NAVAIDs Modernization Program - FAQ

1. Some aircraft operators design their Engine Failure Procedures (EFP) based on the NDB, particularly in mountainous areas. Will NAV CANADA delay the decommissioning of NDB until aircraft operators have developed RNAV EFP?

AeroData, General Electric (GE) and other aircraft performance companies have developed RNAV-based EFP. These RNAV EFP are in use today and coded for the Universal and Collins FMS. These have been available for use since 2015. The decommissioning of NAVAID will be coordinated with aircraft operators in the area to allow them sufficient time to develop RNAV EFP.

2. If NDB are decommissioned in the north, how will pilots reset their gyroscope or magnetic compass to a true heading prior to commencing their approach as required by regulation?

Retaining NDBs at larger locations north of 60 with high-powered facilities (Inuvik, Yellowknife, Rankin Inlet, Iqaluit) and at other sites as required to provide NDB signal reception to all registered or certified aerodromes, but not necessarily required as recovery airports, will allow pilots to meet the regulatory requirement to reset their compass prior to descent.

3. How will pilots flying in the north where there is a lack of surveillance, combined with the great distances in many cases between suitable airports be able to locate a suitable recovery airport in the event of decreased performance of the GNSS?

In addition to the radar at Yellowknife, Iqaluit, Kuujjuaq and Goose Bay, retaining NDBs at larger locations north of 60 with high-powered facilities and at other sites as required to provide NDB or VOR signal reception to all airports with 24 hour aviation weather observations (METAR) and aerodrome forecasts (TAF) as well as additional airports in northern and remote regions. These aerodromes, suitable to the needs of the operators serving the area will be included in the recovery network to allow pilots more choices in the event of large-scale GNSS outage.

4. Decommissioning ground-based NAVAIDs at airports located less than 100 NM distance from other airports with RNAV (GNSS) approaches only will not allow these airports to be held as IFR alternate airports. Will these NDB be retained to provide aircraft operators with suitable alternate aerodromes?

Ground-based NAVAIDs at airports for which a TAF is issued and have other airports within 100 NM, will be retained to provide for choices for alternate airports that are less than 100 NM from the destination airport.

5. Decommissioning ground-based NAVAIDs will result in the airway and air route segments that are based on them to be revoked. How will pilots of commercial flights operate in uncontrolled airspace?

Low-level RNAV routes (L-routes) will be established where required between airports to replace the LF air routes that are revoked when the NAVAIDs are decommissioned. This will permit commercial IFR flight between the airports.

6. How will pilots of non-DME equipped aircraft be able to access a recovery airport if the recovery instrument procedure requires the use of a DME?

Most ILS and VOR instrument procedures in Canada require a DME, where one is available. At locations where a NDB supports the ILS procedure, the NDB may be replaced by a DME. All ILS/DME procedures include a circling procedure which is available to pilots of non-DME equipped aircraft. Where possible, airports for which the VOR is the recovery NAVAID, if there is a VOR procedure it will be retained as the recovery instrument procedure and the VOR/DME procedure revoked. This will increase the number of recovery airports available to the greatest number of IFR operators. At recovery airports where terminal radar service is provided, the air traffic controllers could provide radar assistance to pilots of non-DME equipped aircraft to identify the FAF. Operators of non-DME- equipped aircraft will have to consider their area of operations when making equipment related decisions.

7. If the NAVAID on which the missed approach (MA) portion of an instrument procedure is decommissioned will the minima for that procedure be raised?

Criteria for the Design of Instrument Procedures (TP308) makes for the provision of the use of distance measuring equipment (DME) to support the missed approach segment. DME will be relocated if the VOR is decommissioned or installed to replace a NDB to maintain the MA segment of an IFR procedure and every attempt will be made to maintain the minima at the current limits.

8. If the instrument procedure based on the VOR or NDB is revoked because of the decommissioning of the NAVAID will the airport will be inaccessible for IFR operations by illegal GPS jammers?

No; the use of illegal GPS jammers is usually transient, being located in a vehicle and therefore temporary in its impact in the vicinity of the airport. The pilots of aircraft for which the GNSS signal is temporarily unavailable could request radar assistance from ATC and conduct a landing approach to the airport by either a visual approach or by using the ILS.

9. How will the pilot of an IFR aircraft that is not able to maintain flight at 10,000 ft ASL, or climb to 10,000 ft ASL to be within surveillance airspace or receive a signal from a NAVAID be able to receive assistance to fly to a recovery airport?

The pilot of an aircraft operating IFR below 10,000 ft in instrument meteorological conditions (IMC) at the time of a significant GNSS failure would have to climb as high as possible to obtain radar assistance from ATC or to receive a signal from a ground-based NAVAID and make a decision on the best course of action regarding the most appropriate recovery airport to proceed to. Recognising the 10,000 ft limitation, the recovery plan is based on surveillance and signal coverage at 10,000 ft ASL.

It is assumed that IFR qualified pilots would be able to use dead reckoning for up to 100 NM to enter a NAVAID signal or surveillance coverage area at which point they would be able to receive radar assistance to proceed to a suitable recovery airport, or navigate to one themselves by use of the NAVAID signal. This is deemed as an acceptable recovery strategy.

The proposal is to retain sufficient NAVAIDs to provide a recovery NAVAID to support the recovery airport network and supplement the areas of radar surveillance. This will lower the likelihood of a pilot being unable to receive a signal from a recovery NAVAID in the event of a significant GNSS outage.

10. How will pilots obtain vectors from ATC to a recovery airport if the pilot is flying in uncontrolled airspace and the airport is in an area of uncontrolled airspace?

Airports equipped with an ILS are considered to be recovery airports and an airport located in an area of uncontrolled airspace will also be equipped with a ground-based NAVAID to enable pilots to navigate to the airport in the event of a significant GNSS outage. The Manual of ATS provides guidance to air traffic controllers which allows them to provide vectors to an aircraft into Class G airspace provided that they inform the pilot and obtain the pilot's approval.

11. Many aircraft, especially new ones may not be equipped with NDB. How will pilots of these aircraft be able to fly to and land at a recovery airport?

Where surveillance coverage is not available, or insufficient to provide radar vectors to the ILS, a VOR, if available, will be retained as the recovery enroute NAVAID to assist navigation to a recovery airport, or to serve as the recovery NAVAID to support the instrument approach to the airport. NDB will only be retained as a recovery NAVAID where there is no alternative.

12. With the decommissioning of VOR and NDB, there will be less opportunity for flight schools to train students on the use of these NAVAIDs, for both enroute and approach navigation. How will students obtain the training on ground-based NAVAID?

Flight training schools are increasingly focussing on simulator usage to overcome the increased cost in operating the aircraft. Today's simulators are very realistic and can easily be used to teach the basics of VOR and NDB navigation. If live practice is deemed necessary, travel to a location that a VOR or NDB remains in place is an option.

NAV CANADA estimates that the likelihood of a total GNSS system failure is very low. It is so low in fact that the Transport Canada Flight Test Guide (TP9939) no longer requires the completion of a VOR or NDB approach during an initial or recurrent flight test. NAV CANADA is transforming the air navigation system to one based on GNSS. In the highly unlikely event of a wide spread GNSS failure many recovery

airports are equipped with ILS and are within surveillance coverage. In some remote areas where there is no surveillance service, navigation to a remote recovery aerodrome may involve tracking to a VOR or NDB and then completing an ILS approach. At recovery aerodromes that are not ILS equipped, a VOR or NDB procedure will have to be flown. Pilots who operate in remote regions have the opportunity to practise using the VOR or NDB procedures that are in place during the course of their normal operation.

13. How will operators of non-RNAV equipped aircraft be able to fly IFR if the majority of VOR and NDB are decommissioned?

NAV CANADA is following the ICAO lead in modernizing Canada's airspace. The transition to a Space Based Air Navigation System has been part of the NAV CANADA' Operations Plan for the implementation of performance-based Navigation (PBN) in Canadian airspace that was published in 2014 was developed collaboratively with our customers in recognition of the shared role, responsibility and benefits that PBN represents. The concept of a PBN has been on the agenda of our FIR based customer forums and our meeting with the various operator and airport groups.

As NAV CANADA progresses through the transition and modernizes the ANS, there is an expectation that operators must also make an investment to upgrade current equipment or obtain new fleets that are capable of operating within the new structure. The implementation of the proposed decommissioning of selected NAVAIDs will occur over several years which will allow aircraft operators time to make decisions regarding their fleet. Advance notice of change has been given and NAV CANADA will continue to work with operators to ensure the system transition is scheduled to minimise the impact.

14. In the event of a significant GNSS outage IFR operators will have to fly to an airport with a ground-based NAVAID which may be other than their planned destination or alternate. How will pilots be aware of the weather conditions at the recovery airport?

Where possible all airports designated as recovery airports will have 24-hour aviation weather observations (METAR) and TAF available. Where this is not possible the site will have at least limited hour METAR and TAF. Airports without weather information will not be included in the recovery network. Contacting the appropriate FIC will allow pilots to obtain the latest weather information at the recovery airport.

15. What steps will NAV CANADA take to reduce the duration and frequency of outage times for the remaining NAVAID, on which the recovery network is based?

The current ANS has a maintenance response time (MRT) assigned to each NAVAID based on their criticality to the overall network. This policy remains in force going forward, ensuring no change in the levels of safety. In addition, the probability of a significant, wide-spread and prolonged GNSS outage is extremely remote. The recovery network is composed of ground-based NAVAIDs as well as surveillance coverage with communications allowing air traffic to supplement aircraft navigation capability with vectors. Controllers will provide clearance to an airport with an operational landing system appropriate for the type of aircraft concerned. This will occur regardless of whether the aircraft is within surveillance coverage.

In the highly unlikely event of a multiple unrelated failure of both the GNSS infrastructure and a specific destination ground-based NAVAID at the same time that IMC prevails at the intended destination, a request for an alternate destination would be required.

16. Does NAV CANADA plan to increase the maintenance frequency of NAVAIDs, or decrease the maintenance response time?

Planned/scheduled maintenance of the NAV CANADA NAVAID infrastructure is based on established mean time between failure data and any regulatory statute that applies. During the study process consideration was given to the ability of our technicians to reach remote sites in the event of a failure. There are examples where selection of recovery network NAVAID was based on having a technical work centre on site or nearby.

In day to day operations RNAV is the primary means of navigation. Ground-based landing aids being retained as part of the recovery network have an MRT based on the role of the airport and the NAVAID appropriate to the level of risk and will continue to be assessed against this criteria. There are no plans to change current MRTs on existing NAVAIDs; however, should conditions materially change, the system will be assessed to ensure ongoing conformance to the published policy.

17. What risks to air navigation are posed by solar flares and other space weather phenomena?

The Canadian Space Weather Forecast Centre (CSWFC) in Ottawa is operated by Natural Resources Canada (NRCan). It is a Regional Warning Centre of the International Space Environment Service and contributes to the World Meteorological Organization. Scientists in the CSWFC both monitor and research space weather and its impacts on a variety of technologies. Their goal is to reduce the risk of interruptions to the safe operation of critical infrastructure, such as power grids, pipelines, satellites, communication, and navigation. In collaboration with other government departments, universities and industrial partners such as NAV CANADA, NRCan researchers have provided many important contributions to reduce the vulnerability of critical technology to space weather hazards. These include developing forecasts, alerting of hazardous geomagnetic storms, and modeling and monitoring geomagnetic effects on power systems, pipelines, satellites, HF communication, and GPS navigation. NAV CANADA receives notice of geomagnetic effects that could be hazardous to HF communication and GPS navigation, while NRCan researchers continue to investigate new and emerging topics to improve space weather forecasts.

Through all of the eleven-year solar maximum cycles recorded since GPS was declared to have met full operational capability by the FAA in 1993, there has not been any solar flare activity that has resulted in the loss of enroute RAIM availability in Canada. Furthermore, no solar activity has resulted in catastrophic loss of GPS positioning capability.

18. How long will the NMP project take?

Implementing the entire NMP program is expected to take 5½ years. The program is divided into twelve phases of approximately 20-28 navigation aid removals per phase.

19. What determines the order of the NAVAID removals?

Generally, each navigation aid is assessed based on complexity, impact, workload, life-cycle, and geographic location. Navigation aids that are located close to major airports will be removed later in the program as these areas may be subject to separate airspace projects that will require more time to plan and implement.

20. Does the NMP program include physically removing the selected navigation aids?

No, the NMP program only removes the navigation aids from aeronautical publications and implements required mitigation. A separate program, led by our Technical Operations group, will physically remove the infrastructure.

21. Do the NMP removals follow the Aeronautical Information Publication schedule?

Yes, removals will occur on regular publication date cycles. Generally, a NMP phase will be implemented once every three publication cycles. For example, Phase 1 is targeted for 25 April 2019 and Phase 2 is targeted for 10 October 2019.

22. Who do I contact for further information?

Please send all inquiries to service@navcanada.ca.