ANS Planning: NAV CANADA

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NAM/CAR Workshop on Performance Planning & ASBU Implementation
NACC Office of ICAO - 22-26 August, 2016
About NAV CANADA

- Private, non-share capital company
- 2nd largest ANSP by traffic
- 12 million aircraft movements annually
- 18 million square km of airspace
- Regulated by Federal Government on safety performance
Our Mission Statement

To be a world leader in the provision of safe, efficient and cost effective air navigation services on a sustainable basis while providing a professional and fulfilling work environment for our employees.
Overarching Objectives

- Safety record: top decile
- ANS customer service charges: bottom quartile, and decline over long term
- Modern, cost-efficient technology: top quartile
- Provide value to our customers: improving operational efficiency through technology and service
- Work environment: among the best in Canada
- Environment: Contribute where feasible to reduced aviation footprint
Our Customers (± 40,000)

- Airlines
- Air Cargo Operators
- Air Taxi, Air Charter Operators, Helicopter Operators
- General and Business Aviation (30,000)
Canadian Airspace Characteristics

- Vast distances
- Climate varies from polar to temperate
- Crossroads of global air traffic flows
- Busiest oceanic airspace in the world
- Unique northern airspace operations
- Stimulus for innovation
Polar Routes Growth

TRAFFIC INCREASE ON POLAR ROUTES

More than 15 times between 2003 and 2015
Planning Relationships

Customer & Stakeholder Consultations

Corporate Safety Plan

Vision
Mission
Overarching Objectives

Operations Plan

FIR & Department Business Plans
Customer fuel savings

- 1997-2015: $5 B
- 2016-2020*: $3 B
- 1997-2020: $8 B

GHG emissions savings

- 1997-2015: 13 M tonnes
- 2016-2020*: 8 M tonnes
- 1997-2020: 21 M tonnes

* forecasted achievable

Radar Surveillance

- 42 Radar Sites in Southern Canada
- 1M km² of airspace across Baffin Island, Lower Hudson Bay and Great Slave Lake Region

Multilateration

- Tracks/identifies transponder-equipped targets
- Capacity, efficiency and safety improvements
- Wide Area MLAT in: Vancouver Harbour, Vancouver Mainland, Fort St. John, Kelowna, Fredericton and Springbank
- MLAT for surface surveillance: Montreal Trudeau, Toronto Pearson and Calgary International
Automatic Dependant Surveillance-Broadcast (ADS-B)

- Supports radar-like separation
- A fraction of installed cost
- Preferred routes, reductions in fuel consumption & GHG emissions
- Hudson Bay implemented January 2009
- North East Coast-Greenland: 2011-2012

ADS-B Integration using North Warning System

- Eastern portion of Canadian North
  - Labrador coast and southern Baffin Island
- Implemented October 2010
- Immediate benefits in Gander Domestic and Oceanic airspace
Aireon LLC is a joint venture between Iridium Communications Inc., NAV CANADA, ENAV of Italy, the Irish Aviation Authority and Naviair of Denmark.

The goal of this initiative is to reduce aircraft separation minima through ADS-B (out) via Low Earth Orbiting (LEO) satellites.

**Benefits**

- First ever complete pole-to-pole coverage
- Significant annual savings
- Enhanced safety and decreased congestion
- Increased air operations capacity and efficiency
- Reduced emissions and environmental impact
Controller-Pilot Data Link Communications

CPDLC Messages | Domestic

- **Pilot Response**: 45%
- **ATC Instruction**: 42%
- **ATC Response**: 2%
- **ATC Enquiry**: 2%
- **ATC Free Text**: 4%
- **Pilot Report**: 2%
- **Pilot Request**: 2%
- **Pilot Free Text**: 1%
- **Pilot Other**: 0%

Fully functional in all domestic flight information regions above flight level 290

556,000 DOMESTIC MESSAGES in FEBRUARY 2016
Includes 258,000 Automated and System Messages

16% Over FEBRUARY 2015
More Modernization

- New Flight Inspection Aircraft and System
- Upgraded/expansion weather cameras and automated weather observation system

Electronic NAVAIDS Upgrades
- 120 Distance measuring Equipment Units (DME)
- 95 Instruments Landing Systems (ILS)
Required Navigation Performance (RNP)

“Short turn” approaches feature constant descent and reduced track miles

Total Benefits to 2020
- 351,000 mt CO$_2$e
- CAD $132 M in avoided fuel costs

Area Navigation (RNAV)

Uses GNSS and space-based systems and improves airport accessibility and enroute efficiency

Total Benefits to 2020
- 2,124,000 mt CO$_2$e
- CAD $605 M in avoided fuel costs
• World-leading safety record
• Service charges have not increased in nearly 12 years
  – 32 % below inflation (real rate decrease)
  – 35 % below old Air Transportation Tax
  – 5 % above original levels set in 1999
• Innovative technology development, with global sales
• Domestic system modernization
• Aireon, a global game changer
NAV CANADA’s ANS Plan

- Our projected plans for development
- Initiatives aimed at meeting customers’ requirements
- Generates further stakeholder discussions
- Mapped to ASBU Modules
ANS Plan Structure

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

**SHORT-TERM**
- Initial satellite launch
  - B0-OPFL
  - B0-ASUR
- Align with other ANSPs
  - B0-OPFL
  - B0-ASUR
- Develop & validate procedures
  - B0-OPFL
  - B0-ASUR
- System safety performance monitoring
  - B0-OPFL
  - B0-ASUR

**MEDIUM-TERM**
- Iridium’s next generation satellite constellation deployed with ADS-B receivers
  - B0-OPFL
  - B0-ASUR
- Evaluate the possible replacement of ISSRs with ADS-B
  - B0-ASUR
- Space-based ADS-B implemented in the NAT Region
  - B0-OPFL
  - B0-ASUR
  - B1-FRT0
- Aeronautical studies of PSRs at three sites completed

**2015**
- Space Based ADS-B

**2016**
- TSR/PSR/ISSR
- RAAS
- MLAT/WAM
- ASDE
- Fusion

**2017**
- TSR systems refresh at five major sites to begin.
- Evaluate different sensors for airport surface detection
  - B1-RATS
  - B0-SURF

**2018**
- Fusion training and Ops Evaluation
  - B0-SURF
- Deploy Enroute/Terminal Fusion upgrades
  - B0-SURF
- Expand surface surveillance coverage with MLAT in Vancouver
  - B0-SURF

**2019**
- ASDE equipment upgrades
  - B0-SURF
- Fusion safety net additions
  - B0-SURF
- Enhance RAAS through new technology
  - B1-RATS

**2020**
- Gate-to-gate Fusion integration and national capabilities
  - B0-SURF

**2021**
- Fusion gate-to-gate (surface/air) integration
  - B0-SURF

**2022**
- ASDE augmented with MLAT/video
  - B0-SURF

**NAV CANADA**

SERVING A WORLD IN MOTION
Air Traffic Management

FSS technology upgrade completed B0-ACDM* B0-FIC*  
CFPS integrated weather and Flight Plan functionality implemented B1-SWIM*

Develop an ATM CONOPS to address a catastrophic GNSS failure

Develop online coordination with AOCGs B1-SWIM*

Implement WXXM B0-AMET*

Advance the capability and functionality of GAATS, FUSION and GAATS+ as warranted

Incorporate FIXM into ATM systems where supported by a business case B0-DATM*

SHORT-TERM


ATM Enhancements

AMAN

RLongSM

RLatSM

DST/Safety Net

RPAS

Implement phase 1 RLatSM in the NAT B0-NOPS*

Study CYA requirements at Foremost, AB and Alma, QC B1-RPAS*

Procure and deploy AMAN B0-RSEQ*

SARA implemented B0-NOPS* B0-RSEQ*

Continue the integration of RPAS into the ANS B1-RPAS*

Decision Support Tools B0-SNET*

SARA

Based on trial outcomes and appropriate approvals, implement RLongSM in the NAT and in Gander domestic airspace B0-NOPS*
Aeronautical Information Management

**Short-term**
- Electronic publications product line expanded to include the eCFS by province B0-DATM*
- Canadian NOTAM converted to ICAO format with geo-referencing B0-DATM*
- AIP online B0-DATM*
- Canadian NOTAM format decommissioned
- Manual and automated interface for RSO continue to be expanded B0-DATM* B1-SWIM
- NOTAMJ replaced with ICAO SNOWTAM B0-DATM*
- Digital NOTAM implemented B0-DATM*
- Research the concept of providing downloadable electronic charts B0-DATM*
- Research with vendor partners the concept of print on demand B0-DATM*

**Medium-term**
- The availability of eTod data will continue to be expanded geographically B0-DATM*
- Automated support Tools Coordinate Across Services Operationalize Business Unit Mission Essential Service B0-DATM*
- Aeronautical data available on PEDs expanded to additional vendors B0-DATM*
- AIXM Move to AIXM 5.1 B0-DATM*
- eAIP Aerodromes (AD) Section available B0-DATM*
- AIS Quality Management B0-DATM*
- eAIP General (GEN) Section available B0-DATM*
- eTOD project start B0-DATM*
- eTOD business case developed in full consultation with all stakeholders B0-DATM*
- eAIP Enroute (ENR) Section available B0-DATM*
- AIS to AIM

**Long-term**
- AIRAC, CFS, WAS and DAH replaced by eAIP B0-DATM*
- Network Information Management B0-DATM*
- Optimize Process Staff Qualification Information Lifecycle B0-DATM*
- AIS to AIM
Aviation Weather

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**SHORT-TERM**

- CFPS data displayed as geo-referenced with Flight Plan information
- Install standalone sensor equipment in the event of an AWOS outage
- LWIS capability will be installed on all part-time HWOS units
- HD-AMET

**MEDIUM-TERM**

- Develop a backup plan to ensure weather sensor data is available to ATM Systems in the event of other weather system failures
- B0-AMET
- Data available on mobile PED
- B0-AMET

- HWOS deployed at over 150 sites
- B0-AMET

- Based on a business case supported strategy expand the deployment of 70 WX Cams
- B0-AMET

- Semi-automated TAFs
- B0-AMET

- Ceilometers will be installed at all remaining human observation sites
- B1-AMET
Linking to Regional and Global Planning

• Our consultative and planning processes remain the same
  – customer and system performance requirements drive our initiatives
  – moving to global, rather than Canadian, requirements and provisions
• Element level descriptions allow direct correlation between ASBU Modules and applicable initiatives in our ANS Plan
• ANRF for each Module based on the ANI/WG forms
  – reviewed with subject matter experts
  – determines implementation status of ASBU Elements
  – identifies national initiatives outside ASBU framework
  – supports coordination with Transport Canada for reporting to ICAO
  – will support completion and maintenance of NAM ANP Volume III
## ASBU Implementation - Block 0

<table>
<thead>
<tr>
<th>Module</th>
<th>Elements</th>
<th>Need Analysis</th>
<th>Implementation Status (if Element is needed)</th>
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<td>1. Airport CDM procedures</td>
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<td>3. Collaborative departure queue management</td>
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<td>APTA</td>
<td>1. PBN Approach Procedures with vertical guidance (LPV, LNAV/VNAV minima, using SBAS and Baro VNAV)</td>
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<td>2. PBN Approach Procedures without vertical guidance (LP, LNAV minima, using SBAS)</td>
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<td>3. GBAS Landing System (GLS) Approach procedures</td>
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<td>1. AMAN via controlled time of arrival to a reference fix</td>
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</tr>
<tr>
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<td>2. AMAN via controlled time of arrival at the aerodrome</td>
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<td>4. Departure flow management</td>
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<td>5. Point merge</td>
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<td>2. Including ADS-B APN as an element of A-SMGCS</td>
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<td>3. A-SMGCS alerting with flight identification information</td>
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<td>4. Airpport vehicles equipped with transponders</td>
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<td>WAKE</td>
<td>1. New PANS-ATM wake turbulence categories and separation minima</td>
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<td>2. Dependent diagonal paired approach procedures for parallel runways with centrelines spaced less than 760 meters (2,500 feet) apart</td>
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<td>3. Wake independent departure and arrival procedures for parallel runways with centrelines spaced less than 760 meters (2,500 feet) apart</td>
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<td>4. Wake turbulence mitigation for departures procedures for parallel runways with centrelines spaced less than 760 meters (2,500 feet) apart</td>
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<td>5. 6 wake turbulence categories and separation minima</td>
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<td>5.</td>
<td>Wind shear warnings and alerts</td>
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<td>Other OPMET information (METAR, SPECI and/or TAF)</td>
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<td>QMS for MET</td>
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<td>Aeronautical Information Exchange Model (AIXM)</td>
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<td>1.</td>
<td>AIDC to provide initial flight data to adjacent ATSUs</td>
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<td>AIDC for control data transfer</td>
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<td>4.</td>
<td>AIDC to transfer CPDLC logon information to the Next Data Authority</td>
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<td>3. Minimum Safe Altitude Warning (MSAW)</td>
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<td>2. Continental CPDLC</td>
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Thank you so much Midori!

Carole Stewart-Green
carole.stewart@navcanada.ca