



WORKING PAPER

TWELFTH AIR NAVIGATION CONFERENCE

Montréal, 19 to 30 November 2012

Agenda Item 1: Strategic issues that address the challenge of integration, interoperability and harmonization of systems in support of the concept of “One Sky” for international civil aviation

1.1: Global Air Navigation Plan (GANP) – framework for global planning
c) Navigation roadmap

NAVIGATION ROADMAP

(Presented by Canada)

SUMMARY

This paper presents a summary of the navigation plans published in Canada’s Air Navigation Services provider’s (NAV CANADA) Air Navigation System Plan entitled *Charting the Future*, dated April 2012. It demonstrates the relationship between NAV CANADA system planning, the ICAO Global Air Navigation Plan (GANP) and the implementation of Aviation System Block Upgrades (ASBUs). The Air Navigation System Plan is a collaborative and ‘living’ document, with updates occurring every three years. Consequently, input from the aviation community is a key to ensuring the plan is aligned with day-to-day business realities and the technology and service delivery plans of its system users and stakeholders.

Action: The Conference is invited to agree to the recommendation in paragraph 6.2.

1. INTRODUCTION

1.1 NAV CANADA is the private sector, non-share capital corporation that owns and operates Canada’s civil air navigation system. Transport Canada is Canada’s regulator for the civil air navigation system. NAV CANADA coordinates the safe and efficient movement of aircraft in Canadian domestic airspace and in international airspace assigned to Canadian control. Through its operations, NAV CANADA delivers air traffic control, flight information, weather briefings, aeronautical information, airport advisory services and electronic aids to navigation

1.2 In the interest of ensuring the safety and efficiency of operations, Canada’s Air Navigation Services provider (NAV CANADA) collaborates on an ongoing basis with its system users and stakeholders in the development and implementation of air navigation services. In addition to focused customer consultation associated with major airspace changes, frequent structured consultation meetings are conducted on a regional and national basis.

¹English and French translation provided by Canada.

2. BACKGROUND

2.1 NAV CANADA has been progressive in their adoption and implementation of area navigation (RNAV). As an example, in the early 1990's RNAV Standard Arrival Routes (STARs) were implemented at Canada's busiest airport with no associated conventional STARs for the Toronto Lester B. Pearson International Airport.

2.2 Navigation changes by NAV CANADA are aligned with performance-based navigation (PBN) development. The PBN consultation process with its system users commenced shortly after the publication of the PBN Manual in 2008, resulting in the publication of a collaborative NAV CANADA PBN Concept of Operations document in 2009. The main aims of the document were to:

- a) enable a total performance-based area navigation environment with defined Navigation Specification designator values for all operations conforming to ICAO specifications;
- b) facilitate the implementation of customer preferred routes to the maximum extent possible;
- c) support continued operations of aircraft with lower capabilities as long as operationally practical;
- d) provide a return on investment for system users having equipped with advanced functionality avionics;
- e) provide positioning and navigation data at the required performance levels to support the various applications in the ATM/CNS environment; and
- f) use a space-based infrastructure that will allow the rationalization of the ground-based infrastructure for all phases of flight, thereby ensuring the transition to GNSS in line with ICAO recommendations.

2.3 Implementation of PBN in Canada is seen as an incremental series of qualification upgrades to aircraft, operator training, and ATM. The timing for the provision of upgrades by NAV CANADA and their adoption for use by system users is one of the greatest implementation complexities. There is no planned "big bang" implementation planned for PBN. This means that there will be system users who choose to be early adopters and those who choose to delay the adoption of new technology or procedures. Moving forward, NAV CANADA will endeavour to accommodate those system users who lag in capabilities; however, in respect of the overall system efficiency and capacity they may not fully realize efficiencies provided by the new technologies.

2.4 Critical to the implementation process is ensuring that all of the component system parts are in place; navigation and regulatory infrastructure, airspace design, procedure design, air traffic control readiness, aircraft equipment and aircrew certification. Since the various components that have to come together are not under the same line authority to manage their completion, it is essential that there is a common vested interest amongst all the parties to support implementation.

3. IMPLEMENTATION PROCESS - BUSINESS CASE ANALYSIS

3.1 It is well recognized that commercial aviation operates on narrow profit margins that are susceptible to minor fluctuations in operating costs elements. As a responsible commercial air navigation service provider, NAV CANADA is always looking to control its costs associated with air traffic service provision,

which are passed on to its system users through user fees. Therefore, the use of a business case analysis (BCA) for changes to the ANS is a critical, but not the only, component in the decision making process.

3.2 The BCA is a collaborative effort between the ANSP and the customer, combining the results from each simulation. It must reflect real costs and benefits, recognize the importance of timed investment in the ANS by customer and service provider and address all of the assumptions associated with the ability to extract benefit from a new or revised air navigation service. When the BCA assumptions are agreed by all parties and a common set of performance figures are used, a very compelling direction can be defined resulting in the cornerstone of the investment decision process.

3.3 NAV CANADA has recently completed a first draft of a BCA examining the benefits to be derived from including radius-to-fix (RF) path terminators into terminal and approach operations across Canada. Cooperative efforts with three system users supplying simulator and flight crew time were highly beneficial to supplement the operational data already available to NAV CANADA as well as to examine aircraft/ATC scenarios. Benefits were assessed for 300 runway ends at 120 airports against a variety of base case scenarios dependent on the location, terrain and surveillance environment. The draft report is expected to soon be released to its system users for their review and concurrence as we move forward with the process of priority setting for procedure development.

4. CIVIL AVIATION AUTHORITY INVOLVEMENT

4.1 There will often be elements that affect the outcome of a BCA that are outside of the direct control of either the customer or the ANSP, specifically, those activities related to oversight provided by the Civil Aviation Authority (Transport Canada).

4.2 Transport Canada is the state agency responsible for regulatory and safety oversight of NAV CANADA. In this role Transport Canada ensures the safety and public interest protection of activities that NAV CANADA undertakes. When developing a BCA for new PBN activities, the ANSP needs to highlight their priorities and customer needs according to the terms set by the regulator. Although the ability for the ANSP to deliver more efficient services supports the economy and is therefore in the public interest, there are other direct measures that can be drawn from a BCA that have a demonstrable positive impact; specifically the improvement of safety and the reduction in Greenhouse Gas (GHG) emissions from reduced fuel burn. Engaging the CAA as a vested member in the process is essential.

4.3 Transport Canada and NAV CANADA co-chair the Civil Aviation Regulatory Advisory Committee (CARAC) PBN Working Group. This group is responsible for developing regulatory and non-regulatory recommendations for the implementation of PBN in Canada. This cooperative body includes participation from industry interests as well, and has lead to the prompt and cooperative development of operational approval documents for Canadian aviation. Within recent months Transport Canada has initiated the unprecedented process of consultation on the content of Advisory Circulars and Operations Specifications to support new RNP 1 and RNP AR approvals. This level of consultation and cooperation bodes well for implementation of PBN in Canada.

5. NAV CANADA PBN PRIORITIES

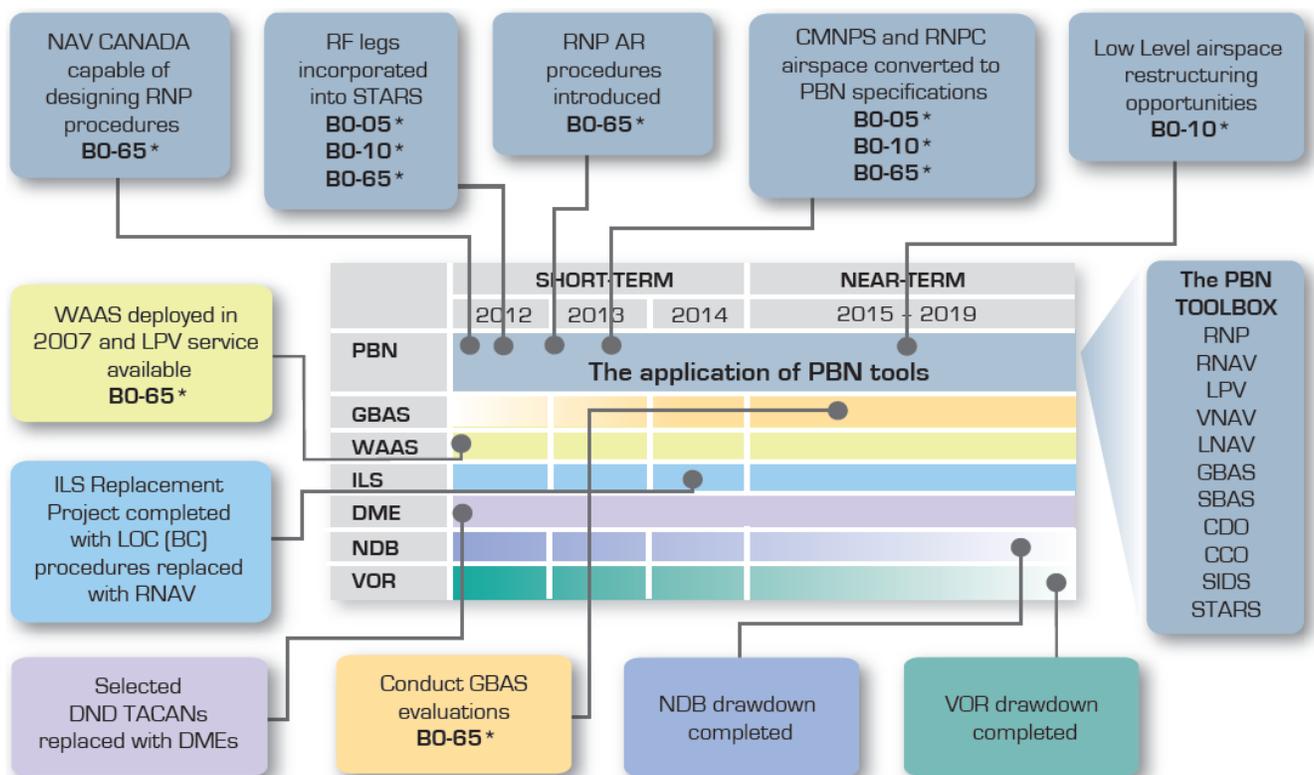
5.1 Short term priorities are defined in the NAV CANADA ANS Plan in the three year period ending in 2014. Since the magnitude of benefits is affected most by its system users' ability to receive operational approvals, employ new equipment and the repetition of operations, the focus is on those areas where the system

users are leading technology adoption and NAV CANADA records a high number of flight operations. Also, from the perspective of safety and accessibility, communities that rely heavily on air transportation will receive priority. NAV CANADA's PBN priorities are:

- a) major terminal airspace;
- b) second and third level airports;
- c) northern/remote airspace and airports, and
- d) targets of opportunity.

5.2 The following graphic maps NAV CANADA's navigation plans against the ICAO Aviation System Block Upgrades (ASBUs). The details of the graphic can be found in NAV Canada's Air Navigation System Plan at:

http://www.navcanada.ca/ContentDefinitionFiles/Publications/CorpPublications/AdditionalPublications/ANS_Plan_2012_EN.pdf



5.3 In summary, owing to the increased utility of RNP navigation specifications to support improvements in safety and efficiency of the ANS, GNSS will be essential during the near-term transition. RNAV routes, SIDs and STARs will continue to be developed and implemented that do not strictly rely on GNSS. As system users equip, gain operational approvals and design criteria becomes available, RNP navigation specifications will come more into use.

5.4 NAV CANADA's navigation plans recognize the importance of satellite technology and its current and future role in the global navigation environment; however, it is expected that the rate of technological development and the time needed for the resolution of institutional limitations to GNSS as a sole-means system will result in the need for a ground-based back-up system for the foreseeable future.

6. CONCLUSION AND RECOMMENDATIONS

6.1 This paper provides a brief overview of CANADA's navigation system planning, the connection to the Global Air Navigation Plan and the relationship to the ICAO ASBUs. The Conference is invited to take note of CANADA's approach to the evolution of navigation systems changes and the associated implementation of PBN.

6.2 The Conference is invited to agree to the following recommendation:

Recommendation 1/x – Navigation roadmap

That the Conference request ICAO to:

- a) include a process of structured business case analysis and consultation that recognizes the need for coordinated action by the industry, the state regulatory authority and the air navigation service provider; and
- b) include a process that allows for a transparent and collaborative involvement by all stakeholders of the regulatory structure required for appropriate safety oversight and public interest in the operation of the air navigation system.

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