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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

d) Surveillance roadmap

A SURVEILLANCE STRATEGY FOR CANADA

(Presented by Canada)

SUMMARY

This working paper provides a high level overview, for both the short-term 2012-2014 and the near-term 2015-2019, of the Canadian surveillance strategy and modernization activities. The correlation of these modernization activities to ICAO aviation system block upgrades (ASBUs) is also reviewed. Surveillance technologies including conventional radar, airport surface surveillance, multilateration, video, surveillance fusion systems and ADS-B together with space-based ADS-B using low earth orbiting satellites are all addressed. This paper supplements the Global Air Navigation Plan (GANP) surveillance roadmap and information paper AN-Conf/12-IP/4 surveillance roadmap, presented by the Secretariat.

Action: The Conference is invited to review this working paper, provide comments, and address the recommendation in paragraph 6.

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 ATC surveillance systems enable air traffic controllers to provide a safe, efficient and orderly movement of air traffic, both in the air and on the ground. Surveillance provides situational awareness to enable the application of reduced aircraft separation minima as compared to those required for procedural control.

1.3 The three classes of surveillance are:

a) independent non-cooperative surveillance which includes primary surveillance radar (PSR) and airport surface detection equipment (ASDE);

[1]English and French translation provided by Canada.

b) independent cooperative surveillance which includes secondary surveillance radar (SSR) and multilateration (MLAT); and

c) dependent cooperative surveillance which includes automatic dependent surveillance-broadcast (ADS-B).

1.4 Today's surveillance technology includes PSR, ASDE, ADS-B, MLAT and video sensors, as well as related surveillance fusion processing. Surveillance systems are used in the enroute, terminal, tower and airport service (ground) environments.

1.5 Deployment of seven Northern radars, ADS-B (Hudson Bay, Northeast Coast/Baffin Island and Greenland) and MLAT as well as access to the FAA radar surveillance and DND North Warning Radar System data have collectively been used to close gaps and expand coverage.

1.6 Purpose

1.6.1 This working paper supplements the Global Air Navigation Plan (GANP) surveillance roadmap and information paper AN-Conf/12-IP/4, surveillance roadmap, presented by the Secretariat, to provide a high-level overview of surveillance modernization activities within Canada and the correlation of those activities with ICAO aviation system block upgrades (ASBUs).

2. SHORT-TERM 2012-2014

2.1 Primary surveillance radar (PSR)

2.1.1 In the short-term, a review of current PSR service areas is being conducted to assess the requirement for PSR.

2.2 Secondary surveillance radar (SSR)

2.2.1 In the short-term, a detailed evaluation is being undertaken to determine the feasibility of using wide area MLAT as a replacement for SSR.

2.3 Automatic dependant surveillance – broadcast (ADS-B)

2.3.1 Building on the successful implementation of ADS-B in Arctic, Oceanic and Coastal areas, a concerted effort will be undertaken to increase equipage rates by streamlining the certification and qualification process. Among the first steps in this process will be a transition of eligibility from a list of performing aircraft to a list of non-performing aircraft.

2.4 Multilateration (MLAT)

2.4.1 MLAT airport surface surveillance will be deployed at Calgary and Toronto International airports to supplement surface movement radar based ASDE systems. Further deployment of independent MLAT systems will be driven by positive benefit-cost and safety analysis.

2.5 Wide area multilateration (WAM)

2.5.1 WAM has been deployed at several airports to augment SSR coverage. This surveillance information is utilized in enroute, terminal and tower facilities. Expanded deployment of WAM will be driven by operational requirements and supported by positive benefit-cost and safety analysis.

2.6 **Video surveillance**

2.6.1 Video surveillance is undergoing testing as standalone ASDE and for use to augment existing surface surveillance systems. Surface surveillance processing systems will be upgraded to employ fusion tracking technology. Video surveillance uses high definition infrared imaging to enable all-weather operation.

2.6.2 Enhanced out-the-window presentation using high definition pan, tilt, zoom (PTZ) cameras is being evaluated at several airports and will augment visual surveillance in safety critical areas and where line-of-sight is obstructed.

2.7 **Airport surface detection equipment (ASDE)**

2.7.1 Existing A-SMGCS are being upgraded to take advantage of enhanced surveillance fusion systems. Surveillance data, including aircraft-derived, ground-based and safety alert information, will be fused with surface movement radar (SMR) to enhance airport and gate-to-gate traffic management services.

2.7.2 Fused MLAT and video surveillance will be evaluated as a replacement for, or alternative to SMR based ASDE.

2.8 **Surveillance fusion system**

2.8.1 Fusion combines data from multiple sources in the enroute and terminal environment so that the resulting information for use in the provision of ANS services is more accurate, consistent and timely. Fusion takes on a number of forms.

3. **NEAR-TERM 2015-2019**

3.1 **Primary surveillance radar (PSR)**

3.1.1 Based upon the results of short-term PSR service evaluations, PSR systems at Toronto, Vancouver, Calgary and Montréal will be replaced.

3.2 **Secondary surveillance radar (SSR)**

3.2.1 Based upon the results of short-term evaluations, a strategy to replace SSR with WAM or ADS-B will be implemented.

3.3 **Automatic dependant surveillance – broadcast (ADS-B)**

3.3.1 Remote high-level surveillance gaps will be assessed and recommendations for expanded ADS-B coverage will be made based on the business case analysis.

3.3.2 The feasibility of space-based ADS-B using low earth orbiting satellites will be evaluated. ADS B via low earth orbiting (LEO) satellites will expand surveillance to oceanic and remote airspace globally. The introduction of LEO ADS-B technology is focused on the North Atlantic Traffic (NAT) nevertheless, benefits will be achieved globally. While oceanic airspace may not be congested or near capacity in terms of sheer traffic volume, the nature of transport business demands access to airports and routes between city pairs at similar and predictable points in time and space on a regular basis. Oceanic airspace is largely procedural, requiring greater distances between aircraft in the absence of surveillance, which can considerably limit the ability for customers to operate on preferred flight profiles. A reduction in aircraft separation minima enables more reliable operating flexibility and can be achieved through planned route, flight level or Mach changes. As a flight progresses fuel is consumed and aircraft become lighter and tend to prefer to operate at higher flight levels where the air density is lower. Evidence confirms that aircraft will climb/descend and take advantage of tail winds/avoid head winds to achieve efficiencies. Longer oceanic flights are expected to have more opportunities for advantageous flight levels

and routings and are exposed to improved operating conditions for more time with the expansion of ADS-B surveillance.

3.4 Wide area multilateration (WAM)

3.4.1 Surveillance coverage in Southern Canada will be expanded using WAM, at specific locations to improve operations and where supported by a business and safety case.

3.5 Airport surface detection equipment (ASDE)

3.5.1 Based upon the results of short-term evaluations, consideration will be given to replacing existing ASDE and providing additional ground surveillance at new airports with fused ADS-B, MLAT and/or video.

3.6 Surveillance fusion system

3.6.1 Performance-based traffic management safety and efficiency benefits will accrue from the deployment of fusion technologies. These technologies will provide gate-to-gate as well as central/national capabilities.

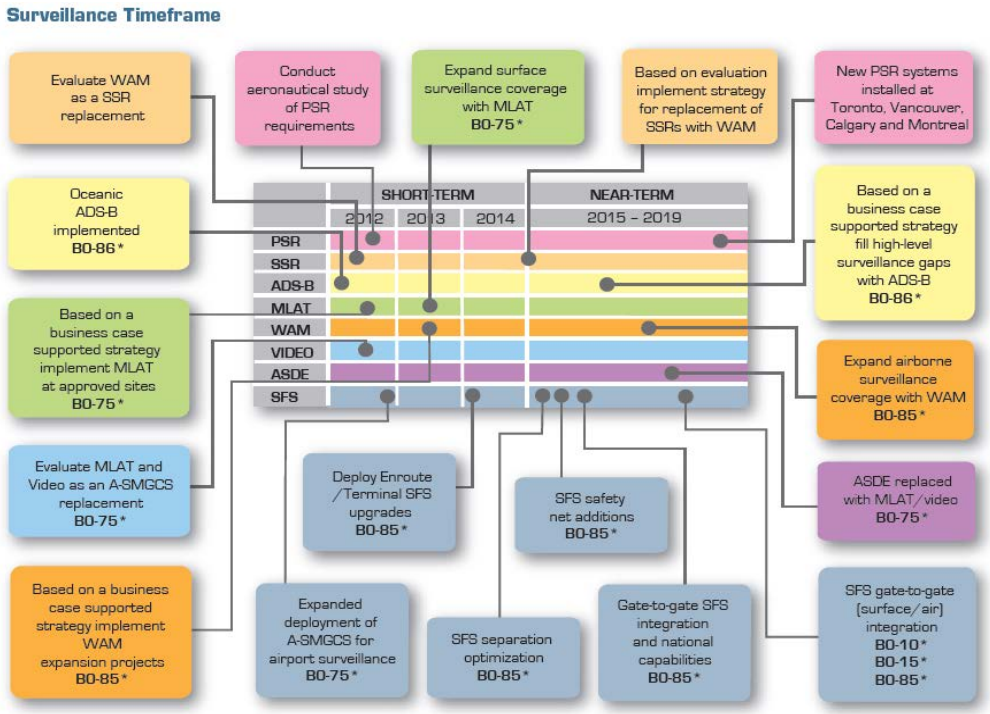
3.6.2 Increased positional accuracy will be evaluated to ascertain what reduction in surveillance separation can be safely attained.

3.6.3 Enhanced trajectory modelling will be employed to augment existing safety alerting processing.

3.6.4 Gate-to-gate surveillance fusion will be evaluated and employed to enhance traffic management and increase surface and airborne efficiency.

4. SURVEILLANCE TIMEFRAME

4.1 The details of the graphic below 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



4.2 **Mapping NAV CANADA initiatives to ICAO ASBUs**

4.2.1 NAV CANADA initiatives are mapped to the ICAO aviation system block upgrades (ASBUs). The modernization initiatives of NAV CANADA are mapped to the global harmonization activities of the ICAO ASBUs. In the each callout box in the surveillance timeframe graph, NAV CANADA initiatives are mapped, where applicable, to the ICAO ASBUs in this manner: e.g.: B0-10 maps to Block 0 Module 10.

5. **CONCLUSION**

5.1 The broad initiatives presented in this paper illustrate a commitment to advanced surveillance technology. These initiatives are harmonized with ICAO ASBUs to facilitate global interoperability.

5.2 Through careful evaluation of established and emerging technologies, the Canadian air navigation system will continue to be enhanced for the efficient movement of people and goods by air. A balanced implementation of these technologies, where the costs are justified by the benefits accrued, will ensure a modern, advanced air traffic management environment.

6. **RECOMMENDATION**

6.1 The Conference invites States to:

a) take note of the outlined roadmap; and a look for synergies within other roadmaps to see were strategies can be aligned; and

b) share their intended roadmaps for surveillance.

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