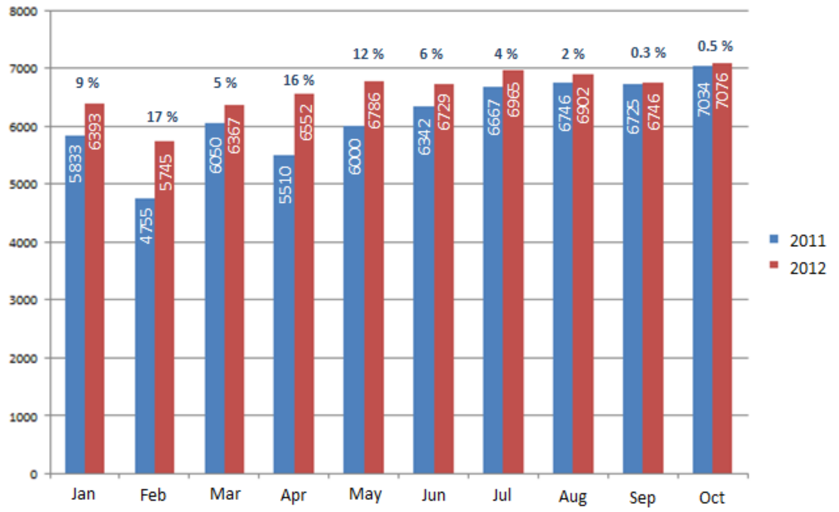


Figure 3. Overflight traffic growth (2011 VS 2012)

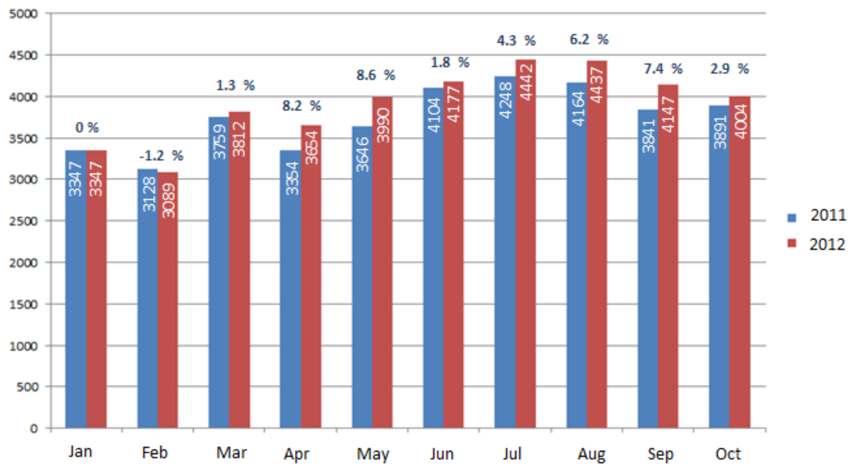


Figure 4. DEP/ARR traffic growth (2011 VS 2012)

2011	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	Total
ARR/DEP	3347	3128	3759	3354	3646	4104	4248	4164	3841	3891	37482
Transit	5833	4755	6050	5510	6000	6342	6667	6746	6725	7034	61662
Total	9180	7883	9809	8864	9646	10446	10915	10910	10566	10925	99144
2012	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**Total**
ARR/DEP	3347	3089	3812	3654	3990	4177	4442	4437	4147	4004	39099
Transit	6393	5745	6367	6552	6786	6729	6965	6902	6746	7076	66261
Total	9740	8834	10179	10206	10776	10906	11407	11339	10893	11080	105360

Measures are required to be introduced to increase airspace capacity to cater for growing air traffic demands. A possible measure of RVSM has already implemented in the region. New measures could be double or multiple tracking of parallel routes, restructuring of airspace and improving air traffic management.

The present ATS route network in Azerbaijan is generally connected by ground-based navigation aids such as VOR/DME whether designated as conventional or RNAV routes.

These traffic flows generally conflict at several waypoints within Azerbaijan airspace resulting in complexity for ATC and increased controller workload. In future, most aircraft are expected to have the capability for advanced RNAV and RNP. Hence, longitudinal separation can be minimized while ensuring safety. This will result in airspace capacity enhancement.

In order to improve operating efficiency, enroute operations will be systematically taken into account while developing new routes in future. Because RNAV allows the establishment of routes that are not anchored to the location of ground-based navigation aids, routes could be more easily re-aligned and parallel spaced based on the PBN navigation specification. This will allow the capacity of the system as a whole to increase without increasing controller workload allowing maximum aircraft at optimum profiles.

4.2.2. TERMINAL AREAS (DEPARTURES AND ARRIVALS)

RNAV/RNP departure and arrival routes can be made shorter than routes that use VOR and other ground-based navigation aids. Although flights enter a terminal area from more than one direction, they must all finally converge onto courses that correspond to landing runways. This is the reason that simply developing RNAV routes alone cannot drastically increase the airspace capacity at busy airports.

Environmental issues are also an important challenge in the current scenario. RNAV/RNP can allow aircraft to fly ground tracks that better avoid noise sensitive areas appropriately addressing the issue. Operations on the published RNAV routes can also reduce the amount of controller workload significantly by reducing vectoring and reducing communication between the pilot and the controller. For airports without Airport Surveillance Radar (non-radar airports), RNAV could also be very effective in shortening routes as those procedures will generally facilitate transition from enroute to approach phase without coming over the facility serving the aerodrome.

4.2.3. APPROACH

All international airports in Azerbaijan are equipped with ILS serving one end of the runway. The approach operations at these airports to the other ends are normally conducted either using available non-precision approach or by visual circling due to terrain/airspace limitations. Besides non-availability of vertical profile, these approaches are not exactly aligned with the runways. In order to make approach operations more effective, RNP APCH along with Baro-VNAV will be implemented where practicable which would result in significant safety enhancement as well as accessibility to those non-instrument runways where conventional approaches are impracticable. RNP APCH designed will serve as primary approach procedure for Non-Precision and existing non-instrument runway ends and as secondary procedure for precision approach runway ends.

4.3. EFFICIENT OPERATIONS

a) Efficiency gains enabled through PBN include:

- Reduced separation standards for air traffic routes in oceanic and some portions of domestic en-route airspace
- Greater flexibility of airspace design in terminal area airspace
- Reduced track distance, noise and fuel consumption through PBN enabled ATS routes and approach procedures
- Reduced environmental impact.

b) The synchronised integration of PBN and non-PBN air routes, airspace and aircraft will be vital if these efficiency gains are to be fully realised.

4.4 DIFFERENT EQUIPPED AIRCRAFT

There are 7 operators registered in the Azerbaijan operating 45 aircraft and 73.5% of these aircraft are exceeding or meeting RNAV1 requirements.

A number of operators not based in the Azerbaijan operate aircraft which do not meet future PBN navigation requirements for a variety of reasons. According to survey 81% of aircrafts are meeting RNAV 1 requirements but less than 40% of aircrafts flying to Azerbaijan airports are not meeting RNP APRCH requirements. These affected aircraft will not be able to comply with PBN requirements and therefore need to be granted a restricted entry via designated routes and at times which will not affect the operations of PBN compliant aircraft.

The airspace review proposed for 2012 will be required to include non RNAV 1 aircraft in the design for the short term period.

NOTE: Operators are expected to upgrade older aircraft types or re-fleet in order to comply with the Azerbaijan PBN Implementation plan. Non-compliance with the PBN Implementation time lines will lead to increasingly severe penalties and eventual total ban from Azerbaijan airspace.

4.5. ENVIRONMENT

Environmental challenges include minimising the impact of noise and emissions on both the communities in the proximity of aerodromes and the global environment. PBN will provide significant efficiencies in the ATM system which will simultaneously increase system efficiency and reduce total carbon emission and aircraft noise levels but a collaborative approach will be essential to deliver all these objectives.

Environmental challenges therefore include:

a) Political developments/considerations

- Increased ATM system capacity due to PBN efficiency gains
- Emission control/management, including demonstrated efficiencies associated with PBN operations
- Noise control/management

b) Technological developments

- Tension between noise outcomes and emissions reduction outcomes

5. IMPLEMENTATION STRATEGY

Azerbaijan airspace is continental airspace exept some portions of Baku FIR which falls over the Caspian Sea. From 2007 Azerbaijan implemented RNAV 5 above FL 195.

This plan provides a high-level strategy for the evolution of navigation capabilities to be implemented in three timeframes: near term (2012-2013), mid term (2013-2016), and Long term (2017 and Beyond). The strategy rests upon two key navigation concepts: Area Navigation (RNAV) and Required Navigation Performance (RNP). It also encompasses instrument approaches, Standard Instrument Departure (SID) and Standard Terminal Arrival (STAR) operations, as well as en-route continental, oceanic and remote operations. The section on Long-term initiatives discusses integrated navigation, communication, surveillance and automation strategies.

5.1. NEAR TERM (2012-2013) MID TERM (2013-2016) AND LONG TERM (2017 AND BEYOND) KEY TASKS

The key tasks involved in the transition to performance-based navigation are:

- Establish navigation service needs through the Long term that will guide infrastructure decisions and specify needs for navigation system infrastructure, and ensure funding for managing and transitioning these systems.
- Define and adopt a national policy enabling additional benefits based on RNP and RNAV.
- Identify operational and integration issues between navigation and surveillance, air-ground communications, and automation tools that maximize the benefits of RNP.
- Support mixed operations throughout the term of this Roadmap, in particular considering navigation system variations during the near term until appropriate standards are developed and implemented.
- To support Civil/Military coordination and develop the policies needed to accommodate the unique missions and capabilities of military aircraft operating in civil airspace.
- Harmonize the evolution of capabilities for interoperability across airspace operations.
- Increase emphasis on human factors, especially on training and procedures as operations increase reliance on appropriate use of flight deck systems.
- Facilitate and advance environmental analysis efforts required to support the development of RNAV and RNP procedures.
- Maintain consistent and harmonized global standards for RNAV and RNP operations.

5.2. NEAR TERM STRATEGY (2012-2013)

The near-term strategy will focus on expediting the implementation and proliferation of RNAV procedures. As demand for air travel continues at healthy levels, choke points will develop and delays at the major airports will continue to climb. RNAV and RNP procedures will help alleviate those problems. Continued introduction of RNAV and RNP procedures will not only provide benefits and savings to the operators but also encourage further equipage.

15 November 2012 Azerbaijan implemented a new flight plan procedures which accommodates PBN operations. This particularly addresses fields 10 and 18.

Operators will need to plan to obtain operational approvals for the planned Navigation Specifications for this period. Operators shall also review Regional PBN Implementation Plans from other Regions to assess if there is a necessity for additional Operational approvals.

5.2.1. EN ROUTE

Enroute operations on all international routes will be implemented in the Azerbaijan airspace will be conducted in accordance with RNAV 5 navigation specification by 2013.

Summaty Near Term Strategy		
Airspace	**Prefered Navigation Specifications**	**Acceptable Navigation Specifications**
En route	RNAV 2	RNAV 5
TMA Arrival/Departure	RNAV-1 in radar environment and with adequate navigation infrastructure.	-
Approach	Nil (Conventional – ILS)	-

5.3. MEDIUM TERM STRATEGY (2013-2016)

5.3.1. EN ROUTE

The review of en-route airspace will be completed by 2016. By the end of the mid term other benefits of PBN will have been enabled, such as flexible procedures to manage the mix of faster and slower aircraft in congested airspace and use of less conservative PBN requirements. Thus RNAV 2 will be implemented above FL 195.

Mid- term automation tools will facilitate the introduction of RNP offsets and other forms of dynamic tracks for maximizing the capacity of airspace. By the end of the mid term, en route automation will have evolved to incorporate more accurate and frequent surveillance reports through ADS-B, and to execute problem prediction and conformance checks that enable offset manoeuvres and closer route spacing (e.g., for passing other aircraft and manoeuvring around weather).

5.3.2. TERMINAL AREAS

Azerbaijan will continue to plan, develop and implement RNAV-1 SIDs and STARs, at major airports and make associated changes in airspace design. In addition, Azerbaijan will implement Basic RNP-1 SIDs and STARs. RNAV-1 will be implemented in airspace where there is sufficient surveillance coverage and Basic RNP-1 where there is no such coverage. Where operationally feasible, Azerbaijan will develop operational concepts and requirements for continuous descent arrivals (CDAs) based on FMS Vertical Guidance and for applying time of arrival control based on RNAV and RNP procedures. This would reduce workload for pilots and controllers as well as increase fuel efficiency.

Terminal automation will be enhanced with tactical controller tools to manage complex merges in busy terminal areas. As data communications become available, the controller tools will apply knowledge of flights' estimates of time of arrival at upcoming waypoints, and altitude and speed constraints, to create efficient maneuvers for optimal throughput.

Terminal automation will also sequence flights departing busy airports more efficiently than today. This capability will be enabled as a result of PBN and flow management tools. Flights arriving and departing busy terminal areas will follow automation-assigned PBN routes.

5.3.3. APPROACH

During this timeframe ILS will remain the main instrument approach. RNP APCH with Baro VNAV and RNP AR APCH will be implemented at major airport UBBB.

5.3.4. HELICOPTER OPERATIONS

In the mid-term, the implementation of Helicopter routes based on PBN is expected, with specific reference to routes out and back from the oil regions/platforms. Implementation priorities for instrument approaches will be based on RNP APCH – Point In Space, and full implementation is expected at the end of this term.

Summaty Mid Term Strategy		
Airspace	**Prefered Navigation Specifications**	**Acceptable Navigation Specifications**
En route	RNAV 2 or RNP 2	RNAV 2 Above FL 195 partially
TMA Arrival/Departure	RNAV-1 in radar environment and with adequate navigation infrastructure.	RNAV -1 at major airports
Approach	RNP APCH (with Baro-VNAV) and APV RNP AR APCH where there are operational benefits	RNP APCH with baro VNAV at major airports

5.4 LONG TERM STRATEGY (2017 AND BEYOND)

The Long-term environment will be characterized by continued growth in air travel and increased air traffic complexity.

No one solution or simple combination of solutions will address the inefficiencies, delays, and congestion anticipated to result from the growing demand for air transportation. Therefore, Azerbaijan and key Stakeholders need an operational concept that exploits the full capability of the aircraft in this time frame.

5.4.1 LONG TERM KEY STRATEGIES (2017 AND BEYOND)

Airspace operations in the Long term will make maximum use of advanced flight deck automation that integrates CNS capabilities. RNP, RCP, and RSP standards will define these operations. Separation assurance will remain the principal task of air traffic management in this time frame. This task is expected to leverage a combination of aircraft and ground-based tools. Tools for conflict detection and resolution, and for flow management, will be enhanced significantly to handle increasing traffic levels and complexity in an efficient and strategic manner.

Strategic problem detection and resolution will result from better knowledge of aircraft position and intent, coupled with automated, ground-based problem resolution. In addition, pilot and air traffic controller workload will be lowered by substantially reducing voice communication of clearances, and furthermore using data communications for clearances to the flight deck. Workload will also decrease as the result of automated confirmation (via data communications) of flight intent from the flight deck to the ground automation.

With the necessary aircraft capabilities, procedures, and training in place, it will become possible in certain situations to delegate separation tasks to pilots and to flight deck systems that depict traffic and conflict resolutions. Procedures for airborne separation assurance will reduce reliance on ground infrastructure and minimize controller workload. As an example, in IMC an aircraft could be instructed to follow a leading aircraft, keeping a certain distance. Once the pilot agreed, ATC would transfer responsibility for maintaining spacing (as is now done with visual approaches).

Performance -based operations will exploit aircraft capabilities for “electronic” visual acquisition of the external environment in low-visibility conditions, which may potentially increase runway capacity and decrease runway occupancy times.

Improved wake prediction and notification technologies may also assist in achieving increased runway capacity by reducing reliance on wake separation buffers.

System-wide information exchange will enable real-time data sharing of NAS constraints, airport and airspace capacity, and aircraft performance. Electronic data communications between the ATC automation and aircraft, achieved through data link, will become widespread—possibly even mandated in the busiest airspace and airports. The direct exchange of data between the ATC automation and the aircraft FMS will permit better strategic and tactical management of flight operations.

Aircraft will downlink to the ground-based system their position and intent data, as well as speed, weight, climb and descent rates, and wind or turbulence reports. The ATC automation will uplink clearances and other types of information, for example, weather, metering, choke points, and airspace use restrictions.

To ensure predictability and integrity of aircraft flight path, RNP will be mandated in busy en route and terminal airspace. RNAV operations will be required in all other airspace (except oceanic). Achieving standardized FMS functionalities and consistent levels of crew operation of the FMS is integral to the success of this Long-term strategy.

The most capable aircraft will meet requirements for low values of RNP (RNP 0.3 or lower en route). Flights by such aircraft are expected to benefit in terms of airport access, shortest routes during IMC or convective weather, and the ability to transit or avoid constrained airspace, resulting in greater efficiencies and fewer delays operating into and out of the busiest airports.

Enhanced ground-based automation and use of real-time flight intent will make time-based metering to terminal airspace a key feature of future flow management initiatives. This will improve the sequencing and spacing of flights and the efficiency of terminal operations.

Uniform use of RNP for arrivals and departures at busy airports will optimize management of traffic and merging streams. ATC will continue to maintain control over sequencing and separation; however, aircraft arriving and departing the busiest airports will require little controller intervention. Controllers will spend more time monitoring flows and will intervene only as needed, primarily when conflict prediction algorithms indicate a potential problem.

More detailed knowledge of meteorological conditions will enable better flight path conformance, including time of arrival control at key merge points. RNP will also improve management of terminal arrival and departure with seamless routing from the en route and transition segments to the runway threshold. Enhanced tools for surface movement will provide management capabilities that synchronize aircraft movement on the ground; for example, to coordinate taxiing aircraft across active runways and to improve the delivery of aircraft from the parking areas to the main taxiways.

5.4.2 SUMMARY OF LONG TERM KEY STRATEGIES (2017 AND BEYOND)

The key strategies for instituting performance-based operations employ an integrated set of solutions.

- Airspace operations will take advantage of aircraft capabilities, i.e. aircraft equipped with data communications, integrated displays, and FMS.
- Aircraft position and intent information directed to automated, ground-based ATM systems, strategic and tactical flight deck-based separation assurance in selected situations (problem detection and resolution).
- Strategic and tactical flow management will improve through use of integrated airborne and ground information exchange.
- Ground-based system knowledge of real-time aircraft intent with accurate aircraft position and trajectory information available through data link to ground automation.
- Real-time sharing of National Air Space (NAS) flight demand and other information achieved via ground-based and air-ground communication between air traffic management and operations planning and dispatch.
- Overall system responsiveness achieved through flexible routing and well-informed, distributed decision-making.
- Systems ability to adapt rapidly to changing meteorological and airspace conditions.

- System leverages through advanced navigation capabilities such as fixed radius transitions, RF legs, and RNP offsets.

- Increased use of operator-preferred routing and dynamic airspace.

- Increased collaboration between service providers and operators.

Operations at the busiest airports will be optimized through an integrated set of capabilities for managing pre-departure planning information, ground-based automation, and surface movement.

- RNP-based arrival and departure structure for greater predictability.

- Ground-based tactical merging capabilities in terminal airspace.

- Integrated capabilities for surface movement optimization to synchronize aircraft movement on the ground. Improved meteorological and aircraft intent information shared via data link.

6. TRANSITIONAL CONSIDERATIONS

- During the coexistence period, conventional navigations systems will be retained to provide services for aircraft without PBN equipage;

- The operators and other airspace users are encouraged to install the avionics that are necessary for the PBN operations;

- The CAA will conduct safety assessment and periodic safety inspections and make contingency plans to ensure continuous operational safety;

- Thorough operation monitoring will be carried out, including the operator qualifications, aircraft navigation performance, navigation error, etc, and corrective measures will be formulated;

- Harmonization of conventional procedure and PBN flight procedure shall be considered in flight procedure design to reduce the risk of procedure conflict while conventional operations and PBN operations coexist;

- Air traffic control trainings to controllers and safety measures will be in place for blended operation environment to ensure safe separation;

- The operators shall be informed as early as possible before PBN operations are to be implemented at the airports or en route and airworthiness and operational approval to the national air carriers shall be actively conducted.

Appendix A –IMPLEMENTATION SCHEDULE