

**48<sup>TH</sup> CONFERENCE OF  
DIRECTORS GENERAL OF CIVIL AVIATION  
ASIA AND PACIFIC REGIONS**

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AGENDA ITEM: 3      Air Navigation Planning and  
Implementation

**GNSS PROCEDURES  
IN NEW CALEDONIA**

(Presented by France)

***DISCUSSION PAPER***

**SUMMARY**

This paper describes the advantages expected from the use of GNSS based Area Navigation (RNAV) procedures at airports on small islands and the efforts deployed to develop such procedures for New Caledonia airports/airfields.

## **GNSS PROCEDURES IN NEW CALEDONIA**

### **1. A New Era in Air Navigation**

1.1 After the limited appeal of Area Navigation (RNAV) in the seventies, when aircraft were allowed to navigate between beacons, RNAV finally met with success with the development of satellite positioning.

1.2 More than 15 years ago, the GPS constellation became fully operational with a precision of about hundred meters for civilian users. In 2000, the United States decided to stop the intentional degradation of the GPS signal accuracy available to civilian users. GPS became the best worldwide positioning system.

1.3 Even though the GLONASS constellation enhanced satellite positioning, the use of the GPS system owned and maintained by a single nation was a concern, until the United States committed to ensure the continuity and precision of the signal available to civilians. The system became the Global Navigation Satellite System (GNSS).

1.4 At the same time, this innovation was seized by industry and fitted wherever positioning, tracking or navigation was needed. We all use in our daily life applications based on these positioning systems.

1.5 Air navigation is still supported by radio aids on the ground, which could be implemented, maintained and controlled by states. If in many countries the network of VOR, NDB, DME and ILS provides enough precision to navigate between radio-aids, isolated islands have no other option than relying on one or two radio-navigation aids positioned at the airport. The expansion of traffic, congestion at airports and fuel costs point to the need to move routes, use direct tracks to reduce costs to operators and optimise the use of the airspace.

1.6 RNAV based on radio-aids and GNSS seems to be the most promising improvement to be expected in aviation and, as for any new technology, will need years to come to full operational use.

1.7 In New Caledonia as in a lot of other island territories in the Asia-Pacific region, it is not so much the reduction of delays or benefits in terms of separations that are expected, but essentially a better air navigation system for operators.

### **2. The RNAV System**

2.1 The area navigation system is a system which allows aircraft operation on any desired flight path within the coverage of station-referenced navigation aids, or within the limits of the capability of self-contained aids, or a combination of these.

2.2 VOR and DME are the station-referenced navigation aids used for RNAV. If these are acceptable for area navigation within continental areas equipped with a large number of VORs and DMEs, in smaller territories and especially island territories, the number of VORs and DMEs installations is insufficient to provide the information required for RNAV.

2.3 New Caledonia has only 3 DMEs and coverage is limited by the mountainous terrain across the main island. Co-located VORs have the same restrictions. GNSS is therefore the only navigation infrastructure useable for RNAV.

### **3. RNAV Criteria**

3.1 With ICAO support, the Performance Based Navigation (PBN) manual has entirely changed the way of apprehending, and allows a better understanding of the technicality of onboard equipment, design

of procedures, ATC staff and pilot training and safety assessment.

3.2 This manual also allows a standardisation of the terminology and criteria for navigation specifications:

- RNAV without onboard performance monitoring and alerting, (i.e. RNAV5, RNAV1)
- RNP with onboard performance monitoring and alerting. (RNP APCH)

3.3 Because of equipment limitations, RNAV is supposed to be used under radar surveillance unless a safety assessment demonstrates an RNAV capability with no radar coverage.

## **4. Onboard Equipment Issues**

### 4.1 Industry:

From the industry perspective there are specific issues:

- Terminology from the PBN manual is not always clearly understood by industry. It is sometimes difficult to understand whether the aircraft has RNAV or RNP capability in different phases of the flight.
- Stand-alone RNAV equipment is available, ready to be fitted in older and medium to small aircraft, but the onboard installation requires a Supplement Type Certification (STC) to be accepted.

### 4.2 Air Traffic Control

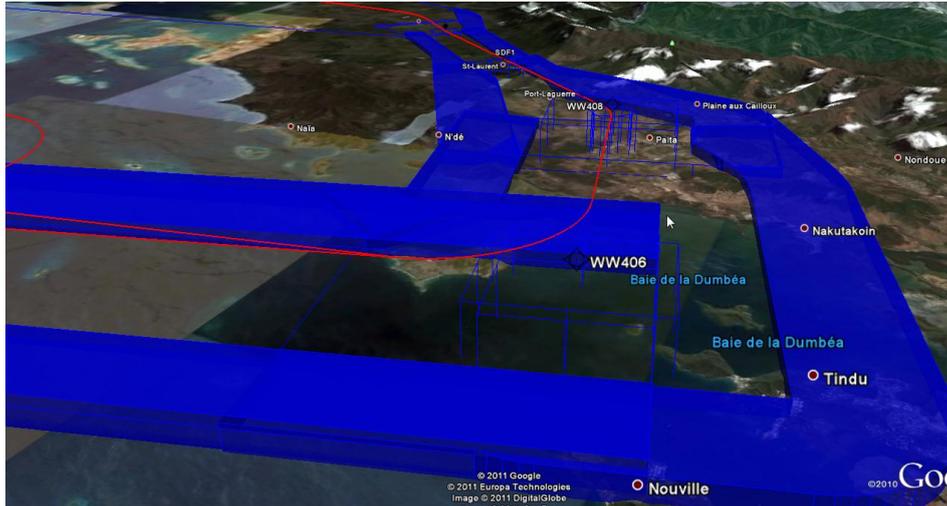
From the ATC's perspective, conventional procedures and RNAV procedures are co-existing as not all aircrafts have GNSS capability. It gives more difficulty to ATC to control and separate aircrafts on different tracks, especially with no radar surveillance.

A precise inventory of aircraft capabilities must be performed prior to planning an expansion of new procedures.

## **5. GNSS Procedures in New Caledonia**

### 5.1 Tontouta International Airport

The first procedure designed in New Caledonia was for a runway that could only be used with visual prescribed track procedures, with a turn towards the runway axis on final approach facing the mountain, as allowed by the PBN manual.



In close collaboration with major operators at the airport (Air Caledonie International, Air Austral, Air New Zealand, Qantas), we have been able to test this procedure on simulators before publication.



Feedback from ATC is required in order to improve safety. At this stage, comments mostly address the ATC perspective, which is common when a new IFR procedure is set up.

The main concern is the lack of arrival tracks on the approach fix to be flown on RNAV5 navigation specification. We are developing a safety assessment of the use of RNAV5 and RNAV1 without radar coverage.

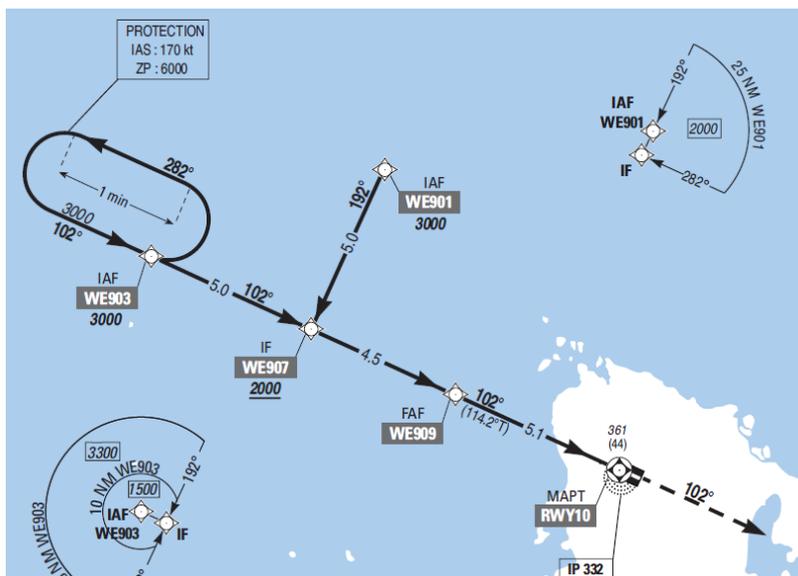
Before July 2012, we intend to design a GNSS procedure on the other runway which will be used during the renewal of the ILS and will provide operators the advantage of a runway aligned procedure with lower minima than the conventional backup procedure.

## 5.2 Domestic Airports

Two main operators are equipped to perform GNSS approaches: Air Caledonie with its ATR72 aircraft and Air loyalty with a recent DHC6 aircraft.

We have focused our priority on designing procedures for two islands.

- Isle of Pines: Nearest island from Nouméa. 19 minutes of flight to reach the NDB beacon, plus 9 minutes for the conventional approach procedure. The GNSS procedure already submitted to operators will save 9 minutes of flight.



- Tiga Island: Tiga is a small island with a 1100 m asphalt strip. There is no beacon on the island and the only possibility to land, is visually.

Procedure design for each runway will make it possible to follow an IFR procedure to minima.

- Others: On other islands, we intend to design GNSS procedures starting with Lifou, Maré and Ouvéa, and on main land at Koné, Touho, Magenta

### 5.3 Implementation Planning of GNSS Approaches in New Caledonia

Airports	2011	2012	2013	2014
Tontouta Intl	RWY 29	RWY 11	RNP RWY 29	
Magenta			RWY 35	
Isle of Pine	RWY 10/28			
Tiga		RWY 16/34		
Lifou		RWY 12/30		
Maré			RWY 13/31	
Ouvéa			RWY 13/31	
Koné			RWY 09/27	
Touho				RWY 13/31

## 6. RNP Authorization Required (RNP AR)

RNP AR use the accuracy of GPS coupled with the capabilities of modern Flight Management Computers (FMC) to allow the aircraft to fly flexible paths using linear containment surfaces.

Initially this specific type of approach was intended to be used in difficult environment, such as Nepal, China, Alaska, South New Zealand. Australia and New Zealand main operators have opened another option by spreading the RNP AR procedure in numerous airports.

We intend to use this experience to design RNP AR approaches at Tontouta international airport.

## **7. Action by the Conference**

The Conference is invited to/

- 7.1 note the information provided in this paper; and
- 7.2 considering the significant advantages in terms of cost-efficiency and safety of operations, encourage States in the Asia and Pacific regions to develop GNSS based procedures for aerodromes under their jurisdiction, in particular when limited ground based navigation aid capabilities exist.

## **Executive Summary for consideration for inclusion in the Conference Report**

### **GNSS PROCEDURES IN NEW CALEDONIA**

**If the use of the GPS is common in everyday life, it is more recent in the aviation domain. The first reason is a need to mitigate risks associated with relying on a single air navigation system. There are also costs associated with upgrading fleets of aircrafts flying in IFR, from heavy lifters to medium and small aircrafts, to enable them to use RNAV procedures.**

**In terms of GNSS efficiency and reliability, nothing needs to be proved anymore.**

**In New Caledonia, with GNSS approaches implementation at Tontouta, Isle of Pine and Tiga airports, the following goal are being achieved:**

- **Enhancing safety with an IFR procedure instead of a visual circling approach**
- **Reducing costs to operators with direct approaches**
- **Providing access with full IFR approach to airports which had no radio aids**

**There are still some difficulties to the expansion of GNSS, especially in island territories where a big part of the traffic is based on small to medium aircraft that need approved STC to be equipped at an acceptable cost. This leads to a combination of mixed navigation tracks including conventional aids and RNAV routes, which add complexity to ATC operations.**

**The efforts deployed in New Caledonia to develop GNSS procedures are highlighted and operators are encouraged to use GNSS certified aircraft. States in the region are invited to develop GNSS based procedures for aerodromes under their jurisdiction, in particular when limited ground based navigation aid capabilities exist.**