



PHILIPPINES

ATC EXPERIENCE ON PBN

a Brief History

➤ **Dependency to Ground Navigational Aids**

In June 2010, the outage of the Manila DVOR/DME and ILS system brought air traffic to a halt. The very low visibility did not help the situation. Scores of flight have to be diverted to nearby airports displacing thousands of air travellers for days. Normal flights to Manila resumed when authorities assured that a safe landing can be made.

a Brief History

➤ **Fleet readiness**

Consultative meetings with local airline operators have been conducted since 2007 to determine the airlines' capability to perform RNAV procedures. Successive surveys were conducted in 2009 and 2010. In 2009, only two (2) out of the five (5) local airlines signified capability to meet the navigational accuracy requirements. By the end of 2010, 90% of domestic registered aircraft are ready and equipped with GNSS avionics necessary to perform RNAV procedures.

a Brief History

➤ **ICAO Mandate**

The 36th Session of the ICAO Assembly held in Montreal in September of 2007 adopted Resolution A36-23 urging all States to implement RNAV and RNP air traffic services (ATS) routes and approach procedures in accordance with ICAO PBN concept described in the *Performance Based Navigation Manual* (Doc 9613).

PBN Training for ATC

On January 24 to 26, 2012. QUOVADIS conduct a PBN training for ATC;

- ❖ Concept of PBN
- ❖ Procedures
- ❖ Stripmarkings
- ❖ Phraseologies
- ❖ Chart Symbols

PBN Training for ATC

- Air Traffic Service ordered Manila Approach training staff to conduct lecture and dry-run to other ATC facilities where RNAV will be implemented.

The ATC facilities are:

1. Legaspi Approach
2. Butuan Approach
3. Laguindingan Approach
4. Iloilo Approach
5. Puerto Prinsesa Approach
6. Tacloban Approach

PBN Training for ATC

7. Bacolod Approach
8. Davao Approach
9. Kalibo Approach
10. Tambler Approach
11. Clark Approach
12. Laoag Approach
13. Caticlan Approach

Experiences on PBN Implementation

- During the first year of implementation of RNAV, ATC verifying all aircraft if RNAV capable.

(Based on the fields of the flight plan check item # 10 and item # 18.) before giving a clearance for an RNAV procedure.

Experiences on PBN Implementation

- In the Philippines we're using RNAV1 and RNP1.
- Manila, Mactan and Clark are using RNAV 1 due to availability of Radar.
- Other airports utilizing RNP1 due to non radar environment.

Experiences on PBN Implementation

- Handling of RNAV capable and non RNAV.

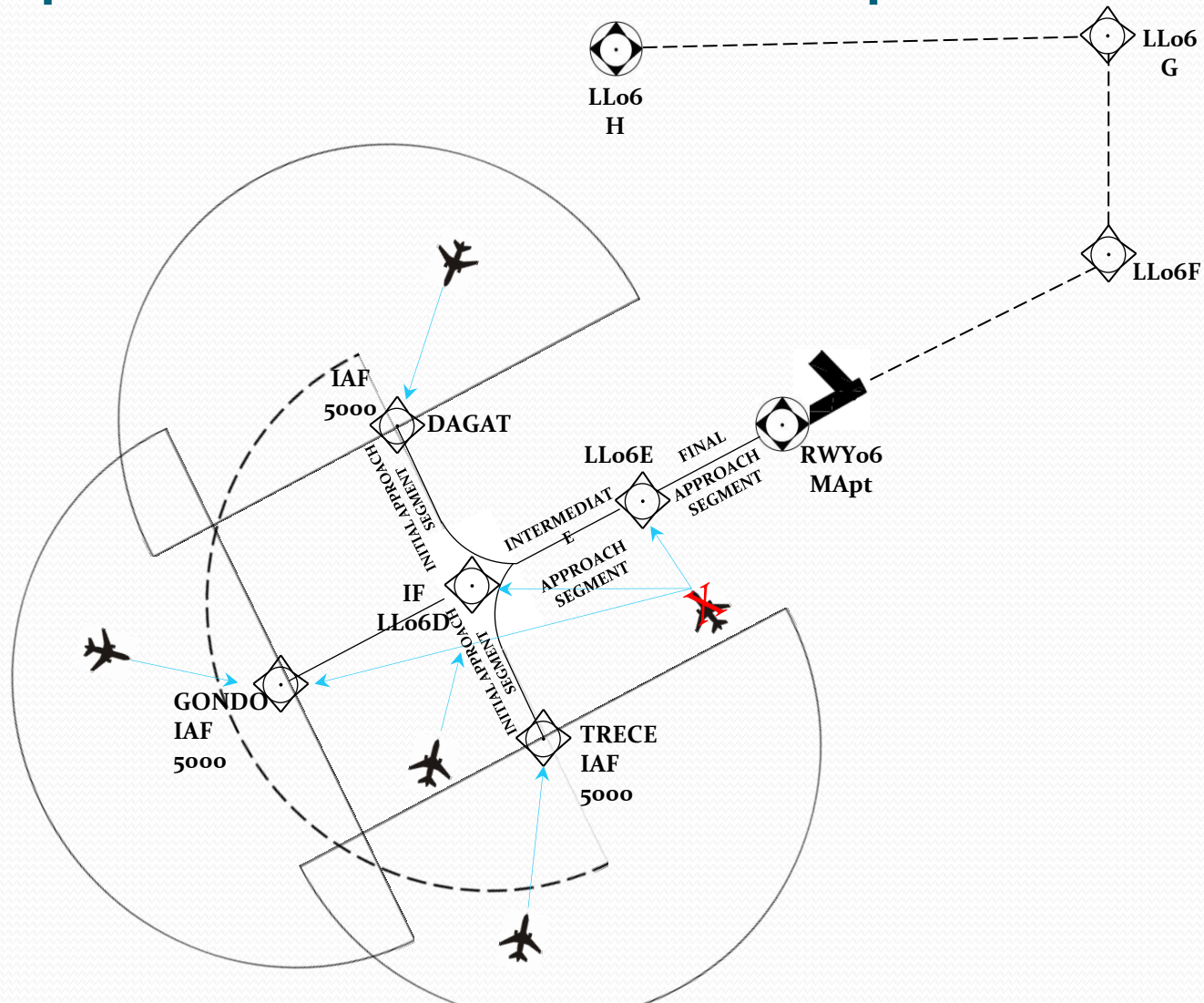
If an ATC faced a difficult situation in handling a mix traffic, ATC discourage the RNAV capable aircraft not to use RNAV STAR.

Experiences on PBN Implementation

- Some pilots opted to request fly to FIX (IF) sometimes its a shorter route than the RNAV STAR.

In some cases pilot were discourage to fly direct to (IF) if the interception to FIX is more than 90 degrees.

Experiences on PBN Implementation



Experiences on PBN Implementation

- Several aircraft significantly diverts from the RNAV SID/STAR path due to weather.

ATC procedure and training to manage a request of deviation from an RNAV procedure: termination of the RNAV SID/STAR procedure, management of the situation by the pilot without the responsibility of the ATCO, delivery of new clearance by the ATCO once the weather problem is solved.

Experiences on PBN Implementation

- Several aircraft significantly diverts from the RNAV SID/STAR path due to failure of GNSS signal.

ATCO procedure and training specifying the necessity for ATCOs to report any GNSS interferences to all aircrews.

Experiences on PBN Implementation

- During arrival phase RNAV clearance to STAR were not issued immediately.

Training of ATCs regarding RNAV must not be limited to approach controllers only.

Experiences on PBN Implementation

- Interference between aircraft on RNAV SID without appropriate separation.

ATCO trained to the specific features of the new procedure, particularly if there are no strategic separations between trajectories.

ATCO procedure and training specific for the management of mixed traffic.

Training for the new ATCO procedures should specify points at which an ATCO may discourage use of PBN procedures when managing mixed traffic environment.

Experiences on PBN Implementation

- GPS signal interruptions were experienced as a result of RNAV implementation are suspended.

RNAV implementation were temporarily suspended until the problem are resolved.

Safety Assessment Activities

The SMS assessment made for Iloilo and Puerto Princesa airports provided a significant guide for PBN implementation for 11 other airports:

- (1) A standard documentation format was designed and prescribed for the ATS facilities providing the approach control services for Iloilo and Puerto Princesa airports. The same format will be applied for all other facilities as they update their respective facility ManOps.
- (2) Stripmarking procedures relevant to PBN implementation was devised and prescribed to all concerned ATS facilities. This innovation is in no way contrary to any ICAO SARPs, CAAP regulations, and ATS standards and generally accepted by everyone in the ATS.
- (3) An additional set of phraseologies were established and shall be used exclusively for the provision of PBN-related procedures.
- (4) Additional coordination procedures may be required in some instances.
- (5) Re-familiarization with FPL processing was prescribed to ensure better understanding of traffic and a clearer picture for pre-planning.

The revised Safety Management Manual (ICAO Doc. 9859 3rd Edition) provided new processes and mechanisms. These updates were adopted by the ATS and applied for the Legazpi review which was completed in 14 February 2014. The ATS SMS used new forms and new technical term as recommended by ICAO. Due to these changes, the conduct of HIRM or Hazard Identification and Risk Management (formerly known as Safety Assessment) had to be conducted by ATS SMS; facility LSOs and SAGs need to be guided closely. The SMS output for Legazpi is an additional guide for other ATS facilities that are yet to be subjected to HIRM for PBN implementation.

Experiences on PBN Implementation

- Training Syllabus
- FPL Processing and Stripmarking
- Safety Requirement
- Procedure for Air Navigation Services



Thank You for listening.

RNAV-PBN TRAINING SYLLABUS (THEORETICAL PHASE)

I. Introduction to RNAV-PBN

- A. Why PBN?
- B. PBN Navigation Specification
 - RNAV 10
 - RNP 4
 - RNAV 5
 - RNAV 2
 - RNAV 1
 - Basic RNP
- C. PBN Obstacle Clearance
- D. PBN Approach Specifications
 - RNP APCH
 - RNP-AR

II. GNSS Concept

- A. GNSS Reliability
- B. RAIM
- C. Waypoints
- D. Flight Management Systems
- E. Accuracy and Repeatability

III. Application of RNAV-PBN in AIR TRAFFIC CONTROL

- A. Standard Phraseologies
 - a. IFR Arrivals
 - Reiteration to the pilot of the QNH prior to the FAF.
 - b. IFR Departure
- B. Strip Markings and Flight Plan Processing
- C. Basic Approaches
- D. Routes of Vectoring / Direct Routing
- E. Continuous Descent Operations
- F. Continuous Climb Operations

IV. Instrument Flight Procedure (IFP)

- A. STAR
- B. IAP
- C. SID
- D. Mixed Sequencing

LIST OF SAFETY REQUIREMENTS IN THE IMPLEMENTATION OF BACOLOD RNAV			
Ref	Safety Requirement	Remarks	Status
SR-02	IAF and waypoints of the STAR shall be indicated as mandatory points of report on the chart	Recommended by Bacolod ATCO the list of waypoints of the STAR shall be indicated as mandatory points are: RWY 03- DIMBO, JULUS, RAVIA, MARIZ and MANAY RWY 21- RIANN, KLAIR, GABRE and LIDIA	Completed
SR-03	<p>ATCO's procedure shall be precise;</p> <p>-the phraseology for request of position' report from the pilot, including the full name of the point</p> <p>-the procedure of verification of the aircraft and aircrew qualification by the ATCO (based on fields of the flight plan) Before giving clearance for an RNAV Procedure</p> <p>-that local QNH provided by the approach controller to the crew at the first altitude clearance</p> <p>-the phraseology associated to clearance For RNAV procedures</p> <p>-the procedure to manage the request of deviation on an RNAV procedure; termination of the STAR RNAV procedure, management of the situation by the pilot without responsibility of the ATCO, delivery of a new clearance by the ATCO once the weather problem is solved</p> <p>-procedure for management of mixed Traffic in Bacolod (including the possibility to discourage usage of PBN procedure when traffic mix is too important)</p>	<p>Already discussed in the Phraseology and stripmarking procedure</p> <p>Check item 10 on Fpl (R for PBN), on item 18 on FPL (O1 or O2 for SID and STAR and S1 or S2 for Approach) and indicate R1 on FPS for O1 or O2 + S1 or S2, R2 on FPS for O1 or O2 only and R3 on FPS for S1 or S2 capable</p> <p>Already discussed in the Phraseology and stripmarking procedure</p> <p>Already discussed in the Phraseology and stripmarking procedure</p> <p>Already discussed in the Phraseology and stripmarking procedure and simulated dry-run</p> <p>Already discussed with Bacolod ATCO's during lectures and simulated dry-run</p>	<p>Completed</p> <p>Completed</p> <p>Completed</p> <p>Completed</p> <p>Completed</p>

SR-04	<p>ATCO shall be trained to:</p>		
	<p>-the necessity to request position report from the pilot at the mandatory points of report indicated on the chart or supplemental points in order to detect hazard such as aircraft deviation or aircraft on the wrong procedure</p>	<p>Already discussed with Bacolod ATCO's during lectures and simulated dry-run</p>	Completed
	<p>-the phraseology for the position's report that should include the complete name of the point</p>	<p>Already discussed in the Phraseology and Stripmarking procedure and simulated dry-run</p>	Completed
	<p>-the necessity to perform a verification of the aircraft qualification (based on fields of flight plan) before giving a clearance for RNAV procedure</p>	<p>Already discussed in the Phraseology and Stripmarking procedure and simulated dry-run</p>	Completed
	<p>-the criticality of the QNH in the LNAV/ VNAV procedures</p>	<p>Already discussed with Bacolod ATCO's during lectures and simulated dry-run</p>	Completed
	<p>-the phraseology associated to clearance For RNAV procedure</p>	<p>Already discussed in the Phraseology and Stripmarking procedure and simulated dry-run</p>	Completed
	<p>-the necessity to report any GNSS Interferences to all aircrews</p>	<p>Already discussed with Bacolod ATCO's during lectures and simulated dry-run</p>	Completed
	<p>-the necessity to assigns conventional procedure in case of GNSS interferences</p>	<p>Already discussed with Bacolod ATCO's during lectures and simulated dry-run</p>	Completed
	<p>-ATC procedure to manage a request of deviation on an RNAV procedure; termination of the STAR RNAV procedure, management of the situation by the pilot without responsibility of the ATCO once the weather problem is solved</p>	<p>Already discussed with Bacolod ATCO's during lectures and simulated dry-run</p>	Completed
	<p>-specific features of the new procedures (intersection with Iloilo trajectories, intersection with conventional trajectories...)</p>	<p>Already discussed with Bacolod ATCO's during lecture on Area Study</p>	Completed
	<p>-the procedure for management of mixed traffic in Bacolod</p>	<p>Already discussed with Bacolod ATCO's during lectures and simulated dry-run</p>	Completed
	<p>-the possibility to discourage usage of PBN procedure when traffic mixed is too important</p>	<p>Already discussed with Bacolod ATCO's during lectures and simulated dry-run</p>	Completed

SR-14	The new specific cross check of the QNH before the FAF shall be part of ATCO procedures and training.	Already discussed with Bacolod ATCO's during lectures and simulated dry-run	Completed
SR-16	GEN part of Bacolod AIP shall define ATCO expectation regarding RNAV procedure(mandatory report. Phraseology, explanation how to read the charts...)	Already discussed with Bacolod ATCO's during lecture on Area Study, Phraseology and Stripmarking	Completed
SR-21	A correspondence table matching TMA entry point/STAR procedure/ Approach procedure shall be defined and published in Bacolod's AIP	Already discussed with Bacolod ATCO's during lecture on Area Study	Completed

PROCEDURES FOR AIR NAVIGATION SERVICES AIR TRAFFIC MANAGEMENT

PROCEDURES FOR DEPARTING AIRCRAFT

NASAG 4P DEPARTURE

LEVEL CLEARANCE ON A STANDARD INSTRUMENT DEPARTURE

When level clearances are issued to aircraft departing or establishing on a SID, the controller shall explicitly indicate either that the aircraft shall follow the published level restriction(s) or that the level restriction(s) on the SID is cancelled. Published minimum levels based on terrain clearances shall be applied.

Note: Example (RNAV Departure RWY 03) where the initial clearance is
CLEARED RPLL via NASAG 4P T10 B473 LIP DCT RPLL CLIMB TOFL280.

i.e., CEB488 cleared RPLL via NASAG 4P T10 B473 LIP DCT
RPLL CLIMB TO FL280.

PROCEDURES FOR ARRIVING AIRCRAFT

BARBA 3PARRIVAL

LEVEL ON STAR

When level clearances are issued to aircraft arriving or established on a STAR, the controller shall explicitly indicate either that the aircraft shall follow the published level restriction(s) or that the level restriction(s) on the STAR is cancelled. Published minimum levels based on terrain clearance shall always be applied.

Note: Example (RNAV ARRIVAL RWY 03) where the initial clearance is
CLEARED BARBA 3P, QNH 1011, EXPECT RNAV
APPROACH RWY03, report DIMBO

i.e. CEB473 CLEARED BARBA 3P, QNH 1011, EXPECT RNAV
APPROACH RWY03, report DIMBO

PART A: Standard Instrument Departure (SID)

A.1) Departure clearance, for the situation where the initial cleared level will allow compliance with all published level restrictions.

NASAG 4P DEPARTURE

APP: SRQ7083 cleared to MANILA via NASAG 4P CLIMB TO 11,000FT

SRQ7083: CLEARED to MANILA via NASAG 4P CLIMB TO 11,000FT

REQUIREMENTS:

SRQ7083 MUST COMPLY WITH THE LATERAL PROFILE OF THE SID AS WELL AS ALL PUBLISHED SPEED AND LEVEL RESTRICTIONS. SRQ7083 MUST NOT CLIMB ABOVE 11,000FT

A.2)CEB488 is airborne, had been cleared for and was established on NASAG 4P DEPARTURE.

Later on, pilot requested weather deviation away from NASAG 4P Subsequently, ATC re-established CEB488 on the NASAG 4P DEPARTURE.

CEB488 is established on NASAG 4P DEPARTURE

(..... time elapses.....)

CEB488: APP, REQUEST DEVIATION TO THE RIGHT DUE WEATHER

APP: CEB488 DEVIATION APPROVED, CANCEL NASAG 4P ADVISE WHEN CLEARED OF WEATHER

CEB488: DEVIATION APPROVED, CANCEL NASAG 4P ADVISE WHEN CLEARED OF WEATHER

(.....time elapses.....)

CEB488: CLEARED OF WEATHER READY FOR LEFT TURN

APP: CEB488 TURN LEFT PROCEED DIRECT MELAI, RESUME NASAG 4P CLIMB TO FL160UFA

CEB488: TURN LEFT PROCEED DIRECT MELAI, RESUME NASAG 4P CLIMB TO FL160UFA

REQUIREMENTS:

ONCE INSTRUCTED TO PROCEED DIRECT TO MELAI, CEB488 MUST ARRANGE FLIGHT SO AS TO COMPLY WITH PUBLISHED LEVEL AND SPEED RESTRICTIONS. CEB488 MUST NOT CLIMB ABOVE FL160UFA.

PART B: STANDARD INSTRUMENT ARRIVAL (STAR)

B.1)For the situation where the cleared level will allow compliance with all published level restriction.

APP: CEB473 CLEARED BARBA 3P, QNH 1011, EXPECT RNAV APPROACH RWY03, report DIMBO

CEB473: CLEARED BARBA 3P ARRIVAL, QNH 1011, EXPECT RNAV APPROACH RWY03, report DIMBO

REQUIREMENTS:

CEB473 must comply with the lateral profile of the STAR as well as all published speed and level restrictions. CEB473 must not descend below 3000ft. Unless ATC clearance for the approach is granted.

B.2)For the situation where the cleared level will allow compliance with all published level restrictions.

APP: CEB473 CLEARED BARBA 3P QNH 1011, DESCEND 9000ft, EXPECT RNAV APPROACH RWY03, report DIMBO

CEB473: CLEARED BARBA 3P, QNH 1011, DESCEND 9000ft, EXPECT RNAV APPROACH RWY03, report DIMBO

REQUIREMENTS:

CEB473 MUST COMPLY WITH THE LATERAL PROFILE OF THE STAR, as well as speed restriction at or above 9,000ft. And do not descend below 9,000ft.

If ATC clears CEB473: "Descend on STAR to 3000ft." prior to reaching DIMBO, CEB473 will be expected to cross DIMBO at or below 6,500ft.

B.3) CEB473 has been cleared for and was established at BARBA 3P ARRIVAL. Pilot requested a weather deviation away from BARBA 3P .Subsequently, ATC re-establishes CEB473 on BARBA 3P

{CEB473 is established on BARBA 3P}

{.....time elapse....}

CEB473: APP REQUEST RIGHT HEADING 150 DUE WEATHER
APP: CEB473 HEADING 150 APPROAVED, CANCEL BARBA 3P
DESCEND 9000FT.
CEB473: HEADING 150 APPROAVED, CANCEL BARBA 3P
DESCEND 9000FT.

{.....time elapse....}

CEB473: APP we are now cleared of weather
APP: CEB473 PROCEED DIRECT TO DIMBO RESUME BARBA 3P, QNH 1011, EXPECT
FOR RNAV RWY03APPROACH, REPORT DIMBO
CEB473: PROCEED DIRECT TO DIMBO RESUME BARBA 3P, QNH 1011, EXPECT
FOR RNAV RWY03 APPROACH, REPORT DIMBO

REQUIREMENTS:

While on weather deviation, CEB473 need not comply with any published level or speed restriction of the STAR, CEB473 must not descend below 9000ft.

Once instructed to proceed direct DIMBO, CEB473 must arrange flight so as to comply with published level and speed restrictions, beginning at DIMBO.

CEB473 is not required to comply with level and speed restrictions published at significant point before DIMBO.

Note: For terrain clearance refer to Minimum Sector Altitude (MSA).