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## TWELFTH AIR NAVIGATION CONFERENCE

Montréal, 19 to 30 November 2012

### REPORT OF THE COMMITTEE TO THE CONFERENCE ON AGENDA ITEM 6

The attached report has been approved by the Committee for submission to the Plenary.

Captain John F. McCormick  
Committee Chairman

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**Agenda Item 6: Future direction****6.1 INTRODUCTION**

6.1.1 At the strategic level, the operational concept provides a vision and the Global Air Navigation Plan (GANP) provides a global framework for the implementation of air navigation systems. The regional planning and implementation process is the principal engine of ICAO's implementation work of air navigation systems. It was recognized that, it is here that the top-down approach comprising global guidance and regional harmonization measures converge with the bottom-up approach constituted by national planning by States. Additionally, the successful rollout of new concepts and technologies will depend on well synchronized strategies for education and training. It was widely agreed that human factors should also be addressed where there is or could be human interaction, as a user and/or as an information source. This is specifically the case with aeronautical information management (AIM), system-wide information management (SWIM), avionics and flight procedure design, or any automated function where the fall-back may be human operation.

6.1.2 The Committee noted that civil aviation was served by a number of standards-making bodies at the global, regional, and national and industry level, with the high-level standards produced by ICAO providing the basis for development of detailed State and industry technical standards. Consequently, it was agreed that in an increasingly multidisciplinary environment, it was important that ensuring the efficient development and delivery of relevant global standards in a coordinated and timely manner, would remain as a significant challenge.

**6.2 IMPLEMENTATION – REGIONAL APPROACH**

6.2.1 The Committee recalled that the development and maintenance of Regional Air Navigation Plans (ANPs) are undertaken by ICAO's six planning and implementation regional groups (PIRGs) in coordination with States. Despite a number of improvements introduced by ICAO over the years to the ANP's and the working arrangements of PIRG's, the Committee noted that a major challenge remained to keep the current paper-based regional ANPs up to date. To address this issue, the Committee was informed that an online format of the regional ANPs, referenced as the electronic regional air navigation plan (eANP), had been launched. The salient features of eANPs include a user-friendly, robust, web-based planning and editing tool, an updated version of the text and tables of ATS routes of Volume I, the Basic ANP and standardized tables of the FASID in Volume II that are aligned with the aviation system block upgrade (ASBU) methodology. In addition to eANPs, the Committee noted that ICAO has been developing a wide range of safety and air navigation tools with the regional air navigation planner in mind.

6.2.2 In the process of aligning the regional ANPs with the GANP, the Committee agreed that PIRGs should focus initially on implementing ASBU Block 0 Modules and finalize the development of their ASBU aligned regional plans by May 2014. To assist PIRGs in this task, ICAO was requested to develop guidance material for the regional/national deployment of new ATM technologies, procedures and operational approvals.

6.2.3 The need to develop a safety framework that would lay the foundation for success of ASBUs was recognized by the Committee. While stressing the importance of participation of regulatory and industry personnel in the planning and implementation of ASBUs, the Committee called on States

and PIRGs to develop action plans to address the identified impediments as part of their ASBU planning activities.

6.2.4 The Committee also recognized that there was a need to address the economic and institutional impediments to implementation of ASBUs and recognized the development of ATM modernization plans by a number of States and suggested that a mechanism be developed for sharing these best practices. As a means of interregional harmonization for ASBU implementation, the Committee agreed to use the various means available to address impediments, including the All Planning and Implementation Regional Group (ALLPIRG) meetings. In this regard, the Committee welcomed the proposal of ICAO to convene an ALLPIRG meeting in March 2013. In order to identify and resolve any roadblocks for ASBU implementation, the Committee encouraged States and PIRGs to use the air navigation report form (ANRF) which was developed to identify such issues.

6.2.5 On the basis of the discussions, the following recommendation was agreed to by the Committee:

**Recommendation 6/1 – Regional performance framework – planning methodologies and tools**

That States and PIRGs:

- a) finalize the alignment of regional air navigation plans with the Fourth Edition of the *Global Air Navigation Plan* by May 2014;
- b) focus on implementing aviation system block upgrade Block 0 Modules according to their operational needs, recognizing that these modules are ready for deployment;
- c) use the electronic regional air navigation plans as the primary tool to assist in the implementation of the agreed regional planning framework for air navigation services and facilities;
- d) involve regulatory and industry personnel during all stages of planning and implementation of aviation system block upgrade modules;
- e) develop action plans to address the identified impediments to air traffic management modernization as part of aviation system block upgrade planning and implementation activities;

That ICAO:

- f) considers how the continuous monitoring approach to safety oversight maps to the evaluation of Member States' safety oversight capabilities concerning aviation system block upgrades
- g) review the current amendment process to the Regional Air Navigation Plans (ANPs) and recommend improvements to increase efficiencies related to the approval and maintenance of the data in the regional ANPs;
- h) develop guidance material, on the basis of best practices employed worldwide, for the regional/local deployment of new ATM technologies, required procedures, operational

approvals and continue to support States in the implementation of the aviation system block upgrades;

- i) identify the issues, funding, training and resource requirements necessary to support a safety framework that would lay the foundation for successful implementation the aviation system block upgrades;
- j) develop, together with industry and stakeholders, an engagement strategy to address the economic and institutional impediments to implementation of the aviation system block upgrades;
- k) develop a mechanism for sharing of best practices for the aviation system block upgrade implementation; and
- l) define a methodology to ensure interregional and global harmonization of air navigation services through ANRF reporting in an effective and timely manner, and consider the employment of interregional and multi-regional fora.

### 6.3 IMPLEMENTATION – GENERAL

#### *Guidelines on Service Priority*

6.3.1 The Committee noted the principle of “First Come First Served” as currently recognized in the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) and in the *Global Air Traffic Management Operational Concept* (Doc 9854). It was also noted that there was a need for global operational performance incentives to obtain early benefits in those operational environments where not all stakeholders have reached the higher capabilities provided by new technologies and procedures, but for which a critical mass of higher capabilities is reached locally. The Committee considered that the incentives to equip for certain performance requirements had been implemented in some areas such as in performance-based navigation (PBN) areas and routes; and in reduced vertical separation minimum (RVSM) airspace. The Committee noted the industry stakeholders plan to present appropriate information to the Sixth Air Transport Conference (AT-Conf/6) in March 2013 on incentives for capability enhancement, with a view that these be considered and further developed by ICAO as required. On the basis of the discussions, the following recommendation was accepted by the Committee:

#### **Recommendation 6/2 – Guidelines on service priority**

That:

- a) ICAO develop an appropriate set of operational and economic incentive principles to allow early benefits of new technologies and procedures, as described in the aviation system block upgrade modules, to support operational improvements, while maximizing safety, capacity and overall system efficiency; and
- b) States and international organizations contribute to this work.

*Assessment of economic, financial and social implications of ATM modernization and ASBUs deployment*

6.3.2 With regard to economic assessment of ATM modernization the Committee considered that complex and systemized network-wide ATM modernization programmes required a network-wide assessment of the costs and benefits at the operational level. Although such assessments could be carried out nationally and/or regionally to take into account the associated costs and benefits of the operators as well as social impacts, they should aim to capture the costs and benefits across as many ATM network stakeholders as possible and be aligned to the deployment process to maximize the benefits that can be achieved through ATM modernization programmes. It was agreed that the impact of the deliverables of the ASBUs and their economic impact should be evaluated. The planned early implementation and the required financing to support it would be a key success factor.

6.3.3 Given that the financial aspects of the GANP was to be augmented pre-Assembly by the AT-Conf/6 in March 2013, the Committee stressed the importance of representation from the ATM community at AT-Conf/6. This in turn would facilitate development or revision of ICAO financial policy materials by which the ATM community could address the challenges. It was agreed that ICAO would undertake an analysis of the best possible working method to do so. The Committee noted that under Agenda Item 2.7 of AT-Conf/6, “Economics of airports and air navigation services”, AT-Conf/6 will address the outcome of the AN-Conf/12 with respect to the economic impact of aviation system block upgrades (ASBUs). Of particular concern will be issues relating to how current ICAO policies and guidance can be applied and how to best respond to ASBU financing challenges.

6.3.4 On the basis of the discussions, the following recommendation was accepted by the Committee:

**Recommendation 6/3 – Assessment of economic, financial and social implications of air traffic management modernization and aviation system block upgrades deployment**

That ICAO:

- a) undertake work toward developing a network-wide operational improvement level assessment for global use, which should include the development of standard values and processes for economic evaluations;
- b) take the relevant conclusions from the AN-Conf/12, regarding economic, financial and social aspects of the aviation system block upgrades, to the Sixth Air Transport Conference with the aim of developing solutions which would support a safe and sustainable air navigation system;

That States:

- c) conduct their economic, financial and social analyses in a closely coordinated manner with relevant ATM stakeholders in view of their diverse position of involvement in the implementation of aeronautical systems.

*Collaboration in the development of new solutions and technologies*

6.3.5 The Committee acknowledged that some ATM solutions and technologies may need to be further adapted to local and regional unique requirements and that such adaptation has to be done without

compromising interoperability. While the focus would be on meeting the unique requirements of specific States/regions, global interoperability should be ensured through collaborations between all relevant development programmes. The Committee recognized that each State/air navigation service provider and region would have its own unique requirements and targets for their respective ATM modernization programmes and agreed that further research and development would be required to realize the new concepts and capabilities as outlined in the aviation system block upgrade methodology, including adaptation to local and regional peculiarities. In this context, the Committee endorsed a cooperative approach, as one of the ways in developing and delivering future ATM solutions.

#### *Regulatory distinction between commercial and General Aviation*

6.3.6 The Committee was informed of a concern regarding the implementation of amendments to ICAO's Standards and Recommended Practices (SARPs). Frequently States did not distinguish SARPs directed at commercial aviation from those directed at general aviation. Similarly, it was pointed out that SARPs applicable to international operation might be unnecessarily applied to domestic operations. In this respect, the Committee emphasized that the methodology of application of ICAO SARPs was subject to sovereign decisions by States and that differentiated regulations had been introduced in a number of States.

## 6.4 HUMAN FACTORS

6.4.1 The Committee agreed that, human performance should be considered as an essential element in the systems approach, there was a need to take into account human capabilities and limitations to more effectively address safety priorities and when designing new technologies, systems and procedures. The benefits of new technologies, such as those proposed to support evolving air navigation systems, could only be realized when they are designed as a tool for humans to enhance their performance, including safety and efficiency outcomes. On the basis of the discussions, the following recommendation was accepted by the Committee:

### **Recommendation 6/4 – Human performance**

That ICAO:

- a) integrate human performance as an essential element for the implementation of ASBU modules for considerations in the planning and design phase of new systems and technologies, as well as at the implementation phase, as part of a safety management approach. This includes a strategy for change management and the clarification of the roles, responsibilities and accountabilities of the aviation professionals involved;
- b) develop guidance principles, guidance material and provisions, including SARPs as necessary, on ATM personnel, licensing and training including instructors and licensing, and on the use of synthetic training devices, with the view to promote harmonization, and consider leading this effort with the support of States and industry;
- c) develop guidance material on using field experience and scientific knowledge in human performance approaches through the identification of human-centred operational and regulatory processes to address both current safety priorities and the challenges of future systems and technologies;

- d) assess the impact of new technologies on competencies of existing aviation personnel, and prioritize and develop competency-based provisions for training and licensing to attain global harmonization;
- e) establish provisions for fatigue risk management for safety within air traffic services;
- f) develop guidance material on different categories of synthetic training devices and their respective usage;

That States:

- g) provide human performance data, information and examples of operational and regulatory developments to ICAO for the benefit of the global aviation community;
- h) support all ICAO activities in the human performance field through the contribution of human performance expertise and resources;
- i) adopt airspace procedures, aircraft systems, and space-based/ground-based systems that take into account human capabilities and limitations and that identify when human intervention is required to maintain optimum safety and efficiency; and
- j) investigate methods to encourage adequate numbers of high quality aviation professionals of the future and ensure training programmes are in line with the skills and knowledge necessary to undertake their roles within a changing industry.

## 6.5 GLOBAL NAVIGATION SATELLITE SYSTEM

### *GNSS implementation issues*

6.5.1 Under this item, the committee noted information on the implementation status of global navigation satellite system (GNSS) constellations and augmentations systems, and considered a number of related implementation issues.

### *Status of core GNSS constellations*

6.5.2 The Committee was informed that the United States is currently deploying modernized global positioning system (GPS) satellites with L1C/A and L5 signals and improved military encrypted signals that will enable civil and authorized State aircraft with modernized equipment to remove ionosphere induced errors and take advantage of increased performance and robustness.

6.5.3 The Committee was informed that the Russian GLObal navigation Satellite System (GLONASS) was operating with a stable constellation of twenty-four GLONASS-M satellites, with additional back-up satellites. In addition, the Russian Federation is continuing its work to develop a new generation of GLONASS-K satellites. In-orbit tests are currently being conducted on an experimental GLONASS-K satellite. The ground control system is also being improved.

6.5.4 The Committee noted that Galileo is a GNSS constellation that is being developed by the European Union in cooperation with the European Space Agency. The first four satellites have already been successfully launched, and it is expected that 18 satellites will be operational by 2015, enabling the



provision of initial services in combination with GPS and other constellations. It is planned that the Galileo constellation will be fully deployed by 2020.

6.5.5 The Committee also noted information on the BeiDou system, a GNSS constellation developed and operated by China. The deployment of the system is progressing as scheduled. The second phase of development has just been completed, supporting a position, navigation and timing (PNT) service for China and the surrounding areas. According to the schedule, full global deployment of the constellation will be completed by 2020.

6.5.6 The meeting also noted that GPS and GLONASS have been offered to the international community free of direct user fees, and recognized that GNSS is a global utility from which many useful applications can be derived and basic GNSS services should be offered without direct user fees.

#### *Satellite-based augmentation system (SBAS)*

6.5.7 The Committee was provided information on the implementation status of several satellite-based augmentation systems (SBAS). In particular, it was noted that the critical (Safety-of-Life) service of the European Geostationary Navigation Overlay Service (EGNOS) system was declared operational for aviation in 2011, and offered to ICAO for use by the civil aviation community. Furthermore, the committee noted the progress made in the deployment of the GPS Aided Geo Augmented navigation (GAGAN) system developed by India, with the completion of the final system acceptance test and the inception of the certification process.

#### *Multi-constellation/multi-frequency GNSS*

6.5.8 Noting the information on implementation status of new and enhanced constellation and augmentation systems, the committee acknowledged that GNSS is currently undergoing a significant evolution. As new constellations are deployed, and existing constellations are enhanced, signals from multiple constellations broadcasting in multiple frequency bands are becoming available. These developments lead to technical performance improvements, which create the potential for achieving significant operational benefits.

6.5.9 At the same time, it was noted that the introduction of multi-constellation, multi-frequency GNSS entailed a number of new technical and regulatory challenges beyond those already associated with current GNSS implementation.

6.5.10 With regard to regulatory challenges, the committee discussed the issues associated with mandating the use of specific GNSS elements. While in some cases mandates might expedite the fruition of the benefits deriving from the use of a specific system or technology, the meeting recognized that a performance-based approach is in principle preferable in the GNSS case.

6.5.11 The meeting acknowledged that some States may mandate equipage of aircraft with a specific GNSS constellation for various reasons not necessarily associated with navigation performance only. In such cases, the consensus of the meeting was that any State intending to introduce such mandates should limit them to aircraft operators for which it is the State of the operator.

6.5.12 The meeting's attention was also drawn to the additional difficulties that would arise if different mandates or prohibitions for specific GNSS elements were introduced in different States or regions. In particular, it was noted that such a situation could result in significant costs for users in terms of additional cockpit controls and procedures, crew training and maintenance support, and possibly raise

human factors concerns. In order to limit such consequences, content and timelines for the implementation of potential mandates would need to be coordinated at the regional and inter-regional level in order to reduce the implementation burden on airspace users.

6.5.13 The Committee concluded that the potential benefits of the on-going evolution of GNSS towards a multi-constellation, multi-frequency scenario could only be fully secured if ICAO, States and aircraft operators take action to overcome the associated challenges.

6.5.14 On the basis of the discussions, the following recommendation was accepted by the Committee:

**Recommendation 6/5 – ICAO work programme to support global navigation satellite system evolution**

That ICAO undertake a work programme to address:

- a) interoperability of existing and future global navigation satellite system constellations and augmentation systems, with particular regard to the technical and operational issues associated with the use of multiple constellations;
- b) identification of operational benefits to enable air navigation service providers and aircraft operators to quantify these benefits for their specific operational environment; and
- c) continued development of Standards and Recommended Practices and guidance material for existing and future global navigation satellite system elements and encouraging the development of industry standards for avionics.

6.5.15 On the basis of the discussions, the following recommendation was accepted by the Committee:

**Recommendation 6/6 – Use of multiple constellations**

That States, when defining their air navigation strategic plans and introducing new operations:

- a) take advantage of the improved robustness and availability made possible by the existence of multiple global navigation satellite system constellations and associated augmentation systems;
- b) publish information specifying the global navigation satellite system elements that are approved for use in their airspace;
- c) adopt a performance-based approach with regard to the use of global navigation satellite system (GNSS), and avoid prohibiting the use of GNSS elements that are compliant with applicable ICAO Standards and Recommended Practices;
- d) carefully consider and assess if mandates for equipage or use of any particular global navigation satellite system core constellation or augmentation system are necessary or appropriate;

That aircraft operators:

- e) consider equipage with GNSS receivers able to process more than one constellation in order to gain the benefits associated with the support of more demanding operations.

*Mitigating GNSS vulnerabilities*

6.5.16 The meeting noted that the very low strength of GNSS signals received from satellites makes GNSS vulnerable to interference and other effects that have the potential to affect multiple aircraft over a wide area. The sources of GNSS vulnerabilities include unintentional interference, intentional interference, effects of the ionosphere and solar activity (space weather) and others.

6.5.17 The meeting noted that intentional interference to GNSS fell into the category of the cyber security issues addressed by Recommendation 2/3 of the Conference and Annex 17 — *Security — Safeguarding International Civil Aviation against Acts of Unlawful Interference*, Chapter 4, 4.9.

6.5.18 The meeting then considered a number of measures that can be taken to reduce the likelihood of GNSS signal disruption due to the sources described above. For example, the introduction of new constellations and frequencies for GNSS will significantly reduce the probability of loss of service caused by unintentional interference, by virtue of the diversity of frequencies and increased number of satellites in view. The availability of dual GNSS frequencies will also help compensate for the ionosphere delay effect.

6.5.19 The meeting recognized that the primary means to reduce the likelihood of both intentional and unintentional interference is effective spectrum management. This involves the creation of a strong regulatory framework controlling the allocation and use of spectrum in such a way as to secure protection of GNSS frequencies. At the national level, this is the responsibility of the radio regulatory authorities in each State. At the international level, the International Telecommunication Union (ITU) provides such a framework through its Radio Regulations.

6.5.20 The meeting acknowledged that, even though the likelihood of GNSS signal disruption can be significantly reduced as discussed above, disruption cannot be completely ruled out, and therefore ANSPs must be prepared to deal with potential loss of GNSS signals. This requires the completion of a risk assessment that will determine the residual likelihood of service outages and the impact of an outage in specific airspace, and the application of realistic and effective mitigation strategies to ensure the safety and regularity of air services and to discourage those seeking to disrupt operations.

6.5.21 The meeting was also informed that several States have identified the need for an alternative position, navigation and timing (APNT) strategy, with the goal of maintaining air navigation services to the maximum extent possible in the event of a GNSS signal outage, by taking advantage of current systems, and defining a realistic evolution path.

6.5.22 On the basis of the discussions, the following recommendations were accepted by the Committee:

**Recommendation 6/7 – Assistance to States in mitigating global navigation satellite system vulnerabilities**

That ICAO:

- a) continue technical evaluation of known threats to the global navigation satellite system, including space weather issues, and make the information available to States;
- b) compile and publish more detailed guidance for States to use in the assessment of global navigation satellite system vulnerabilities;
- c) develop a formal mechanism with the International Telecommunication Union and other appropriate UN bodies to address specific cases of harmful interference to the global navigation satellite system reported by States to ICAO; and
- d) assess the need for, and feasibility of, an alternative position, navigation and timing system.

**Recommendation 6/8 – Planning for mitigation of global navigation satellite system vulnerabilities**

That States:

- a) assess the likelihood and effects of global navigation satellite system vulnerabilities in their airspace and apply, as necessary, recognized and available mitigation methods;
- b) provide effective spectrum management and protection of global navigation satellite system (GNSS) frequencies to reduce the likelihood of unintentional interference or degradation of GNSS performance;
- c) report to ICAO cases of harmful interference to global navigation satellite system that may have an impact on international civil aviation operations;
- d) develop and enforce a strong regulatory framework governing the use of global navigation satellite system repeaters, pseudolites, spoofers and jammers;
- e) allow for realization of the full advantages of on-board mitigation techniques, particularly inertial navigation systems; and
- f) where it is determined that terrestrial aids are needed as part of a mitigation strategy, give priority to retention of distance measuring equipment (DME) in support of inertial navigation system (INS)/DME or DME/DME area navigation, and of instrument landing system at selected runways.

6.5.23 Following the general discussion on GNSS vulnerabilities, the meeting considered a proposal specifically addressing the vulnerabilities associated with ionosphere and space weather aspects. The effectiveness and efficiency of a collaborative approach to address the mitigation of ionospheric vulnerabilities was recognized.

6.5.24 On the basis of the discussions, the following recommendation was accepted by the Committee:

**Recommendation 6/9 – Ionosphere and space weather information for future global navigation satellite system implementation**

That ICAO:

- a) coordinate regional and global activities on ionosphere characterization for global navigation satellite system implementation;
- b) continue its effort to address the global navigation satellite system (GNSS) vulnerability to space weather to assist States in GNSS implementation taking into account of long-term GNSS evolution as well as projected space weather phenomena; and
- c) study the optimum use of space weather information that is globally applicable from low to high magnetic latitude regions for enhanced global navigation satellite system performance at a global context.

That States:

- d) consider a collaborative approach to resolve ionospheric issues including ionospheric characterization for cost-effective, harmonized and regionally suitable global navigation satellite system implementation.

6.5.25 The meeting was informed that currently a significant effort is expended to update aeronautical information with changing magnetic variation (MAGVAR). Modern avionics carry out navigation calculations with reference to true north, and then convert the information for pilot displays to Magnetic (by applying a magnetic variation based on a magnetic model), or True heading or true Track, depending on aircraft capability. It was suggested that having all operations referenced to true north would enhance the overall safety floor and save considerable effort in maintaining MAGVAR tables. The meeting noted the information and concluded that any States interested in the matter could conduct further studies of the technical and operational impact of the proposal, and of the expected costs and benefits to all aviation stakeholders.

## 6.6 NAVAIDS

6.6.1 The Committee discussed the opportunities for the rationalization of terrestrial navigation aids arising with the implementation of performance-based navigation enabled by GNSS capability in the aircraft. It considered an approach that aimed at maximizing the greatest economic benefits of rationalization, namely those that come from avoiding the replacement of navigation aids at the end of their lifecycle. The approach was based on an analysis aimed at identifying rationalization opportunities, evaluating the necessary route changes and determining whether a limited PBN implementation on the affected routes would be more cost effective than the replacement of the aids.

6.6.2 The committee noted that one constraint on the rationalization process is that a minimum network of terrestrial aids should be maintained to cope with temporary loss of GNSS service. In general, the fundamental requirement to be met by such a network is to fully maintain safety following the loss of GNSS service, and maintain an acceptable level of efficiency and continuity to the extent possible.

6.6.3 On the basis of the discussions, the following recommendation was accepted by the Committee:

**Recommendation 6/10 –Rationalization of terrestrial navigation aids**

That, in planning for the implementation of performance-based navigation, States should:

- a) assess the opportunity for realizing economic benefits by reducing the number of navigation aids through the implementation of performance-based navigation;
- b) ensure that an adequate terrestrial navigation and air traffic management infrastructure remains available to mitigate the potential loss of global navigation satellite system service in their airspace; and
- c) align performance-based navigation implementation plans with navigation aid replacement cycles, where feasible, to maximize cost savings by avoiding unnecessary infrastructure investment.

**6.7 REGIONAL PERFORMANCE FRAMEWORK – ALIGNMENT OF AIR NAVIGATION PLANS AND REGIONAL SUPPLEMENTARY PROCEDURES**

6.7.1 The Committee considered positively and welcomed a proposal to align the areas of applicability of the air navigation plans (ANPs) and the regional supplementary procedures (SUPPs) and the associated benefits to States, to PIRGs and to the ICAO Secretariat, in particular in support of the ASBU methodology. The Committee also noted that proposals for amendments of the appropriate documentation (ANPs and SUPPs) would be developed by ICAO Secretariat and circulated to States and international organizations in accordance with existing procedures, and comments by States and international organizations would be taken into account by the Council of ICAO when deciding on the amendments.

6.7.2 On the basis of the discussions, the following recommendation was accepted by the Committee:

**Recommendation 6/11 – Regional performance framework – alignment of air navigation plans and regional supplementary procedures**

That ICAO initiate a formal amendment process in accordance with normal procedures to align the areas of applicability of the air navigation plans and the regional supplementary procedures, observing the following principles:

- a) there will be no change to the current accreditation of the ICAO regional offices to Contracting States;
- b) there will be no change to the obligation of individual States to provide services in accordance with ICAO Annex 11 — *Air Traffic Services*, 2.1;
- c) there will be no change to the governance responsibilities of the ICAO Council, including approval of amendments to air navigation plans and regional supplementary procedures;

- d) there will be no change to the current requirements for services and facilities and or to the current supplementary procedures for a given airspace as listed in current air navigation plans and regional supplementary procedures;
- e) there will be no change to the principle that a planning and implementation regional group is composed of the Contracting States providing air navigation service in the air navigation region and that other Contracting States can participate in the activities with observer status;
- f) there will be no change to ICAO's assistance to planning and implementation regional groups from the regional offices;
- g) the responsibilities of the performance framework management for an air navigation region will now be integrated and will rest with the planning and implementation regional group established for the region; and
- h) to the extent possible, the main traffic flows will be accommodated within homogeneous airspaces in order to minimize changes between different air navigation systems and different operational procedures during flight.

## **6.8 PRIORITIZATION AND CATEGORIZATION OF AVIATION SYSTEM BLOCK UPGRADE MODULES**

6.8.1 The Committee acknowledged that the GANP was a high level strategic planning document that contained a rolling plan for the next fifteen years of aviation systems improvements in the form of modules within the block upgrades. Although the GANP has a global perspective, nonetheless, the Committee recognized that not all modules contained in ASBUs were intended for universal implementation. In fact, some of the block upgrade modules contained in the GANP are specialized packages that may be applied where specific operational requirements or corresponding benefits exist. In this regard, the Committee expressed the need to clarify how each Block Upgrade module would fit into the national, regional and global framework. Consequently, the Committee debated different proposals put forwarded in the Conference for a module categorization system with the objective of ranking each module in terms of implementation priority. At the same time, as Block 0 modules in many cases provide the foundation for future development, the Committee concurred that all Block 0 modules should be considered for early implementation by States in accordance with their operational needs. Since, the Committee could not come to a consensus, it was decided that ICAO should continue to work on categorization of ASBU modules for implementation priority and provide guidance as necessary to PIRGs and States.

6.8.2 With reference to the module numbering system (B0-65, etc.) the Committee noted that for now ICAO has retained what was employed during the block upgrade systems engineering development phase in order to demonstrate continuity from inception to final drafts. Nevertheless, the Committee noted that ICAO has plans to simplify this numbering system in future versions. This new approach called for a more user and database friendly numbering system of the block year of readiness (0, 1, 2 or 3) and a 3-4 letter identifier replacing the existing tracking number, in conjunction with a short title for each module. On this basis, the Committee examined the ICAO approach to a simplified module numbering/naming system using an intuitive approach and agreed for ICAO to continue its work on this subject. In terms of categorization of modules in Blocks 2 and 3, the Committee concurred that this task will need to be re-examined by ICAO at a future date based on the experience gained thus far.

6.8.3 The Committee reiterated that safety is the highest priority in the approach to implementation of ASBU modules and this aspect has been adequately captured in the principles of the GANP.

6.8.4 The Committee was advised that the prioritization exercise to be taken by ICAO, regions and States needs to be carried out taking into account the existing or potential divergence challenges including ADS-B surveillance system and datalink communication system and agreed that a comprehensive study would be needed for this issue from the standpoint of air navigation priority setting.

6.8.5 On the basis of the discussions, the following recommendation was accepted by the Committee:

**Recommendation 6/12 – Prioritization and categorization of block upgrade modules**

That States and PIRGs:

- a) continue to take a coordinated approach among air traffic management stakeholders to encourage effective investment into airborne equipment and ground facilities;
- b) take a considerate approach when mandating avionics equipage in its own jurisdiction of air navigation service provision, taking into account of burdens on operators including foreign registry and the need for consequential regional/global harmonization;

That ICAO:

- c) continue to work on guidance material for the categorization of block upgrade modules for implementation priority and provide guidance as necessary to planning and implementation regional groups and States;
- d) modify the block upgrade module naming and numbering system using, as a basis, the intuitive samples agreed by the Conference; and
- e) identify modules in Block 1 considered to be essential for implementation at a global level in terms of the minimum path to global interoperability and safety with due regard to regional diversity for further consideration by States.

## 6.9 SAFETY MANAGEMENT SYSTEM

6.9.1 The Committee recognized the importance of safety management and having SARPs which support performance-based provisions and should help create systems that ensure safety by using the critical elements in regulations whilst at the same time allowing the necessary flexibility to accept new developments in technology. Furthermore the committee noted a proposal that ICAO ensure that the State safety programme (SSP) and the States' safety oversight capability requirements are integrated in the new Safety Management annex and that ICAO auditing activities reflect that integration. In this regard, the committee was informed that the first edition of the new Safety Management annex had undergone a preliminary review within ICAO and it was basically a compilation of the safety management system (SMS) and SSP provisions from all the other annexes. Additionally the committee noted that the Safety



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Management Panel had been tasked by ICAO to further develop provisions including requirements for a State's safety oversight system in support of the SSP.

6.9.2 The Committee recognized that in order to develop a cohesive system that is more effective and minimizes duplication, an integrated approach to safety oversight and safety management decision-making was essential.

6.9.3 Without specific recommendations, the Committee proposed that ICAO take into account the following:

- a) ensure that State safety programme and the States' safety oversight capabilities are integrated in the new Safety Management annex and that ICAO auditing activities reflect this integration;
- b) promote the highest common standard of safety are applied in civil aviation worldwide;
- c) promote a risk based approach;
- d) promote the concept of total system approach in particular for safety and safety regulation;
- e) promote safety objectives in rulemaking;
- f) encourage:
  - 1) the use of industry standards and coordination between standardization bodies through ICAO; and
  - 2) an open dialogue with Stakeholders in particular the use of open and transparent processes for safety rulemaking;
- g) promote the development of:
  - 1) State safety programmes together with their enablers, occurrence reporting and analysis, just culture, and incorporation of human factors principles; and
  - 2) safety management system.

## 6.10 STANDARDS AND RECOMMENDED PRACTICES

6.10.1 The Committee recognized that ICAO provisions (Standards and Recommended Practices (SARPs) and Procedures for Air Navigation Services (PANS)), as well as guidance material, would continue to make a significant contribution in enhancing global aviation safety, interoperability, harmonization and efficiency. Furthermore, after analyzing States' mature modernization plans and ICAOs ASBUs, the Committee acknowledged the need to develop new ICAO provisions, revise existing ICAO provisions and remove obsolete ICAO provisions. In recognizing that current working practices to update ICAO provisions and guidance material may not meet the needs of the evolving aviation system in an efficient and timely manner, the Committee agreed that ICAO should review its approach to the development and maintenance of ICAO provisions. While a restructuring of experts groups was

discussed, in terms of achieving required outcomes to meet the needs of the evolving aviation system, the Committee noted that this was part of an on-going process, using established procedures. It was recognized that the ultimate goal was to make more effective use of experts and reduce the financial burden on States and the resource requirements of ICAO. Furthermore, while there was support in the Committee for a greater focus on “core” SARPs Assembly Resolution A37-15 was recalled as a basis for the development of broad, mature and stable provisions. Nevertheless, the Committee agreed that a review of A37-15 could prove necessary.

6.10.2 The Committee acknowledged the important contribution of State experts, regulators, other standards-making organizations, air navigation service providers and industry in the development and implementation of ICAO provisions. All of these stakeholders were considered critical to the success of the related phases of development and implementation of ICAO provisions and guidance material. It was agreed that the knowledge and experience within the expert groups remained a vital link in ICAO’s ability to continue to deliver global implementation standards. Further to this, the Committee reaffirmed its support for the transparent and longstanding process used in ICAO by its governing bodies for the development, processing, approval and/or adoption of ICAO provisions.

6.10.3 Additionally, the Committee agreed that ICAO should address the necessary planning work to develop ICAO provisions needed to implement the ASBUs and the need for ICAO to support performance-based standards. An example of one area where this kind of management could be applied included defining the principles and requirements for integrating meteorological data into the automated ATM process.

6.10.4 The importance of reporting processes, coordination amongst ICAO expert groups, geographical representation and the need to liaise with standards-making bodies to make best use of resources and prevent potential duplication or gaps were highlighted, and it was agreed that to make better use of industry standards, the establishment of an ICAO body that would support the coordination and development of global and technical standards amongst standards development organizations would be advantageous. It was also agreed that there was also a need to relate the work of the PIRGs to the on-going work of expert groups and that ICAO should communicate with States, well in advance, the consequences of future SARPs and their impact, early in the process. The Committee agreed that the review by ICAO of the verification and validation process of material developed by other standards-making organizations, before they are referenced in ICAO documents, should be part of this overall initiative, acknowledging that a consequential review of Assembly Resolution A37-15, which addresses this issue, should also be reviewed.

6.10.5 As a result of the discussions, the following recommendation was agreed by the Committee:

**Recommendation 6/13 – Development of Standards and Recommended Practices, procedures and guidance material**

That ICAO:

- a) improve its project management and coordination of contributing ICAO panels, study groups and other expert groups, including task forces and other specialized teams tasked with the development of ICAO provisions and related work, through:
  - 1) consistent application of the *Directives for Panels of the Air Navigation Commission* (Doc 7984);

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- 2) receiving regular reports from the expert groups against agreed terms of reference and work programmes;
  - 3) mandating strong coordination between all expert groups developing ICAO provisions to ensure efficient management of issues and avoidance of duplication;
  - 4) application of the principles of accountability, geographical representation, focus, efficiency, consistency, transparency and integrated planning to the operation of all the expert groups;
  - 5) developing documented procedures for other expert groups, including task forces and other specialized teams as well; and
  - 6) better use of today's communication media and internet to facilitate virtual meetings, thereby increasing participation and reducing costs to States and ICAO;
- b) establish and lead a suitable coordination with the other standards-making organizations in order to make the best use of the capabilities of these other standards-making organizations and to make reference to their material, where appropriate;
  - c) request ICAO to initiate studies to improve the verification and validation process required within ICAO before material developed by recognized standards-making organizations can be referenced in ICAO documentation; and
  - d) consider a methodology by which ICAO can capture the regional implementation and challenges, and to reflect them in a standardized process to effectively support the aviation system block upgrade deployment.

6.10.6 The Committee noted that with airports becoming the hub of economic activity, special attention should be given to the need for comprehensive guidelines for States in the uniform application in conducting aeronautical studies to assess the permissible penetration of obstacle limitation surfaces (OLS). Significant construction was occurring at these airports and no uniform guidelines were available with respect to the extent of the penetration and the density of obstacles, etc.

6.10.7 As a result of the discussions, the following recommendation was accepted by the Committee:

**Recommendation 6/14 – Guidelines for conducting aeronautical studies to assess permissible penetration of obstacle limitation surfaces**

That ICAO develop comprehensive guidelines for States in the uniform application in conducting aeronautical studies to assess the permissible penetration of obstacle limitation surfaces (OLS).