International Civil Aviation Organization

AN-Conf/12-WP/61
3/10/12

WORKING PAPER

TWELFTH AIR NAVIGATION CONFERENCE

Montréal, 19 to 30 November 2012

Agenda Item 6: Future direction
6.2: Standardization – approach to SARPs development in support of One Sky

REGULATION AND STANDARDIZATION IN SUPPORT OF THE EUROPEAN ATM MASTER PLAN

(Presented by the Presidency of the European Union on behalf of the European Union and its Member States[1]; by the other Member States of the European Civil Aviation Conference[2]; and by the Member States of EUROCONTROL)

SUMMARY

This paper addresses the planning of the work to develop the ICAO provisions needed to implement the aviation system block upgrades (ASBUs). The ASBU implementation will require that the international standards are validated and in place by the time they are needed.

It is also proposed that ICAO works with performance-based standards. These standards can be further specified by referring to material developed by other organizations. ICAO could also liaise with standards-making bodies, like those from industry, to ensure integrated planning, best use of resources and prevent potential duplication or gaps.

The paper also makes proposals to foster the development of international standards.

Action: The Conference is invited to agree to the recommendation in paragraph 6

1. INTRODUCTION

1.1 The States and Organizations presenting this paper support the aviation system block upgrade (ASBU) approach of ICAO. Input has been given based on the SESAR programme, the aviation research programme of the Single European Sky (SES). The European Master Plan is their agreed roadmap connecting research and development (R&D) with industrialization and deployment scenarios to achieve performance objectives. It also includes regulatory and standardization roadmaps and identifies the essential changes to meet the performance needs in the framework of the SES political targets and objectives. New developments have an impact on both air and ground and should be based on a total systems approach. Regulation and standardization (including for safety) are essential elements of these developments. Based on this experience further input can be given to ICAO.

[1] Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom. All these 27 States are also Members of ECAC.

[2] Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Croatia, Georgia, Iceland, Moldova, Monaco, Montenegro, Norway, San Marino, Serbia, Switzerland, The former Yugoslav Republic of Macedonia, Turkey and Ukraine.

1.2 In the SES environment a distinction is made between *Regulation* (law making) and *Standardization* (technical specifications). *Regulation* is established, where needed, to make some standard characteristics of the ATM system mandatory, and achieve faster the benefits of a standardized and/or synchronized deployment of new concepts. Regulation can be national, but the EU mechanisms allow it to be applicable in all States participating in the SES at once. This may require amendments to the annexes (SARPs), applied uniformly and with formal legal commitment to apply them effectively. This paper focuses more on *Standardization*, which ICAO embeds in standards and other provisions, either providing the full material or referring to standards produced by other bodies.

2. MAJOR STANDARDIZATION AND REGULATION AREAS WITH RELEVANCE FOR THE WORK OF ICAO

2.1 The European ATM Master Plan (see AN-Conf/12-WP/36) prioritizes the operational changes identified to support the modernization of the ATM systems and identifies the areas for regulation and standardization. They have been identified to meet performance needs by providing significant performance benefits and/or an essential change towards implementation of the target concept – although further work is required to validate the requirements – and include[3]:

1. moving from airspace to 4D trajectory management:
   a) trajectory management and business/mission trajectory;
   b) system interoperability with A/G data sharing; and
   c) free routing;
2. traffic synchronization:
   a) I4D+CTA; and
   b) integrated AMAN, DMAN & extended AMAN horizon;
3. network collaborative management and dynamic/capacity balancing:
   a) network operation planning;
4. SWIM:
   a) initial SWIM services;
5. airport integration and throughput:
   a) surface management integrated with arrival and departure; and
   b) airport safety nets;
6. conflict management and automation:
   a) enhanced decision-support tool and performance-based navigation; and
   b) conflict detection and resolution.

2.2 The *regulatory* roadmap of the European ATM Master Plan identifies the following candidates for potential regulation as *institutional enablers* in the SES area[4]:

1. Revision of the existing regulation on data link services, to ensure a synchronized and harmonized application of air-ground data link messaging to support i4D (CPDLC & ADS-C). A technology-independent regulatory approach would be maintained.
2. Establishment of provisions defining the rules, roles and responsibilities for each of the Stakeholders involved in the SWIM process, also called the SWIM framework. The intended scope of such a SWIM Framework regulation would be the governance aspects, not the data models which will have to be agreed at ICAO, or infrastructure aspects.
3. Performance-based navigation (PBN): The EC has issued a mandate for regulation of PBN to EUROCONTROL which is presently executing the required work in close coordination with EASA. The rules will addresses ICAO Resolution A37-11, define minimum navigation performance

[3] The European ATM Master Plan, figure 11: "Mapping of essential Operational Changes to SESAR key features" – STEP1 essentials
[4] The European ATM Master Plan, chapter 4.4.2: "The regulatory roadmap"

requirements based on the ICAO PBN Manual and introduce a new package of functionalities in en-route and terminal airspace, and also in final approach. Different scenarios are currently being developed. Formal consultation on the regulatory approach is in process.

2.3 Potential areas to be investigated for standardization supporting the *operational changes* in Europe based on the European ATM Master Plan are the following, noting that several of these issues can be realised by reviewing existing Standards in Europe[5]:

1. initial 4D trajectory operations (i4D) + controlled time of arrival (i4D + CTA);
2. data communication in the 4D trajectory and SWIM context;
3. 4D trajectory flight plan;
4. SWIM;
5. network operations plan/AOC-UDPP (Airline Operation Centre-User-Driven Prioritization Process)/AOP (Airport Operations Plan);
6. aircraft certification;
7. trajectory management and exchanges (trajectory data exchange models; air/air and air/ground data communications services and enablers; ground/ground data exchange models;
8. traffic synchronization (Status of extended AMAN/DMAN);
9. integrated airport management;
10. enhanced decision support; and
11. conflict management and automation (Synchronized deployment).

2.4 Other elements mentioned in the European ATM Master Plan are:

1. new communication systems;
2. new navigation system based on satellite;
3. new surveillance system;
4. safety nets; and
5. wake turbulence separation.

2.5 In relation to global interoperability, ICAO Standards are required covering the same subjects, in order for EU regulation to make reference to them. This should already be described in precise terms for Block 1, whereas Blocks 2 and 3 planning should be prepared now, but at a higher level of description.

2.6 EU regulation, and the need for ICAO Standards, needs to include safety. Prescriptive safety regulations could prevent the implementation of new technical concepts. The proposed regulatory approach could be called performance-based regulation. The binding elements included in a rule should be the following:

1. identification of the entities subject to the rule (who must comply);
2. the critical elements for safety. For example, this could describe the function to be carried on board of an aircraft. (what must be complied with); and
3. the applicability dates (when does the rule enter into force).

2.6.1 This model could work at national, regional and global (ICAO) level. Appropriate procedures would need to be developed addressing in particular:

1. definition of a hierarchy of texts;
2. definition of the authority adopting the text;
3. open and transparent consultation processes; and
4. definition of appropriate regulatory and standardization roadmaps.

[5] The European ATM Master Plan, chapter 4.4.1: "The standardisation roadmap", tables 8 and 9

2.6.2 The idea is to create a system that ensures safety by mandating the critical elements in a rule (and in an ICAO Standard) and at the same time allow for the necessary flexibility to accept new technologies. Also interoperability is ensured by the existence of the standards.

3. THE "INFORMATION MANAGEMENT" OF ICAO PROVISIONS AND STANDARDS

3.1 While there is already a notion of hierarchy among the different ICAO provisions and with respect to industrial specifications, it would be useful to use this capability to the full extent where applicable when considering new provisions or reviewing existing provisions in support of the revised GANP. High level standards, defining the key elements – preferably performance based rather than a prescription of a specific technology – being supported by more detailed material, in the order: reference material, but "legally" speaking part of the Standards; and guidance material.

3.2 Reference material can be:

a) developed by ICAO itself; which is then responsible for its development and updates;

b) copied from material from other organizations and endorsed by ICAO, with ICAO then becoming fully responsible for this information; and

c) mentioned in an ICAO provision, but referring to in material developed by other organizations or industry bodies. Then it is legally part of the ICAO standard, and it will then have a strong global position but it saves ICAO the resources for developing and updating this detailed material by itself. This could raise some issue for change of management, taking in account the aviation requirement (see 3.4 below).

3.3 These three options of developing reference material can be applied according to the specific needs and opportunities to make use of material from others. In Europe option c) is intended to be applied wherever possible for SESAR, using international and European standards which may take into account material produced by Eurocae and RTCA. Also in the safety regulation standards from other standardization bodies can be recognized.

3.4 If ICAO would apply option c), it would need to adapt its arrangements:

1. to check quality and applicability at global level, without duplicating the work;
2. for updates of the reference material when needed by ICAO or when proposed by the body that had developed this material; and
3. to formalize the process, since the Air Navigation Commission has to endorse the ICAO Standards and the reference to supporting material.

3.5 Much information is available from other sources, such as legal material from States or State organizations, as well as reference material from public organizations, recognized regional and international standardization bodies and standard making bodies of industry. Programmes like SESAR, NextGen and others have to specify their own needs, and to establish their reference material. Good cooperation with these programmes would assist ICAO in working in accordance with the last option.

3.6 These improvements in the clarification of the standards landscape would benefit from parallel efforts in terms of more accurate planning and enhanced production of the standard material. This paper however does not advocate that all technical specifications from standardization bodies need to be included in ICAO Standards (this is not the case in Europe), but only when needed to ensure interoperability.

4. KEY ASPECTS OF PLANNING OF ICAO STANDARDS

4.1 Several aspects in the planning of standard material have to be strengthened to make the process more efficient:

1. Full traceability to the GANP and its roadmaps. It will be helpful if this is also supported by an architecture to map the new developments, their relations and their logical order/grouping;
2. Type and hierarchy of ICAO provisions, as discussed in the previous paragraph;
3. Timeframe: the ASBU module descriptions and the roadmaps in the GANP should be used to identify and plan the work on ICAO provisions;
4. Governance structure of the planning and regular maintenance and updates, for instance as suggested by ICAO in the GANP and linked to:
   - A clear status of the GANP: its endorsement by this Conference is an essential milestone. Its update, including ASBU and roadmaps, must be based on a clear, transparent process, identifying who is responsible and how other parties will be involved The status of additional paper and/or electronic documents must be defined as well.
   - An update mechanism (in line with that of the GANP itself reviews and refinements for middle and longer term needs) based on:
     i. triennial Assembly cycle, linked to priorities and resources; and
     ii. annual work programme of the ICAO Council and the Air Navigation Commission, detailing the global planning and adjusting to actual progress;
   - Validation and approval of ICAO provisions, also when referring to material from other organizations; this has to be transparent and documented; and
5. The actors and partners needed not only to prepare the plan but also to achieve its execution.

5. KEY ASPECTS OF STANDARDS PRODUCTION

5.1 The production of standard material requires a particular attention, especially as ICAO has to rely on contributions from member States and industry. The revised GANP and the ASBU give a greater performance-oriented and top-down orientation; the greater integration of the air and ground functions implies more interdependencies between the system elements than in the past. It is therefore essential that the development or amendment of standard material is not considered as a set of isolated activities, but is seen as a consistent system engineering and a multi-disciplinary, cross-organization collaboration. This points to reinforcing the following:

1. coordination role of ICAO, including for material not developed by itself;
2. clear principles and procedures for balanced and transparent working arrangements;
3. management of cross-coordination between activities in a Project Management oriented approach; with a form of system engineering function to create synergies across expertise areas and contributing entities and make best use of resources available;
4. accurate Terms of Reference for activities and deliverables; and
5. responsibility for monitoring the development and dialogue with other organizations: organization of timely involvement of relevant parties, to achieve global interoperability.

5.2 ICAO is responsible for its internal production processes and procedures, but if ICAO works more with material from others, it must be clear who will be involved, where and for what. There is a need to identify:

1. What kind of actors have to be involved: States, regional organizations, 'stakeholders', industry.
2. A structure in which these actors can deliver their contributions.

5.3 The process should ensure that:

1. the work directly supports the GANP and the needs of the different regional, State and industrial modernization programmes and can benefit from suitable expertise across the world;
2. the organizations responsible for these programmes and industry, which have a direct interest in the further development and implementation of the modules of the ASBUs, have access to and can review the produced material to ensure it fits their needs; their regular involvement is necessary after the 12th Air Navigation Conference to better align the work of these programmes with the work of ICAO and vice versa; and
3. the PIRGS can play planning and implementation support role to the ICAO regional plans and help ensure there is a balance between the global work and that done at States/regional level.

5.4 The above considerations should have an impact on the nature and/or composition of the formalized working arrangements put in place within ICAO. While the notion of expert panel or study groups is not challenged, it would be appropriate to envisage the possibility of arrangements in order to consult and coordinate with existing air navigation programmes (like SESAR, NextGen, CARATS…) in order to benefit from their experience and support the Air Navigation formations (Air Navigation Commission, Bureau). These arrangements should involve other standardization stakeholders such as EUROCAE and RTCA to harmonize roadmaps and strategies and to address specific issues. Some feedback from these programs in the form of regular coordination meetings or even symposium on GANP implementation might be an option. In any case, the respective responsibilities should be clear and the set-up should maximize the added value and ensure the transparency of ICAO standardization process for all its member States. The formal decision process about the provisions and the work of ICAO remains the responsibility of the ICAO Commission and Council.

6. RECOMMENDATIONS

6.1 ICAO is invited to:

a) develop an ICAO roadmap of the required SARPs provisions to implement the GANP in accordance with the need of States and regions, as well as a mechanism for its updating;

b) ensure that the elements mentioned in paragraph 2 are considered for inclusion in the list of topics to be covered by the roadmap;

c) ensure that ICAO and international standards of other bodies are in place by the time they are needed;

d) structure the standards and other provisions, so as to make the best use of the capabilities of other standardization organizations where appropriate and to make reference to their relevant material;

e) establish and lead a suitable coordination with the other standardization organizations in order to improve the overall efficiency of the production of the international aviation standards required in support of the GANP; and

f) develop the working arrangements for the further work on the ICAO provisions needed to implement the GANP and for the overall supervision of the system-wide issues.

— END —