Organización de Aviación Civil Internacional
Oficina para Norteamérica, Centroamérica y Caribe (NACC)
Primera Reunión sobre implementación de Navegación Aérea para las Regiones NAM/CAR (ANI/WG/1)
Ciudad de México, México, 29 de julio al 1 de agosto de 2013

Cuestión 4 del Orden del día **Asuntos de Navegación Aérea**

4.2 Seguimiento en la implementación del Plan de Implementación de Navegación Aérea Basado en la Performance para las Regiones NAM/CAR (RPBANIP NAM/CAR);

- **Informes de Planes Nacionales sobre ASBU (AIM, ATM y CNS)**

PLAN DEL SISTEMA DE NAVEGACIÓN AÉREA DE NAV CANADA

(Presentada por Canadá)

RESUMEN

Esta nota de estudio presenta un resumen del proceso de planificación de NAV CANADA, el cual ha sido relacionado con las Mejoras por Bloques del Sistema de Aviación de la OACI.

Referencias:

- Documento de Trabajo de las Mejoras por Bloques del Sistema de Aviación de la OACI publicado el 17 de julio de 2012.
- Documento de Trabajo de las Mejoras por Bloques del Sistema de Aviación de la OACI publicado el 28 de marzo de 2013.
- Mapeando el futuro – El Plan del Sistema de Navegación Aérea

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

Objetivos Estratégicos	*Esta nota de estudio se relaciona con los Objetivos estratégicos:* *A. Seguridad operacional* *C. Protección al medio ambiente y desarrollo sostenible del transporte aéreo*

1. Introducción

1.1 NAV CANADA es la corporación de capital sin acciones del sector privado, que posee y opera el sistema de navegación aérea civil de Canadá. NAV CANADA coordina el movimiento seguro y eficaz de las aeronaves en el espacio aéreo nacional de Canadá y en el espacio aéreo internacional por lo que Canadá ha aceptado la responsabilidad de proporcionar los servicios. NAV CANADA proporciona control de tránsito aéreo, información de vuelo, informes meteorológicos, información aeronáutica, servicios de asesoramiento al aeropuerto y ayudas electrónicas a la navegación.

1.2 *Trazando el Futuro: El Plan del Sistema de Navegación Aérea*, publicado en abril de 2012, describe los planes proyectados de NAV CANADA para el futuro desarrollo del sistema de servicios de navegación aérea (ANS). El objetivo primordial del NAV CANADA es continuar la modernización de los ANS para satisfacer las necesidades del cliente, a la vez que reconoce las limitaciones de recursos de los clientes. El documento está en consonancia con los requisitos de las actividades principales para administrar y operar los ANS de una manera segura, eficiente y rentable.

1.3 El objetivo principal del Plan de ANS 2012 es en el corto plazo (2012 a 2014), pero también incluye detalles relacionados con la planificación a mediano plazo (2015-2019). Las actividades de planificación de NAV CANADA están íntimamente vinculadas a las actividades de armonización mundial de la Organización de Aviación Civil Internacional (OACI) y de numerosas iniciativas detalladas en el Plan de ANS 2012 fueron asignadas a los módulos ASBU relevantes.

1.4 NAV CANADA presentó información sobre este tema en el Taller Preparatorio de la Doceava Conferencia de Aeronavegación que se celebró en la Sede de la OACI en Montreal el 16 y 17 de noviembre de 2012.

1.5 El Plan de ANS de NAV CANADA está organizado en las siguientes secciones:

- Navegación Basada en la Performance (PBN)
- Comunicaciones
- Vigilancia
- Gestión del Tránsito Aéreo (ATM)
- Gestión de la Información Aeronáutica (AIM)
- Meteorología Aeronáutica

1.6 Normalmente, NAV CANADA actualiza sus ANS plan cada tres años. Sin embargo, NAV CANADA recientemente realizó una alianza estratégica para formar Aireon Sociedad de Responsabilidad Limitada (LLC), una empresa conjunta para proporcionar capacidad de rastreo satelital global. Otros socios en esta empresa conjunta en la actualidad incluyen Iridium Communications, Incorporated, con el apoyo de la Administración Federal de Aviación de los Estados Unidos (FAA) y los proveedores de Harris Corporation y IT Exelis. El objetivo inicial de NAV CANADA con esta empresa conjunta es reducir mínimas de separación entre aeronaves que operan en el Atlántico Norte mediante el uso de la Vigilancia dependiente automática - radiodifusión (ADS-B) con salida a través de los satélites de órbita terrestre baja (LEOS). La iniciativa LEOS ADS-B se considera como innovadora, que va a cambiar significativamente las prioridades de NAV CANADA y los planes de servicio. Más detalles sobre esta iniciativa se presentan por separado en una nota de información.

1.7 Por último, hay que señalar que los módulos ASBU presentados en la Doceava Conferencia de Aeronavegación de la OACI están siendo re-editados, lo que se traducirá en cambios en la numeración y descripción. Como resultado, NAV CANADA emitirá su próximo Plan ANS en el otoño, con un año de anticipación. NAV CANADA seguirá relacionando las iniciativas del Plan ANS a módulos ASBU relevantes. (Nota: la presentación que se **adjunta** a esta nota de estudio ha sido actualizada de acuerdo al Documento de trabajo para las mejoras por bloques del sistema de aviación actualizado, expedido el 28 de marzo de 2013) (***disponible únicamente en Inglés***).

1.8 *Trazando el Futuro*, la edición 2012 del Plan del Sistema de Navegación Aérea de NAV CANADA, se presenta en el adjunto a esta nota de estudio.

2. Acción Sugerida

2.1 Se invita a la Reunión a:

a) tomar nota de los planes proyectados de NAV CANADA para el futuro desarrollo del sistema de Servicios de navegación aérea (ANS), y

b) revisar y comentar sobre su contenido con el fin de proponer actualizaciones, en su caso, al RPBANIP.

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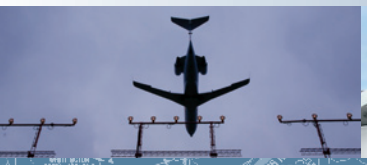
ANI/WG/1-WP/11-NE/11

NAV CANADA

April 2012




CHARTING THE FUTURE

The Air Navigation System Plan

SERVING A WORLD IN MOTION

Contents

Foreword

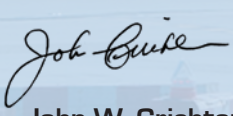
NAV CANADA is the private sector, non-share capital corporation that owns and operates Canada's civil air navigation system. We coordinate the safe and efficient movement of aircraft in Canadian domestic airspace and in international airspace assigned to Canadian control. Through our operations, NAV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

Charting the Future: The Air Navigation System Plan describes NAV CANADA's projected plans for future ANS system development. Our overarching goal is to continue modernizing the ANS to meet customer needs, while also recognizing customer resource constraints. Our vision for this document is in keeping with the requirements of our core business – to manage and operate the ANS in a safe, efficient and cost effective manner.

While the primary focus of the ANS Plan is on the short-term (the next three years) our planning horizon extends to the near-term (2015 to 2019).

We recognize that the ANS Plan does not exist in a vacuum. As readers will note, the contents are inextricably linked to global harmonization activities of the International Civil Aviation Organization (ICAO). In addition, the initiatives noted herein are closely aligned with internal strategic planning processes within NAV CANADA.

Finally, it is important to note that this plan is meant to be a collaborative and 'living' document, with updates occurring every three years. Consequently, input from the aviation community is key to ensuring the plan is aligned with the day-to-day business realities, and the technology and service delivery plans, of our customers and stakeholders. As such, we welcome any and all comments on the content to follow.



John W. Crichton
President and Chief Executive Officer

Introduction

The Air Navigation System (ANS) Plan describes NAV CANADA's short-term and near-term initiatives aimed at meeting customers' requirements. It provides an outlook to generate discussion among customers, staff and other stakeholders, with the goal of choosing the most beneficial path to the ANS of the future. NAV CANADA will continue to communicate and collaborate with customers through this plan and other documents such as *Direct Route* and web sites such as OnBoard (www.onboard-abord.ca).

STRUCTURE

The ANS Plan is organized into the following sections:

- Performance Based Navigation (PBN)
- Communications
- Surveillance
- Air Traffic Management (ATM)
- Aeronautical Information Management (AIM)
- Aviation Weather

TIMEFRAMES

The content in each section is presented in two timeframes in calendar years:

- Short-Term 2012 - 2014
- Near-Term 2015 - 2019

CONTENT

The content of each section is supported by supplementary information contained in text boxes, a timeframe graph with callout boxes highlighting key milestones and an acronym table.

MAPPING TO ICAO AVIATION SYSTEM BLOCK UPGRADES

NAV CANADA initiatives in the ANS Plan are mapped to the ICAO Aviation System Block Upgrades. This links the modernization initiatives of NAV CANADA to the global harmonization activities of ICAO. In the timeframe graph, NAV CANADA initiatives in each callout box are mapped, when applicable, to the summary table of the ICAO system block upgrades contained in Appendix A (i.e., B0-10 maps to Block 0 module 10).

UPDATE SCHEDULE

The ANS Plan will be updated every three years coinciding with the short-term time frame.

QUESTIONS COMMENTS

To provide comments or for more information on the ANS Plan, please contact NAV CANADA Customer Service at service@navcanada.ca or 1-800-876-4693.

PERFORMANCE BASED NAVIGATION (PBN)

Overview

The PBN concept represents a shift from sensor-based to performance-based navigation. PBN specifies that aircraft navigation performance requirements/specifications be defined in terms of accuracy, integrity, availability, continuity and functionality, which are needed for the proposed operations in a particular airspace. PBN provides a list of navigation specifications that have applicability to one or more types of airspace (terminal, en-route, and remote/oceanic) and is only one of several enablers (Surveillance, Communications and Air Traffic Management) of an airspace concept. As with all changes to the ANS, PBN will be implemented, where feasible, based on a positive business case.

PBN provides the basis for a regulatory framework that addresses today's and tomorrow's navigation requirements for safety, efficiency, capacity, accessibility and the environment.

Short-Term 2012 - 2014

Existing PBN specifications for instrument procedures will be implemented in Toronto, Montreal, Ottawa and Quebec City. RNP 10 will be implemented in Edmonton North Airspace (North of 70N). Terminal airspace redesigns using PBN concepts will commence adhering to the established PBN implementation priorities. Trials of radius-to-fix paths in Toronto, Ottawa, Calgary and Vancouver terminal airspace will determine priorities for future application. Based on aeronautical studies, selected non-essential ground-based NAVAIDS will be decommissioned.

PBN Implementation Priorities

1. Major Terminal Airspace
2. Second and Third Level Airports
3. Northern/Remote Airspace and Airports
4. Targets of Opportunity

Canadian Airspace is divided into Northern and Southern domestic airspace with further classification into CMNPS and RNPC. Navigation performance requirements in Canada are classified as meeting either of these unique Canadian standards. These designations will be replaced by PBN Navigation Specifications.

Near-Term 2015 - 2019

Transition from a sensor-based environment to a PBN environment will commence as PBN specifications are approved for application. Terminal airspace redesigns using PBN concepts will continue based on the established PBN implementation priorities. The low-level airspace structure will be redefined, in concert with surveillance strategies, to incorporate PBN concepts. The decommissioning of selected non-essential ground-based NAVAIDS will continue when supported by aeronautical studies. Additional RNAV and RNP procedures will be implemented following Airport/Terminal airspace reviews, aeronautical studies and AIS reviews of existing procedures.

GBAS technology currently supports precision approach equivalent to ILS Cat I. ICAO is developing the necessary SARPs to support equivalency to ILS Cat II/III. NAV CANADA will investigate the technical and financial feasibility of Cat I GBAS in the near-term and monitor the development of Cat II/III.

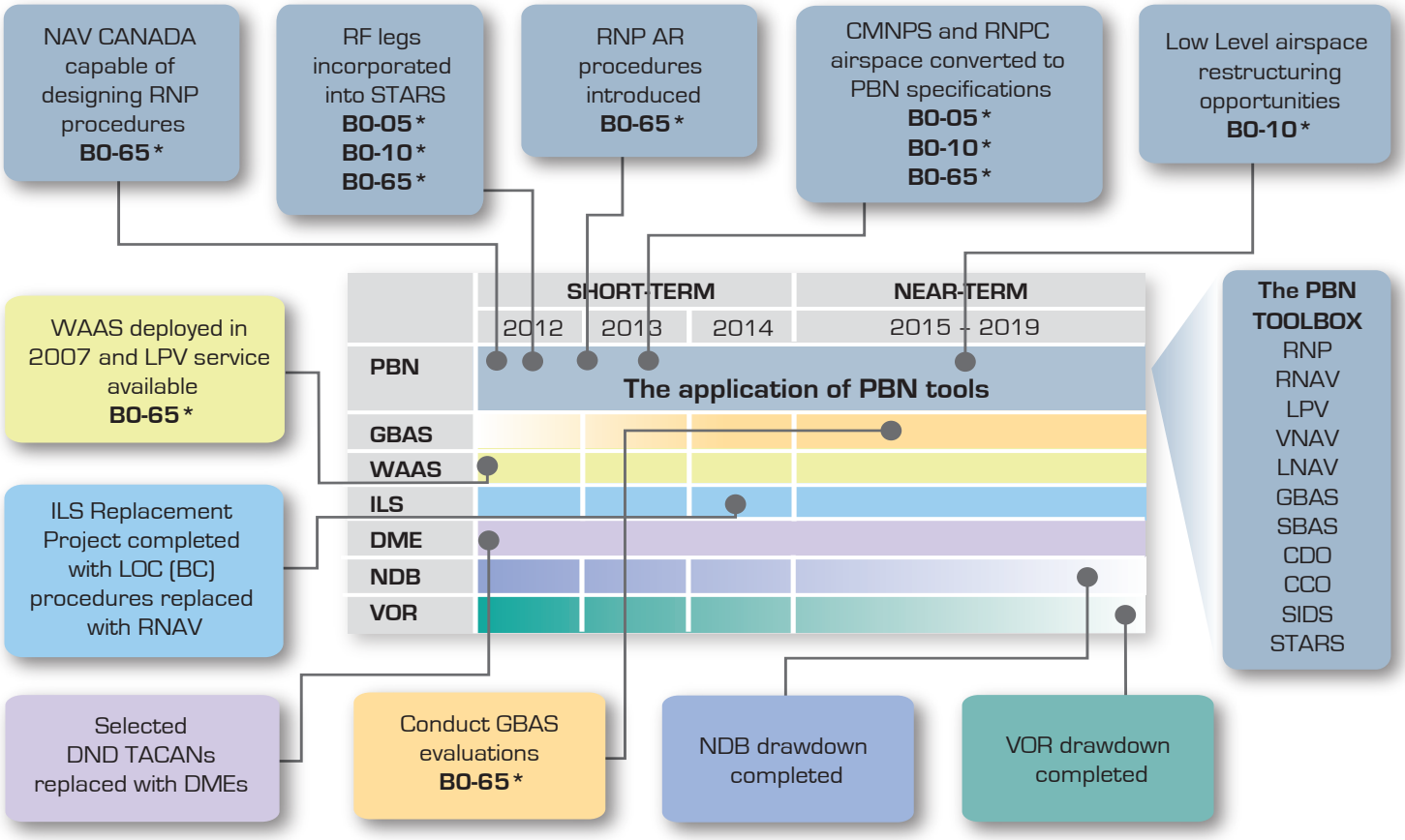
NAV CANADA will continue the transition to a PBN environment with ground-based navigation aids providing only a back-up capability. It is envisaged that 4D TBOs will exist in the long-term supporting the transition to full gate-to-gate management. Terminal airspace redesigns will consider future technologies and design an airspace system that is flexible enough to be able to adjust for future TBOs with minimal effort.

Implementation of **PBN** in Canada is seen as an ongoing series of qualification upgrades to aircraft, crew and ATM. PBN specifications will be implemented based on the development of viable business cases that will consider customer equipage, ICAO PBN standards, and the applicability of the specification to the airspace. Consequently, not all specifications will be applied in Canada.

Approximate northern limit of 99% WAAS LPV coverage.

PBN Timeframe

Implementation will be based on priorities that are cognizant of regulations (current and future) as well as customer requirements and capabilities. The requirement is for a total system capability to enable an air operation and, therefore, implementation will be aligned with advancements in communications (DCPC, CPDLC), surveillance (ADS-B, WAM) and Air Traffic Management. PBN implementation projects, including WTM and AASP, will need to meet stakeholder requirements and a viable business case.



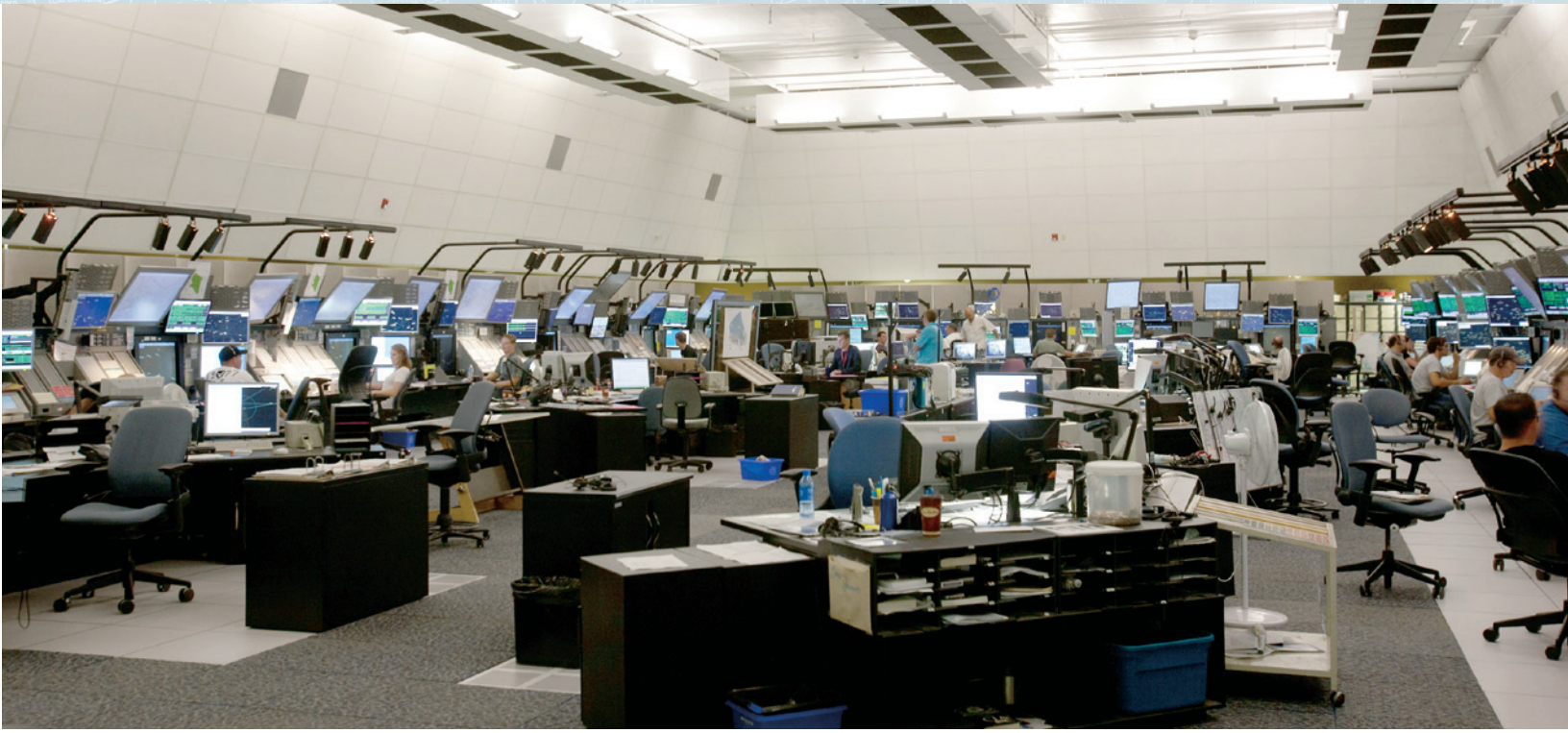
*Note: * See explanation of mapping to ICAO Aviation System Block Upgrades on page 1.*

NAV CANADA supports the extension of the US **WAAS** into Canadian airspace to approximately 70 degrees north. This service supports our application of LPV approaches and further work in the short-term is expected to result in the ability to conduct LPV approaches to a 200 foot DA. WAAS supports high integrity positioning supporting RNP and surveillance applications.

Acronym Table

AASP	Alberta Airspace and Services Project
ADS-B	Automatic Dependent Surveillance -Broadcast
AIS	Aeronautical Information Services
CCO	Continuous Climb Operations
CDO	Continuous Descent Operations
CMNPS	Canadian Minimum Navigation Performance Specifications
CPDLC	Controller-Pilot Data Link Communications
DA	Decision Altitude
DME	Distance Measuring Equipment
DCPC	Direct Controller-Pilot Communications
GBAS	Ground Based Augmentation System
ILS	Instrument Landing System
LNAV	Lateral Navigation
LOC(BC)	Localizer (Back Course)
LOS	Level of Service
LPV	Localizer Performance with Vertical Guidance
NDB	Non-Directional Beacon
RF	Radius to Fix
RNAV	Area Navigation
RNP	Required Navigation Performance
RNP AR	Required Navigation Performance Authorization Required
RNPC	Required Navigation Performance Capability
SARPs	Satndards and Recommended Practices
SBAS*	Satellite Based Augmentation System
SIDS	Standard Instrument Departures
STARS	Standard Arrival Routes
TBOs	Trajectory-Based Operations
VNAV	Vertical Navigation
VOR	Very high frequency Omnidirectional Range
WAAS*	Wide Area Augmentation System
WAM	Wide Area Multilateration
WTM	Windsor/Toronto/Montreal Airspace and Services Review

** WAAS is the North American version of the generic SBAS*



Overview

Communication is an integral element of navigation, surveillance and ATM initiatives. There will be a significant increase in the use of data link with the benefit of high speed, high integrity data transfers and reduced frequency congestion and improved message clarity. The use of UHF and HF voice communications will decline, however voice communications, primarily digital and analog VHF, will remain an efficient method of achieving DCPC. The NAV CANADA air-to-ground communications strategy does not currently include HFDL. The use of CPDLC is expanding from oceanic and remote applications to the domestic environment.

Short-Term 2012 - 2014

The RCO redesign program will be completed. In consultation with customers, UHF services will be reduced while retaining the required coverage.

The **FIC RCO** system is being redesigned to resolve frequency congestion and interference problems. Four FISE frequencies will be deployed at RCO sites to ensure minimum frequency overlap with one of the four frequencies strategically sited for optimum use above FL 180. This redesign will improve FISE and support IFR operations.

The VHF radio replacement program will continue the replacement of over 2,000 radio pairs. SATCOM voice will be used as an alternate communication link when preferred and when an aircraft is out of the coverage area of ground-based communications. CPDLC will be implemented in the domestic enroute environment. PDC will be implemented at major airports. AIDC implementation will be pursued. ADS-C capability for use in domestic airspace will be researched.

PDC is a system that provides IFR departure clearance via data link to subscribing airlines at selected airports. NAV CANADA PDC currently uses the 620/622 communications protocol, with service currently limited to ARINC data link service subscribers. At major airports, NAV CANADA will be introducing the PDC 623 protocol, which will be available to subscribers of both ARINC and SITA.

The eight year NAV CANADA **VHF radio replacement program** will be completed in 2016. Over 2,000 VHF radio pairs, fully compatible with all current and planned future analog and digital voice and text message formats, will be installed at some 320 sites across the country. All radios will be capable of future international standards either VDL digital communications or 8.33 kHz spacing. The radios will be configured for 25 kHz frequency spacing, matching current frequency assignments in Canada and the USA.

Near-Term 2015 - 2019

The VHF radio replacement program, including the new telecom infrastructure, will be completed. HF voice will migrate to a backup service for VHF and data link. AMHS will be implemented and AFTN will be decommissioned. ADS-C will replace AFTN waypoint reporting.

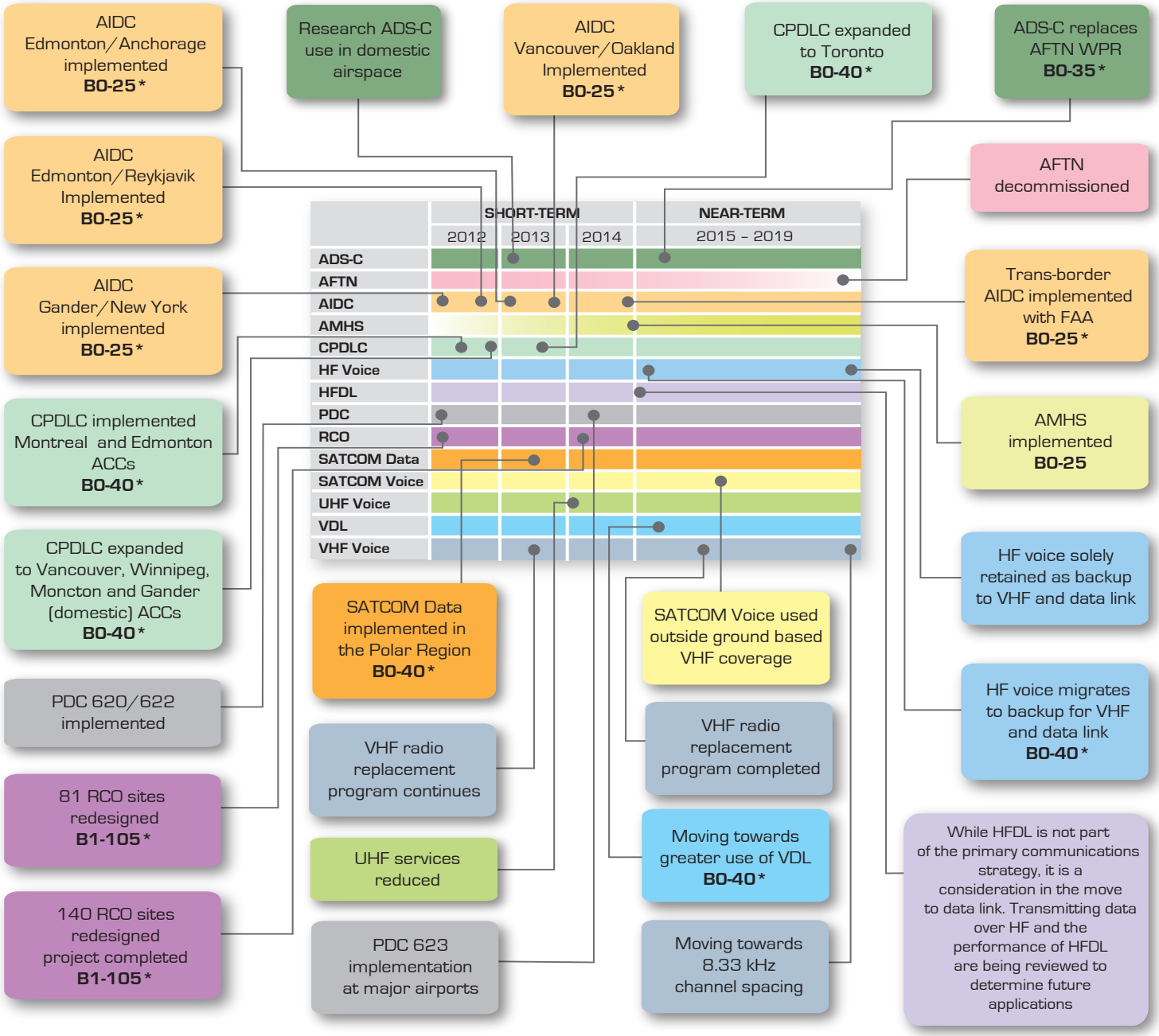
HF voice will be solely retained as a backup to VHF and data link. All radios will be capable of VDL digital communications or 8.33 kHz channel spacing.

NAV CANADA will continue to modernize the telecommunications structure to accommodate future technology advances and associated customer requirements.

SATCOM includes SATCOM Voice and SATCOM Data. SATCOM Data is already being used in the Pacific and NAT Regions and will soon be utilised in the Polar Region. SATCOM is being used globally, primarily outside VHF coverage. The use of SATCOM Voice to supplement data link is being evaluated.

AMHS is a modern electronic messaging system used to transfer and deliver ground to ground data such as flight plans, NOTAM and weather information amongst the members of the global air traffic control community. It is a replacement technology for the AFTN which is now technically obsolete.

Communications Timeframe



*Note: * See explanation of mapping to ICAO Aviation System Block Upgrades on page 1.*

Acronym Table

ADS-C	Automatic Dependent Surveillance – Contract	ATM	Air Traffic Management	PDC	Pre-departure Clearance
AFTN	Aeronautical Fixed Telecommunications Network	CPDLC	Controller Pilot Data Link Communications	RCO	Remote Communications Outlet
AIDC	ATS Interfacility Data Communication	DCPC	Direct Controller Pilot Communications	SATCOM	Satellite Communications
AMHS	Air Traffic Services Message Handling System	FIC	Flight Information Centre	UHF	Ultra High Frequency
		FISE	Flight Information Service Enroute	VDL	Very High Frequency Data Link
		HF	High Frequency	VHF	Very High Frequency
		HFDL	High Frequency Data Link	WPR	Waypoint Reporting

Overview

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. Today's surveillance technology includes Primary and Secondary Radar, Airport Surface Detection Equipment, Automatic Dependent Surveillance-Broadcast, Multilateration and video sensors, as well as related surveillance fusion processing. Surveillance systems are used in the enroute, terminal and airport service (ground) environments. Over the years, deployment of seven Northern Radars, ADS-B (Hudson Bay, Northeast Coast/Baffin Island and Greenland) and Multilateration as well as access to the FAA radar surveillance and DND North Warning Radar System data have collectively been useful in closing gaps in coverage.

Continuous air traffic surveillance enhances safety, reduces aircraft separation minima, increases airspace capacity and enables improved flight profile efficiencies.

The three classes of surveillance are:

- ***Independent Non-Cooperative Surveillance which includes PSR and ASDE.***
- ***Independent Cooperative Surveillance which includes SSR and MLAT.***
- ***Dependent Cooperative Surveillance which includes ADS-B.***

There is a transition underway from independent to dependent surveillance.

Short-Term 2012 - 2014

A review of current radar capability will be conducted to assess the requirement for PSR. Expanded deployment of WAM and airport MLAT systems will occur based on a positive business case. Specifically, WAM for Kelowna will be deployed in early 2012. MLAT airport surface surveillance will be deployed at Calgary International and Toronto International airports. Video surveillance will be

ADS-B equipped aircraft transmit their position, derived from the GNSS, automatically via data link. ADS-B broadcasts are received by ground stations and routed to ATC facilities for use in ATM. ADS-B transmissions contain a large quantity of information including aircraft position, altitude, speed and trajectory.

implemented as stand alone ASDE and as part of existing systems. Surveillance processing systems will be upgraded to employ fusion tracking technology through both airport-specific (surface A-SMGCS) and regional (air fusion) programs.

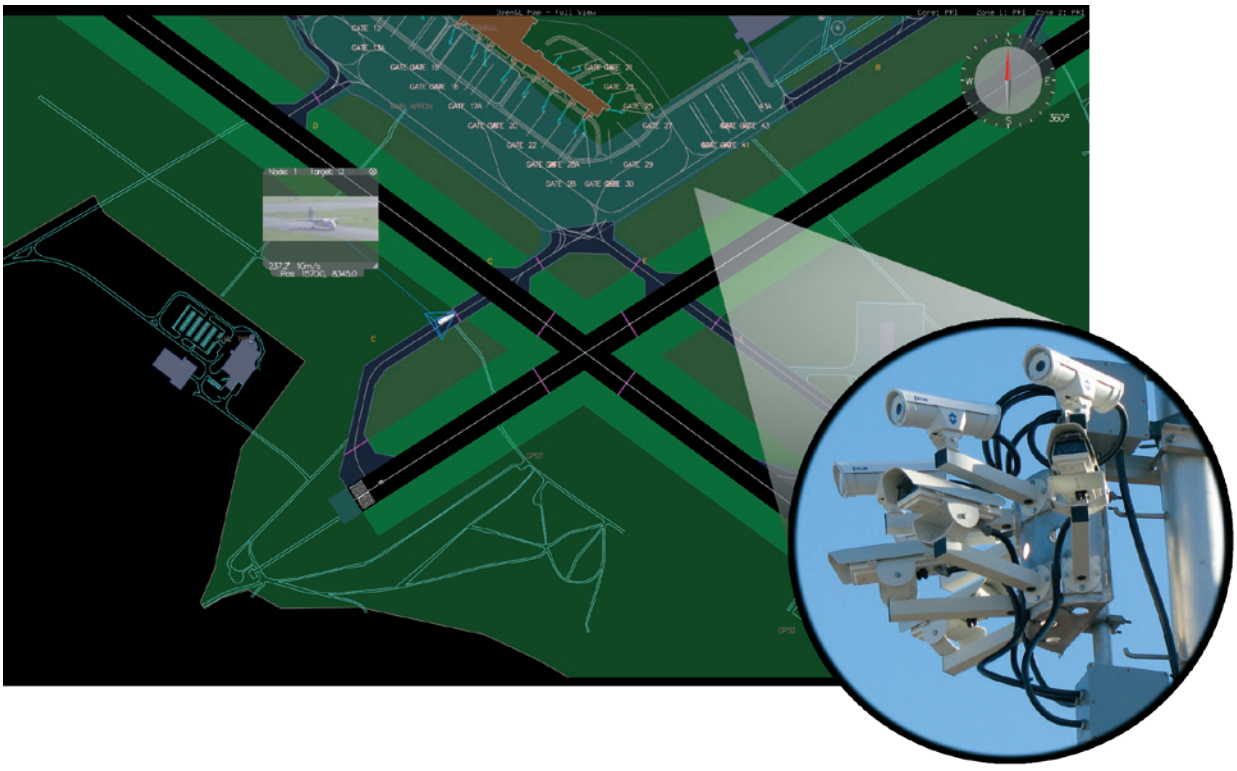
Fusion combines data from multiple sources so that the resultant information for use in the provision of ANS services is more accurate, consistent and timely. Fusion takes on a number of forms. Fusing data for ATC display is one form utilized in ATM display systems. In the case of A-SMGCS and surveillance fusion systems, surveillance data, including aircraft-derived, ground-based and safety alert information, is fused enhancing airport and gate-to-gate traffic management services respectively.

Near-Term 2015 - 2019

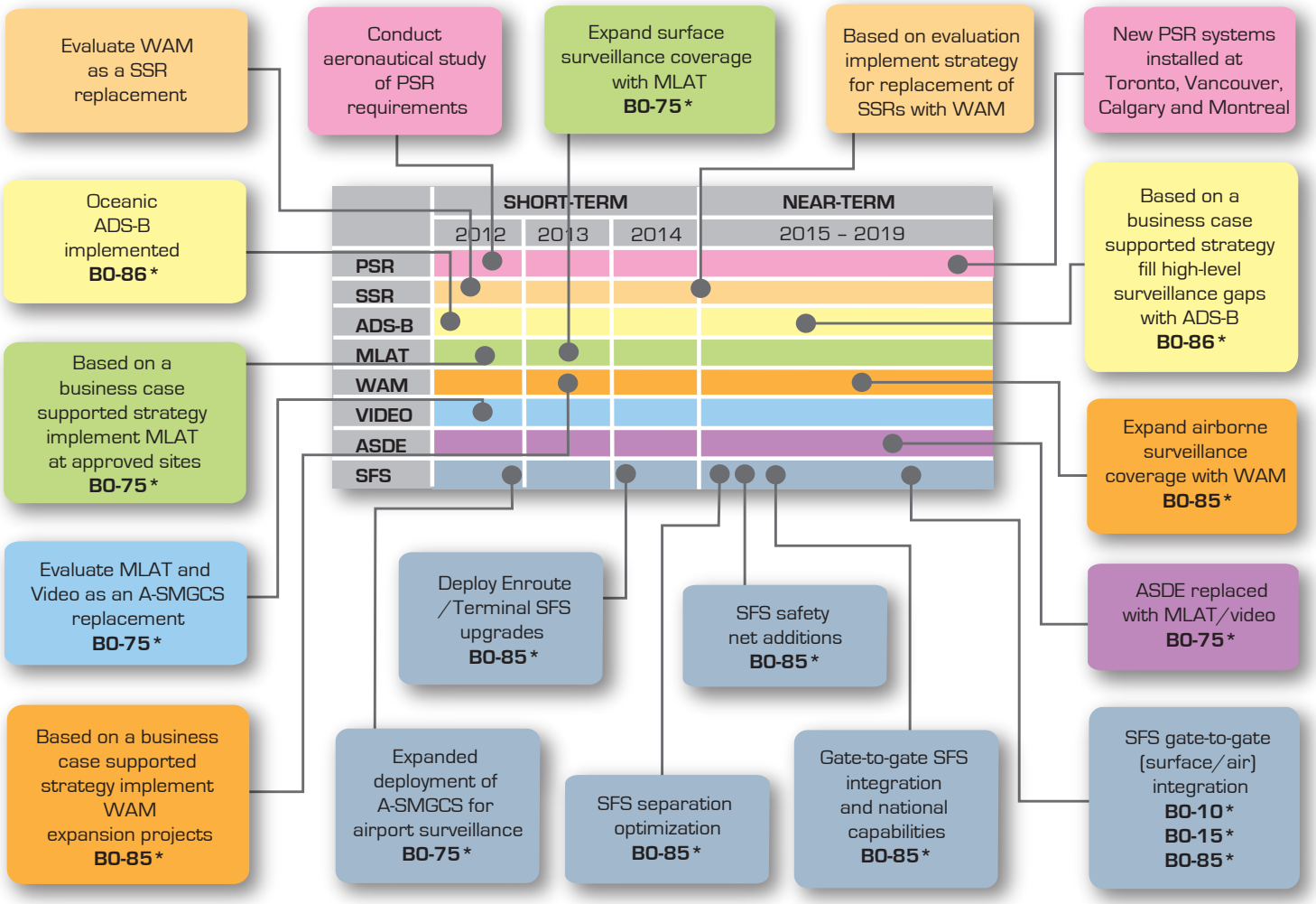
For this timeframe, replacement of specific radars will be undertaken for the major airports and their back-up sites. Remote high-level surveillance gaps, including the southeast coast of Canada, oil platforms in the Atlantic, Yukon Territory bordering Alaskan airspace and the balance of the Arctic airspace, will be assessed and recommendations made based on the business case analysis. In addition, surveillance coverage in Southern Canada will be expanded using WAM, at specific locations to improve operations and where supported by business and safety cases. Performance-based traffic management safety and efficiency benefits (see ATM section) will accrue from the deployment of fusion technologies. These technologies will provide gate-to-gate as well as central/national capabilities. Consideration will be given to replacing existing ASDE and providing additional ground surveillance at new airports with ADS-B, MLAT and/or video.

It is envisaged that both radar and WAM will be assessed for conversion to ADS-B surveillance provided customer ADS-B equipage reaches an acceptable level. In addition, NAV CANADA will investigate expanding surveillance in the North Atlantic using low earth orbit satellites.

MLAT is a method of position sensing using at least three receivers. The location of an aircraft or vehicle is determined by performing a time difference of arrival analysis on signals from vehicle and aircraft transponders.



Surveillance Timeframe



*Note: * See explanation of mapping to ICAO Aviation System Block Upgrades on page 1.*

Current TSR Airports

1	Toronto - Major	12	London
2	Vancouver - Major	13	Saskatoon
3	Calgary - Major	14	Thunder Bay
4	Montreal - Major	15	Regina
5	Ottawa	16	St. John's
6	Winnipeg	17	Hamilton
7	Edmonton	18	Prince George
8	Quebec	19	Sault Ste Marie
9	Victoria	20	North Bay
10	Moncton	21	Gander
11	Halifax	22	Mirabel

Acronym Table

ADS-B	Automatic Dependent Surveillance-Broadcast
ADS-C	Automatic Dependent Surveillance-Contract
ASDE	Airport Surface Detection Equipment
A-SMGCS	Advanced Surface Movement Guidance and Control System
ATS	Air Traffic Services
DCPC	Direct Controller-Pilot Communications
DND	Canadian Department of National Defence
FAA	USA Federal Aviation Administration
GNSS	Global Navigation Satellite System
MLAT	Multilateration
PSR	Primary Surveillance Radar
SFS	Surveillance Fusion System
SSR	Secondary Surveillance Radar
TSR	Terminal Surveillance Radar
WAM	Wide Area Multilateration

Overview

ATM, the integrated management of air traffic and airspace, will be achieved safely, economically and efficiently to meet current and future customer requirements. The ATM system must provide collaborative, seamless services supported by communications, navigation and surveillance in a system-wide environment that generates and manages information through the use of technology. Systems will be incrementally enhanced to support increasingly performance-based services.

Short-Term 2012 - 2014

SARA provides speed and route advisories to assist in ensuring an aircraft's time over a meter fix at a time provided by SASS.

Implement CFPS interface with CAATS in 2012 allowing web-based IFR flight planning to be fully integrated into ATM systems. Implement CFPS integrated weather and NOTAM functionality in 2013 allowing web-based flight plan centric pilot briefings. Implement mobile app for CFPS flight plan filing by 2013. Implement ICAO compliant data exchange interface, WXXM, for weather data exchange between CFPS and internal and third party systems. Implement FP 2012. Implement initial SARA at Toronto airport and conduct individual business cases to determine if expansion is warranted. Decision support tools such as MTCD and VWF will be implemented. Implement FSS modernization at all FSS. Implement changes to GAATS+ and coordinate with other agencies to facilitate the implementation of RLatSM Phase 1. A CONOPS for the implementation of RLatSM Phases 2 and 3 will be developed. As supported by trial outcomes and a sound business case, with the appropriate approvals, RLongSM will be implemented in the NAT and Canadian domestic airspace. Working with industry, Transport Canada and ICAO advance the integration of RPA into the ANS.

The **FSS** modernization project aims to deliver a family of NAV CANADA developed Tower and FSS products to all Flight Service Stations in Canada. Configuration will include many standard IIDS applications.

RLongSM has been in trial in the NAT since March 2011.

Near-Term 2015 - 2019

Implement ICAO compliant data exchange interface, for flight data exchange between CFPS and internal and third party systems. If supported by Phase 1 trial outcomes and a business case, RLatSM Phase 2 will be implemented in the NAT. Based on a business case supported strategy the deployment of SARA and other advanced decision support tools will be expanded. Advance the capability and functionality of CAATS, SFS and GAATS+ as warranted. In concert with NextGen and SESAR, the concepts of FF-ICE will be researched and implemented when advancements to interoperability, efficiency and capacity can be effectively achieved. The integration of RPA into the ANS will continue.

Advances in **ATS** standards and procedures, such as ADS-B in-trail procedures, improved separation standards for crossing/merging tracks, climb/descent separation and fusion tracks, will continue to be explored and implemented as warranted.

RLatSM Implementation Phases

Phase 1 [2015]	25 NM lateral separation ½ degree spacing between 2 core tracks, within vertical limits of NAT Data Link Mandated airspace
Phase 2 [2017]	25 NM lateral separation ½ degree spacing through the entire NAT OTS, within vertical limits of NAT Data Link Mandated airspace
Phase 3 [2020]	25 NM lateral separation ½ degree spacing through the entire NAT Region, including converging and intersecting tracks, within vertical limits of NAT Data Link Mandated airspace

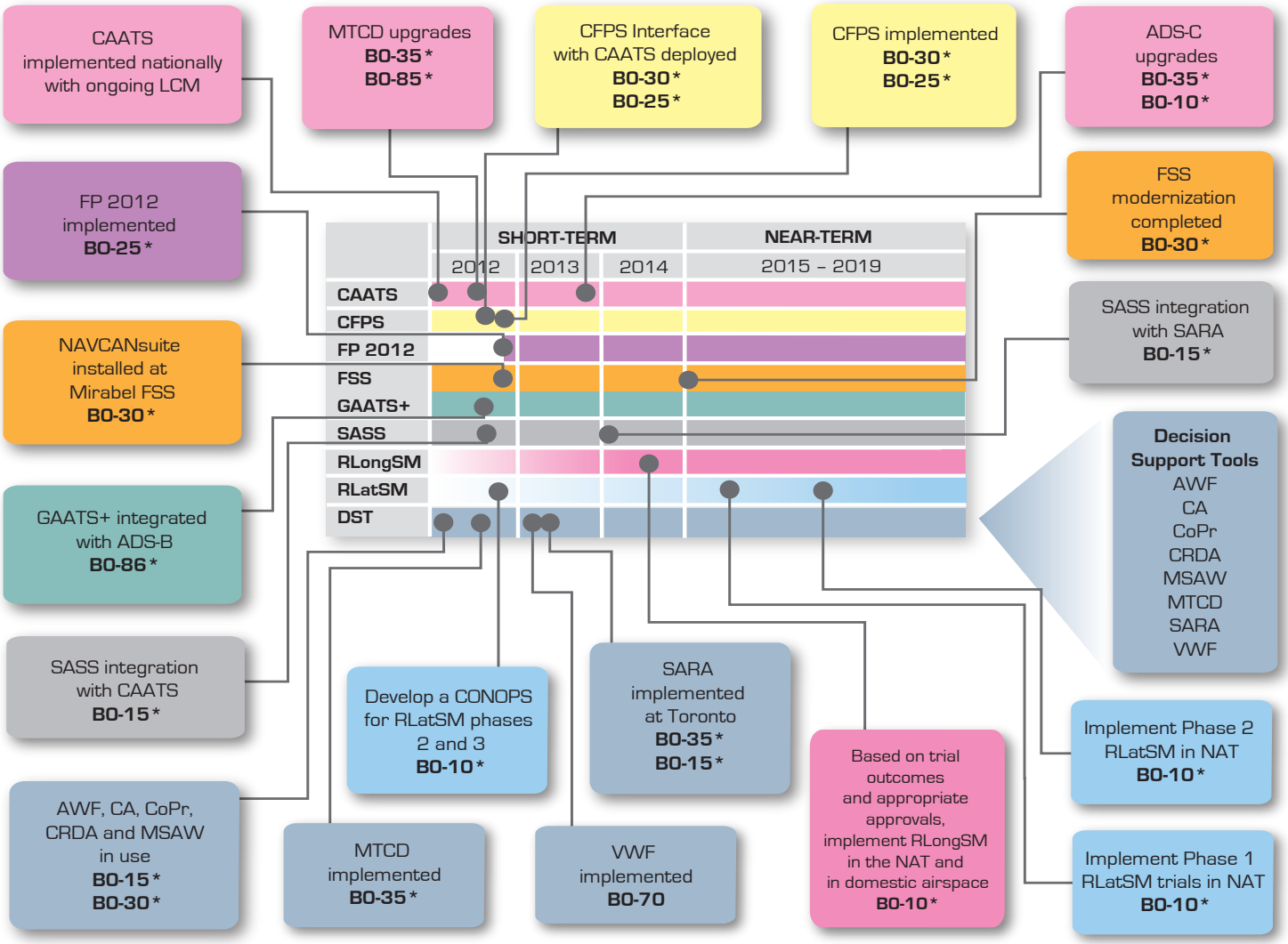
Separation optimizations and related safety net improvements (e.g. Approach Path Monitoring, Air-Ground Conformance) will be implemented through incremental deployment of data fusion technologies.

RLatSM Requirements

1. RNP4 operations
2. ADS-C position reports
3. CPDLC established

It is envisaged that advances in ATFM, including dynamic ATS routing, system wide flow management, and interval management will result in a balancing of demand with capacity. If supported by a comprehensive business case, Phase 3 of the RLatSM will be implemented in the NAT. The concept of FF-ICE will continue to be pursued.

ATM Timeframe



*Note: * See explanation of mapping to ICAO Aviation System Block Upgrades on page 1.*

Acronym Table

AFTN	Aeronautical Fixed Telecommunications Network
ATFM	Air Traffic Flow Management
AWF	Airspace Warning Feature
CA	Conflict Alert
CAATS	Canadian Automated Air Traffic System
CFPS	Collaborative Flight Planning System
CONOPS	Concept of Operations
CoPr	Conflict Prediction
CRDA	Converging Runway Display Aid
DST	Decision Support Tools
EXCDS	Extended Computer Display System
FF-ICE	Flight and Flow Information for a Collaborative Environment
FIC	Flight Information Centre
FP 2012	Flight Plan 2012
FSS	Flight Service Station Modernization
GAATS+	Gander Automated Air Traffic System
IIDS	Integrated Information Display System
LCM	Life Cycle Management
MSAW	Minimum Safe Altitude Warning
MTCD	Medium Term Conflict Detection
NARDS	NAV CANADA Auxiliary Radar Display System
NAT	North Atlantic
NextGen	Unites States' Next Generation Air Transportation System
OIDS	Operational Information Display System
RLatSM	Reduced Lateral Separation Minimum
RLongSM	Reduced Longitudinal Separation Minimum
RPA	Remotely Piloted Aircraft
SARA	Speed and Route Advisor
SASS	Scheduling and Sequencing System
SESAR	Europe's Single European Sky ATM Research
SFS	Surveillance Fusion System
VWF	Vortex Warning Feature
WPR	Waypoint Reporting
WXXM	Weather Exchange Model

AERONAUTICAL INFORMATION MANAGEMENT (AIM)

Overview

AIM is the integrated management of aeronautical information services through the provision and exchange of quality-assured digital aeronautical data. This provision and exchange of data ensures the flow of information necessary for the safety, regularity and efficiency of international air navigation. NAV CANADA is making data available to customers in more standardized forms that can be manipulated for display as products specific to customers' requirements. Electronic publications are now available for download from an e-commerce site and on portable electronic devices.

Short-Term 2012 - 2014

Benefits of ICAO SNOWTAM

- Designed to be data driven
- ICAO standard ensures global recognition
- Reporting by runway thirds
- By definition expires after 24 hours

The ICAO specified content of the AIP including AIP amendments, supplements and circulars will be published in a structured electronic format referred to as the eAIP. NOTAMJ will be replaced with the ICAO format SNOWTAM. Automated friction measurement reporting and an interface for manual and automated input of RSC reports will be implemented. The electronic publications product line and agreements with vendors, allowing Canadian aeronautical data on portable electronic devices, will be expanded.

The **eAIP** will replace the AIRAC and paper AIP.

Near-Term 2015 - 2019

Canadian NOTAM will be converted to the ICAO format and standard including geo-referencing and grouping in series for ease of use. Digital NOTAM will replace the current free text message composition format. eTOD will be available in a data modelling framework. The process to assess the impact of all human-made obstacles will be automated. Aeronautical Publications will explore the feasibility of moving towards distributing aeronautical information in electronic format only, moving away from paper publications.

Digital NOTAM will integrate aeronautical data into a comprehensive data management system providing more standardized and consolidated information to our customers. This initiative is aligned with the ICAO AIS to AIM Roadmap.

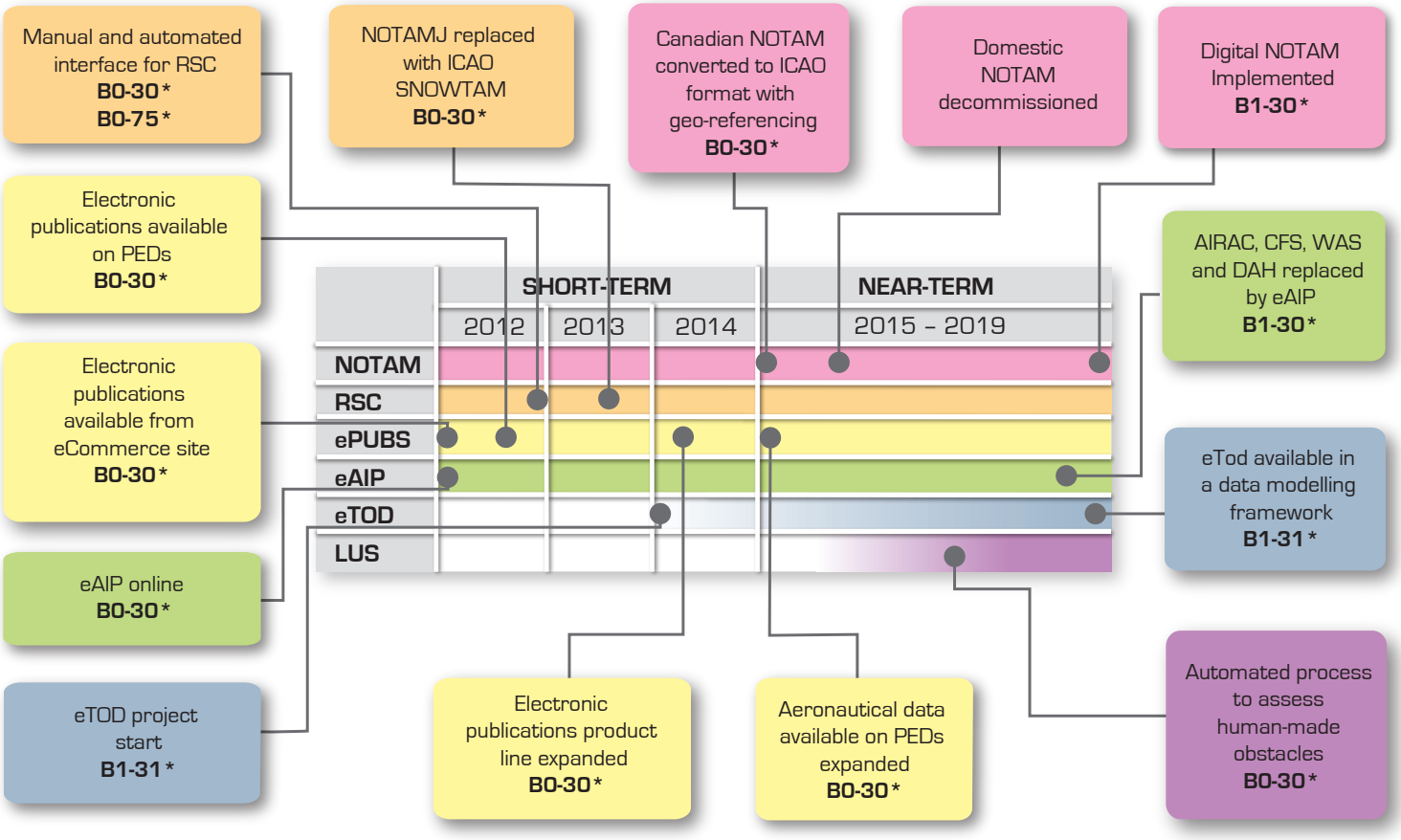
The automation of the **land use assessment process**, which determines the impact of human-made obstacles, such as wind turbines, on aviation, will enhance flight safety.

NAV CANADA AIM will provide data-dependent systems with high-quality, timely aeronautical information in the form of digital data based on structured databases and geographic information systems.

eTOD Applications

- Aeronautical chart production
- Instrument procedure design
- Minimum safe altitude warning systems
- Ground proximity warning systems
- Emergency contingency procedures
- Advanced surface movement guidance and control systems
- Approach path monitoring
- Air-ground automated coordination (trajectory based operations)

AIM Timeframe



*Note: * See explanation of mapping to ICAO Aviation System Block Upgrades on page 1.*

NOTAM Series

A	Aerodrome/Movement or Landing Area
B	ATC Facilities and Services
C	Special Uses Airspace
D	Obstruction
E	Airspace
G	GNSS
H	Chart Corrections
J	Special Notices
M	Military Flight Safety
N	NAVAID
O	Other Aeronautical Information
P	Procedural
S	SNOWTAM
V	ASHTAM
W	Database Corrections
Y	Test
Z	Airway

Acronym Table

AIRAC	Aeronautical Information Regulation and Control
eAIP	Electronic Aeronautical Information Publication
ePUBS	Electronic Publications
eTOD	Electronic Terrain and Obstacle Data
LUS	Land Use Submission Automation
PED	Portable Electronic Device
NOTAM	ICAO format NOTAM (Notice to airmen)
NOTAMJ	The Canadian version of a SNOWTAM
RSC	Runway Surface Condition Report
SNOWTAM	A NOTAM series addressing snow, ice, slush on movement areas

Additions, withdrawals and amendments to published aeronautical information are distributed under the regulated system AIRAC which provides advance notification of changes to aeronautical information based on an established series of common effective dates.

NOTAMJ is a Canadian special-series NOTAM that contains information related to the condition and braking action of runway surfaces in relation to published criteria.

Overview

NAV CANADA provides aviation weather services through the distribution of aviation weather reports and forecasts prepared primarily by the Meteorological Service of Canada. These products are available through numerous means including the NAV CANADA CFPS. Efforts continue to improve pilot awareness and understanding of enroute and pre-flight weather services, such as digital weather camera information, available throughout Northern and remote service areas by contacting the local FIC.

The **AWWS** is being replaced by **CFPS** which will be designed to provide weather, NOTAM, aeronautical, weather camera and flight plan information to both internal and external users. Flight service specialists, air traffic controllers, pilots and dispatchers will view, use and share the same weather and flight plan information, allowing for collaboration between all.

Short-Term 2012 - 2014

CFPS data will be displayed as geo-referenced information, allowing users to make decisions using all information for their route of flight. Initial deployment of CFPS will allow external users to file, cancel, delay and change flight plans. HWOS will be implemented. The addition of voice broadcast and LWIS capability to HWOS CARS sites will be assessed. The NAV CANADA AWOS/LWIS will be implemented at the remaining 16 planned sites.

WX Cams provide images of current conditions at approximately 130 sites across Canada. This service is anticipated to expand to more than 180 sites by 2014. Canadian aviation weather warnings (SIGMET) and aviation weather advisories (AIRMET) will be converted to an ICAO compliant bulletin format by November 2013.

The **HWOS** will replace the two legacy systems currently used to input weather observations (WinIDE and MIDS) at all NAV CANADA staffed weather sites. The HWOS will also include a set of updated sensors. Key benefits include a standardized system throughout the network, a reduction in support costs, direct ingestion of sensor data and the elimination of transcription errors.

Near-Term 2015 - 2019

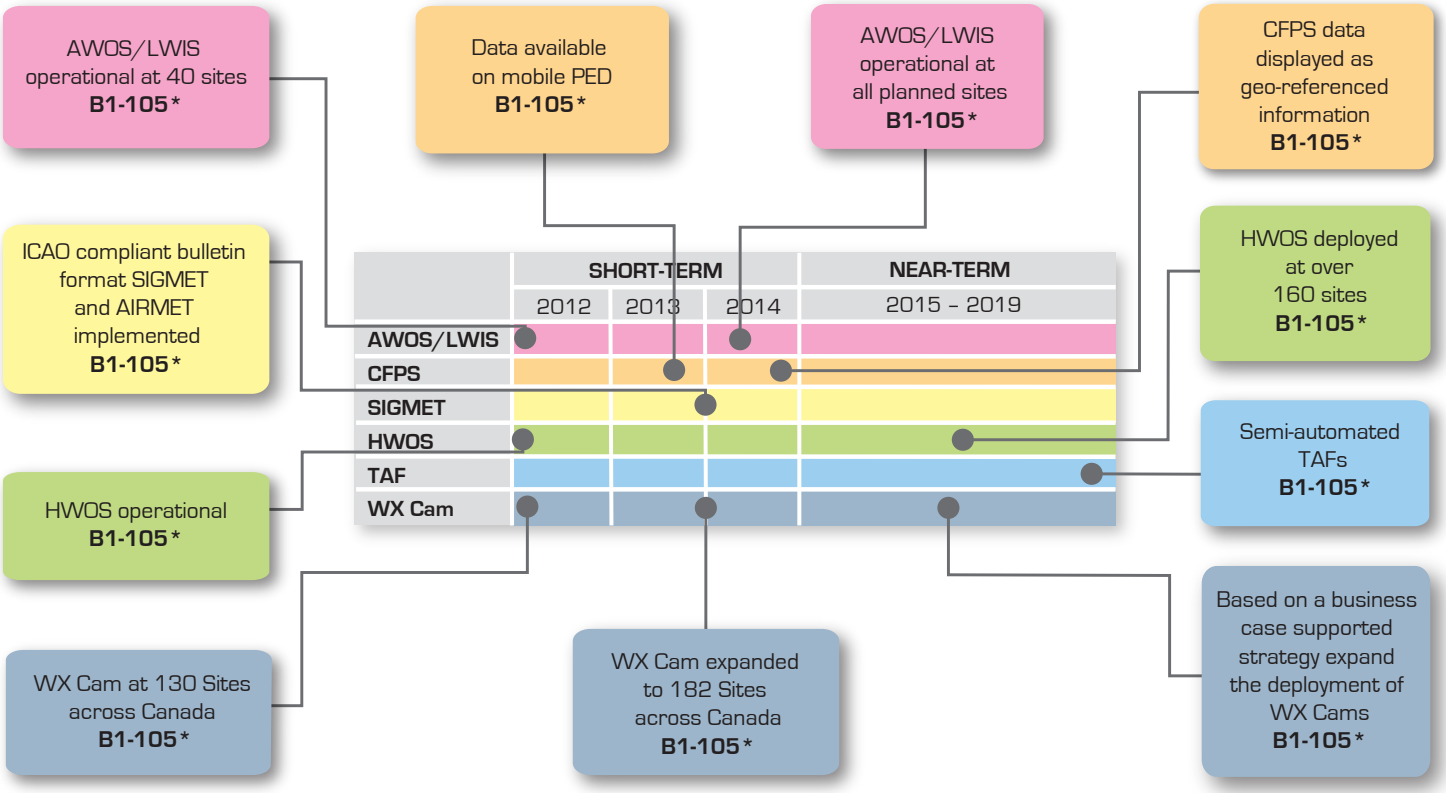
Enhancements to the CFPS will continue to be pursued based on customer collaboration. Information and updates will be available using modern technology (e.g. weather and NOTAM updates for enroute aircraft available using a mobile device). The aviation weather forecast production system will move toward the introduction of semi-automated TAFs. Enhancements to AWOS will be pursued, including applying advances in WX Camera visibility technology. HWOS will be deployed at over 160 sites. The HWOS is designed to be expandable, allowing future sensors to connect to the system.

WX Cams provide near real-time images of weather and visibility conditions, accessible through the NAV CANADA AWWS. The high resolution, colour image is updated every 10 minutes, using a wide-angle perspective, and can be overlaid with height and distance markers that reference key elements of the landscape.

The move towards a fully-automated TAF is an ongoing activity that will proceed as evolving technologies allow and in consideration of customer requirements. As the AWOS/LWIS system matures, more opportunities will be considered such as using the minute-by-minute data to support both aircraft operations and flight planning decision support systems and expanding the network of stations.

TAF is a format for reporting aviation weather forecast information. TAFs apply to a five statute mile radius from the center of the airport runway complex and are prepared for approximately 180 aerodromes across Canada and are generally prepared four times daily with periods of validity up to a maximum of 30 hours.

Aviation Weather Timeframe



*Note: * See explanation of mapping to ICAO Aviation System Block Upgrades on page 1.*

Acronym Table

AIRMET	Aviation weather advisories
AWOS	Automated Weather Observation System
AWWS	Aviation Weather Web Site
CARS	Community Aerodrome Radio Station
CFPS	Collaborative Flight Planning System
HWOS	Human Weather Observation System
LWIS	Limited Weather Information System
METAR	Aerodrome routine meteorological report
MIDS	Multipurpose Information Display System
PED	Portable Electronic Device
SIGMET	Canadian aviation weather warnings
SPECI	Aerodrome special meteorological report
TAF	Aerodrome Forecast
VGM	Voice Generator Module
VGSS	Voice Generator Sub-System
WinIDE	Windows Interactive Data Entry
WX Cam	Digital Weather Cameras
WXXM	Weather Exchange Model

APPENDIX A: ICAO AVIATION SYSTEM BLOCK UPGRADES SUMMARY TABLE

An Aviation System Block Upgrade designates a set of improvements that can be implemented globally to enhance ATM System performance. A block is made up of modules representing a specific improvement providing a performance benefit.

Modules are group in blocks based on the date of their availability for deployment as follows:
Block 0: available now
Block 1: available to be deployed globally from 2018
Block 2: available to be deployed globally from 2023
Block 3: available to be deployed globally from 2028 and beyond

Performance Improvement Areas (PIA)	Block 0 (2013)	Block 1 (2018)	Block 2 (2023)	Block 3 (2028 & >)
1 Greener Airports	Module 65 Optimization of **approach procedures** including vertical guidance	Module 65 Optimized **Airport Accessibility**		
	Module 70 Increased Runway Throughput through **Wake Vortex Separation**	Module 70 Increased Runway Throughput through Dynamic **Wake Vortex Separation**	Module 70 Advanced **Wake Vortex Separation** (Time-based)	
	Module 75 Improved Runway Safety (Airport surface surveillance)	Module 75 Enhanced Safety and Efficiency of **(Airport) Surface** Operations	Module 75 Optimized **(Airport) Surface** Routing and Safety Benefits	
	Module 80 Improved Airport Operations Through Airport-CDM **(A-CDM)**	Module 80 Optimised Airport Operations through **A-CDM**		
		Module 81 **Remote Operated Aerodrome Control Tower**		
	Module 15 Improved Traffic Flow through Sequencing **(Arrival/Departure Management (AMAN/DMAN))**	Module 15 Improved Airport Operations through **Departure, Surface and Arrival Management**	Module 15 Linked **AMAN/DMAN**	Module 15 Integrated **AMAN/DMAN/SMAN**
2 Globally Interoperable Systems and Data	Module 25 Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration. **Flight and Flow Information for a Collaborative Environment (FF-ICE)**	Module 25 Increased Interoperability, Efficiency and Capacity through **FF-ICE**/1 application before Departure	Module 25 Improved Coordination through multi-centre Ground-Ground Integration (**FF-ICE**/1 and Flight object, SWIM)	Module 25 Improved Operational Performance through the introduction of Full **FF-ICE**
	Module 30 Service Improvement **through Digital AIM**	Module 30 Service Improvement through Integration of **Digital ATM** Information		
		Module 31 Performance Improvement through the application of **System Wide Information Management (SWIM)**	Module 31 Enabling Airborne Participation in collaborative ATM trough **SWIM**	

APPENDIX A: ICAO AVIATION SYSTEM BLOCK UPGRADES SUMMARY TABLE

Performance Improvement Areas (PIA)	Block 0 (2013)	Block 1 (2018)	Block 2 (2023)	Block 3 (2028 & >)
3 Optimum Capacity and Flexible Flights	Module 10 Improved Operations through **Enhanced Enroute Trajectories**	Module 10 Improved Operations through **Free Routing**		
	Module 35 Improved **Flow Performance** through Planning based on a Network-Wide view	Module 35 Enhanced **Flow Performance** through Network Operational Planning	Module 35 **Increased user involvement** in the dynamic utilisation of the network	Module 35 **Traffic complexity Management**
		Module 105 Better Operational Decisions through **Integrated Weather Information** (Planning and Near-term Service)		Module 105 Better Operational Decisions through **Integrated Weather Information** (Near and Intermediate Service)
	Module 85 **Air Traffic Situational Awareness** (ATSA)	Module 85 Increased Capacity and Flexibility through **Interval Management**	Module 85 **Airborne Separation** (ASEP)	Module 85 **Self-separation** (SSEP)
	Module 86 Improved access to Optimum Flight Levels through **Climb/Decent procedures using ADS-B**			
	Module 101 **ACAS Improvements**		Module 101 New **Collision Avoidance System**	
4 Efficient Flight Path	Module 05 Improved Flexibility and Efficiency in **Decent Profiles** [Continuous Descent Operations (CDO)]	Module 05 Improved Flexibility and Efficiency in **Decent Profiles** [Optimized profile descent (OPD)]	Module 05 **Optimized arrivals** in dense airspace	
	Module 40 Improved Safety and Efficiency through the initial application of **Data Link Enroute**	Module 40 Improved Traffic Synchronization and Initial **Trajectory-Based Operations**		Module 40 **Full 4D** Trajectory-based Operations
	Module 20 Improved Flexibility and Efficiency in **Departure Profiles**			
		Module 90 Initial Integration of **Remotely Piloted Aircraft (RPA)** Systems into non-segregated airspace	Module 90 **RPA** integration in Traffic	Module 90 **RPA** Transparent Management


TRANSPONDER MODE C REQUIRED WITHIN 65NM OF YYZ VOR, ABV 6500 ASL
LAKE ONTARIO
TORONTO
Brampton
Oakville
Hamilton
Burlington
Niagara Falls
St. Catharines
Oshawa
TORONTO/BUTTONVILLE
TORONTO/DOWNSVIEW
TORONTO/BILLY BISHOP TORONTO CITY
TORONTO/MARKHAM
TORONTO/LESTER B. PEARSON
SERVING A WORLD IN MOTION