International Civil Aviation Organization
CAR/SAM Planning and Implementation Regional Group (GREPECAS)
Second Meeting of the Programmes and Projects Review Committee (PPRC/2)
Lima, Peru, 16 - 18 July 2013

Agenda Item 2: Air navigation activities at global and inter-regional level

2.2 Results of the Twelfth Air Navigation Conference

GLOBAL AIR NAVIGATION PLAN (GANP)

SUPPORT FOR THE GLOBAL AIR NAVIGATION PLAN, AVIATION SYSTEM BLOCK UPGRADES AND REGIONAL IMPLEMENTATION

(Presented by the United States)

SUMMARY

A significant outcome of the International Civil Aviation Organization (ICAO) 12th Air Navigation Conference (ANC/12) was an agreement in-principle, by the Conference, to support the Global Air Navigation Plan (GANP) and the Aviation System Block Upgrade (ASBUs) concept. ANC/12 also recommended that ICAO define a stable and efficient process for endorsing the GANP and ASBUs, by the 38th Session of the ICAO Assembly.

While the Conference agreed in-principle, there remain common misconceptions among States, Regional Groups and Industry regarding the GANP and ASBUs, which may lead States to hesitate their endorsement during the 38th Session of the ICAO Assembly. These misconceptions center around the structure of the ASBUs, the potential to have mandatory modules, the associated timeframes, and implementation.

The United States views the endorsement of the GANP as a positive direction and the ASBUs as the framework for implementation of future capabilities. This paper details the United States view towards a regional implementation framework and provides an overview of an economic analysis framework.

Action: The Conference is invited to agree with the recommendations in paragraph 6.

Attachment: Economic Benefit Analysis for United States Next Generation Air Transportation System (NextGen)

ICAO Strategic Objective(s)	*This working paper is related to Strategic Objective A Safety – Enhance global civil aviation safety.*

1. INTRODUCTION

1.1 In order to coordinate a constantly evolving global air navigation system, it is important to have a harmonized plan for aviation regulators, operations and industry to follow. The planning, development, training and implementation of a globally harmonized system is contingent on a framework that includes scalable plans and provides the expected operational, economic and safety benefits.

1.2 The proposed GANP and ASBUs, provide the strategic direction, with clearly defined and measurable operational improvements as well as economic benefits. The GANP and ASBUs help regulators; operators; and industry derive the positive business cases and allow for a scalable and customized approach. The ASBUs outline the air and ground equipment, timelines, and standards and procedures necessary for implementation.

1.3 We believe States and Regions face three primary challenges with GANP and ASBUs: 1) understanding the GANP and ASBU core plans; 2) ASBU implementation; and 3) guidance on relating applicable economic issues to an implementation business case. The United States offers to clarify the GANP and ASBUs and propose a plan for regional implementation and an example of an economic framework.

2. GANP

2.1 The GANP is the overarching framework or plan, for the next 15 years. The plan includes key civil aviation policy principles to assist ICAO Regions, sub-regions and States with the preparation of their Regional and State air navigation plans. The objective of the GANP is to increase the capacity and efficiency of the global civil aviation system, through a harmonized approach, while improving or at least maintaining safety.

2.2 The framework contained in the GANP outlines a logical architecture for air traffic management to utilize in ensuring that global aviation systems are harmonized and prioritized. The architecture is built around Performance Based Navigation (PBN) which was endorsed during the 37th Session of the ICAO Assembly. The GANP is also closely tied to ICAO Doc. 9854- *Global Air Traffic Management Operation Concept;* Doc. 9882- *Manual on Air Traffic Management System Requirements;* and ICAO Doc. 9883- *Manual on Global Performance of the Air Navigation System.*

2.3 The GANP provides States and Regions with greater flexibility on how they may move forward with implementing new systems and technologies. States will need to map their individual or regional programs to the GANP and will require active collaboration through the Planning and Implementation Regional Groups (PIRGs) for implementation.

3. ASBUs

3.1 The ASBUs serve as the "tool box" States and Regions will utilize to implement the GANP. The concept behind the ASBUs, enables each State to decide for themselves what technologies and systems they will need to be interoperable and harmonized within their region.

3.2 There are four blocks – each Block contains a package of upgrades, called modules, which individual performance capabilities. The Blocks are numbered based on the dates those capabilities will be available for implementation.

- Block 0 can be fully implemented by the end of 2013;
- Block 1 can be fully implemented by 2018;
- Block 2 can be fully implemented by 2023; and
- Block 3 can be fully implemented by 2028.

3.3 A module is a specific upgrade or "tool" contained within a Block. The modules are organized into specific performance target areas. The areas include; airport operations, interoperable systems and data, globally collaborative ATM and efficient flight paths. The modules contained in Block 0 are the basic technologies. The modules continue to evolve and continue to full maturity by Block 3.

3.4 The ASBUs and modules are not mandatory. They should be deployed, if and when, a State or Region can benefit from the particular upgrade. This concept is different from that of the aviation safety oversight structure. For example, the safety oversight structure requires implementation of eight critical safety elements. Some States and Regions may only choose to deploy a minimal number of modules, while other States and Regions may choose to deploy full Blocks. The United States will implement a majority of modules in our air navigation system; however, we will not deploy all modules to every area within the United States.

4. Prioritization and Regional Implementation

4.1 As the primary mechanism for developing and implementing regional plans, the PIRGs will need to take an active role in coordinating with their accredited States in the development of a regional framework which will incorporate the GANP and ASBUs. The PIRGs will also need to increase cross-regional coordination between each other, and may benefit from ICAO hosting All Planning and Implementation Regional Group (ALLPIRG) meetings, or from Global coordination meetings. Regional Air Navigation Plans (ANPs) and Regional Supplementary Procedures (SUPPs) will also need to be maintained and regularly updated to account for the many advancements and timelines proposed in the GANP and ASBUs.

4.2 In order to efficiently implement the above, Regions, PIRGs and States should establish a systematic process to determine their specific needs. The process should consist of stages. The following stages are recommended: Analysis, Assessment, Implementation and Monitoring.

4.3 The Analysis stage should begin with an analysis of stakeholder needs to include; capacity, routes, user requirements, environment, safety, current air traffic flows and forecasting for both civil and military operations. Once these needs are analyzed, a review of the State’s Air Navigation Plans (ANPs) and Facilities and Services Implementation Document (FASID) should be conducted to determine performance and capability gaps.

4.4 The Assessment stage will identify mitigating factors of the performance and capability gaps. The mitigating factors will assist Regions and States in selecting and prioritizing their relevant modules. After the relevant modules are determined, a cost benefit analysis will provide the business case for deployment. At the end of the Assessment phase Regions and States will need to obtain stakeholder commitment before advancing to the implementation stage.

4.5 The Implementation stage begins with amending regional implementation plans based on the relevant modules and a positive business case. States would then update their individual ANPs to reflect their participation in regional plans. States, with the help of their ICAO Regional Office, will then need to ensure that the regulatory and training requirements are developed and in place.

4.6 After implementation, States would report progress and performance to their ICAO Regional Office and PIRG, which in turn would update the regional plans as needed. The reporting process continues as it is reviewed, validated and monitored and reported to ICAO Montreal in the Air Navigation Capacity and Performance Report. Finally, when all regional reports are consolidated at ICAO Montreal, there will be a clear picture of global implementation and deployment of the ASBUs.

5. Economic Analysis Framework

5.1 One of the biggest challenges for the implementation and deployment of the ASBUs is developing a positive business case through a cost benefit analysis. There are multiple ICAO guidance documents regarding the economics of air navigation that should be referenced when conducting a business case analysis. These documents include:

- ICAO's Policies on Charges for Airports and Air Navigation Services (Doc 9082)
- Manual on Air Navigation Services Economics (Doc 9161)
- Economics of Satellite-based Air Navigation Services (Circ 257)
- Report on the Financial and Related Organizational and Managerial Aspects of Global Navigation Satellite System (GNSS) Provision and Operation (Doc 9660)
- ICAO Council provisional policy guidance on the allocation of the incremental costs of more advanced GNSS
- Manual on Air Traffic Forecasting (Doc 8991)

5.2 International organizations and industry groups can also help to prepare an economic analysis and business cases. The International Air Transport Association (IATA) conducted a thorough analysis for the Asia Pacific Region and presented its findings at the Third Meeting of the ICAO Asia/Pacific Seamless ATM Planning Group held in January, 2013.

5.3 Attached is a synopsis that provides a framework of the economic benefits derived from the United States Next Generation Air Transport System (NextGen). The synopsis is intended to provide an overview of the United States framework and variables analyzed to derive costs and benefits.

6. Conclusion

6.1 The GANP and ASBUs provide a strategic and tactical direction to advancing and harmonizing international air navigation systems in a safe and efficient manner. While there has been much confusion about the GANP and ASBUs, it should be noted that the only mandate is that States and Regions work together and map their individual plans to the GANP. The ASBUs are the toolkit to use in implementing the GANP and should only be deployed when a State or Region can benefit from the particular upgrade.

7. Recommendations

7.1 Based on the above considerations, the Meeting is invited to agree to the following recommendations:

a) agree to endorse the GANP and ASBUs at the 38th Session of the ICAO Assembly;
b) consider the framework for prioritization and regional implementation;
c) consider the attached economic analysis framework as information in developing their business case, and,
d) encourage participation in the ASBU Regional Workshop scheduled for July 22-26 at the ICAO North America, Central America and Caribbean Regional Office in Mexico City.

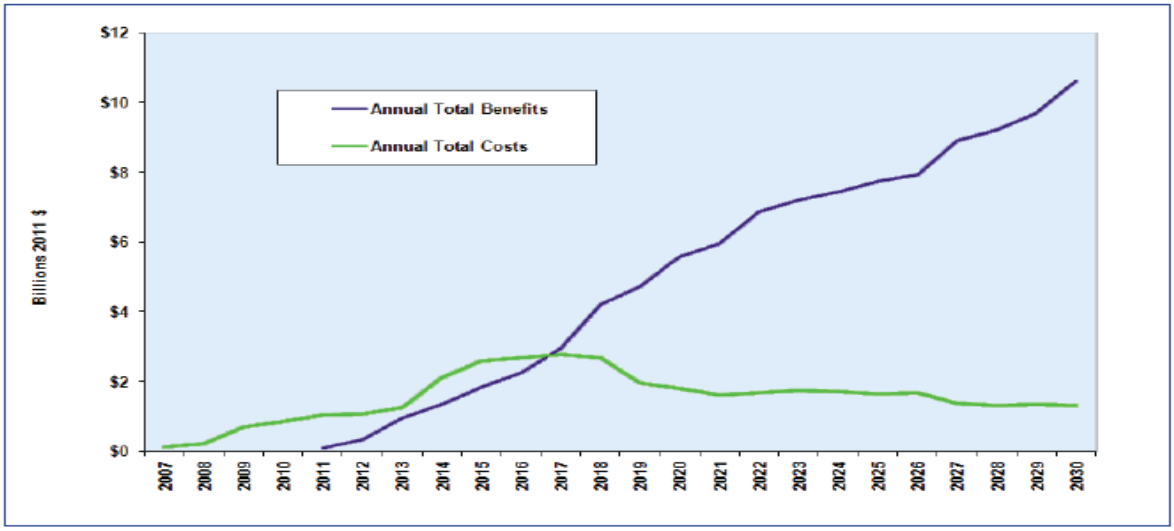
ATTACHMENT

Economic Benefit Analysis for United States Next Generation Air Transportation System (NextGen)

NextGen is a wide-ranging transformation of the air transportation system, including air traffic management technologies and procedures; airport infrastructure improvements; and environmental, safety and security-related enhancements. The FAA's business case addresses only the air traffic management aspects of NextGen, as the costs of these improvements are most directly borne by the FAA and system users. The U.S. considers the costs and benefits of addressing the shortfalls of the current system with new technologies. As noted in the GANP, each state will implement the ASBUs and modules that are appropriate to its airspace. Not every portion of the ASBUs will be applicable to every airspace. The following sections note how the United States developed the case for its NextGen system.

Benefit-Cost Analysis of Mid-Term Improvements

The cost and benefit calculations underlying this business case have been developed based on the plans described in the FAA's 2011 Mid-Term Concept of Operations and the NextGen Implementation Plan. Our modeling of the benefits and costs of NextGen relies on various inputs. For basic inputs, the U.S. relied on traffic data from fiscal year 2010, along with traffic and fleet forecasts released in early 2011. Recommended economic values, such as those for passenger value of time, etc., are from 2011. Based on these inputs, our analysis shows that NextGen mid-term improvements will generate $106 billion in benefits for the nation as a whole through 2030, compared to costs of $37 billion. The figure below illustrates the annual cash flows for these benefits and costs.



Estimated Benefits of NextGen Improvements

This business case focuses on the direct benefits to aircraft operators, passengers, and taxpayers from the rollout of NextGen improvements.

Types of benefits included in the business case are:

Reduced airline direct operating costs (ADOC)
Passenger value of time (PVT)
Reduced FAA operating costs

Additional flights enabled by greater capacity
Reduced flight cancellations
Increased safety
Environmental benefits from reduced aircraft emissions (CO_2 only).

The FAA's System Wide Analysis Capability (SWAC) is a fast-time simulation model that we used to estimate the potential benefits of NextGen improvements in the NAS. SWAC calculates delay and fuel burn savings along with the potential for an increase in accommodated flights achieved by the various NextGen mid-term improvements working together. At its core, SWAC is a discrete-event queuing model.

NAS resources that may be capacity constrained – such as sectors, arrival or departure fixes, or airports – are represented as "servers" in the queuing model. SWAC contains server representations for all en route sectors in CONUS airspace, 110 domestic airports, terminal airspace at the 35 busiest airports, and in-trail constraints for aircraft entering oceanic airspace. In order to represent the demand on those servers with any accuracy, each flight must be modeled at a very detailed level.

In its current iteration, SWAC models a subset of NextGen-enabled improvements to the operating environment. Nearly 85 percent of the cumulative benefits by value are modeled directly in SWAC. The remaining benefits are based on FAA studies.

The resulting benefit estimates are as follows:

- The benefit of avoided delay – estimated at $77 billion from 2011 through 2030 – is by far the largest component.
- The remainder of benefits, including safety improvements, FAA cost savings, more direct routings for flights, fewer cancellations, and reduced CO2 emissions, total $29 billion through 2030.

In constant 2011 dollars, the FAA's total investment in NextGen is projected to be $18 billion through 2030 to achieve mid-term improvements.

Investment by aircraft operators is also expected with NextGen implementation. This investment includes the purchase and installation of the avionics necessary to take advantage of NextGen's capabilities. The technologies which the U.S. considers are Automatic Dependent Surveillance – Broadcast (ADS-B) Out, ADS-B In, Data Communications, and RNP navigation. While most of these expenses will be borne directly by aircraft owners and operators rather than by the FAA, it is an important component of the overall investment of NextGen. Over time, the annual benefits of NextGen will increase as new capabilities are brought into service.

The United States can make more of the data used to calculate the NextGen cost/benefit analyses available to other interested States. The U.S. can also provide additional information, criteria, and step-by-step analyses used to determine these benefits.

The data cited above is from the 2012 Business Case for NextGen.

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