Regional Seminar on MMEL/MEL and Special Operations

[Airbus Amber]

Organized by ICAO Regional Office for Western and Central Africa (WACAF)

Dakar - Senegal - from 30 June to 5 July 2025

RNP AR Certification and Operational approval

Julien BERNAGE, AIRBUS Approach and Navigation Flight Ops specialist

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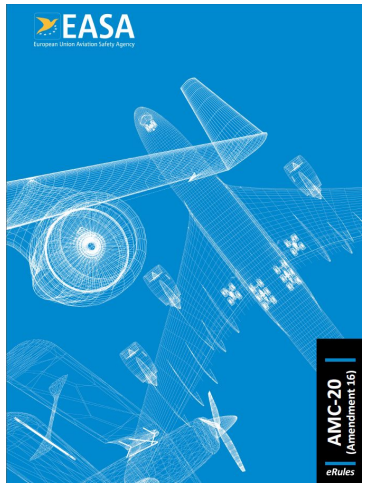
RNP AR regulations, EASA world

AMC 20-26



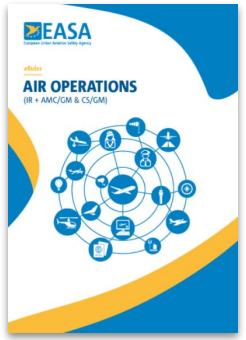
Airworthiness part — **For the OEM**

Capability and **demonstrated performances** must be provided in Ops documentation (AFM + document referenced in the AFM such as ACD)

Approval part — **For the Operator**

The operator uses OEM data (compliance / procedures) for its approval

CS-ACNS



AIR OPS

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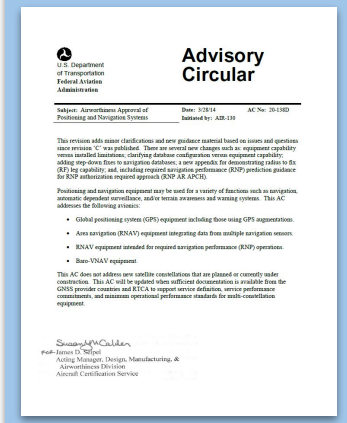
RNP AR regulations, FAA world



U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Airworthiness Approval of Positioning and Navigation Systems

Date: 5/28/14 AC No: 20-138D
Initiated by: AIR-130

This revision adds minor clarifications and new guidance material based on issues and questions since revision 'C' was published. There are several new changes such as: equipment capability versus installed limitations; clarifying database configuration versus equipment capability; adding step-down fixes to navigation databases; a new appendix for demonstrating radius to fix (RF) leg capability; and, including required navigation performance (RNP) prediction guidance for RNP authorization required approach (RNP AR APCH).

Positioning and navigation equipment may be used for a variety of functions such as navigation, automatic dependent surveillance, and/or terrain awareness and warning systems. This AC addresses the following avionics:

- Global positioning system (GPS) equipment including those using GPS augmentations.
- Area navigation (RNAV) equipment integrating data from multiple navigation sensors.
- RNAV equipment intended for required navigation performance (RNP) operations.
- Baro-VNAV equipment.

This AC does not address new satellite constellations that are planned or currently under construction. This AC will be updated when sufficient documentation is available from the GNSS provider countries and RTCA to support service definition, service performance commitments, and minimum operational performance standards for multi-constellation equipment.

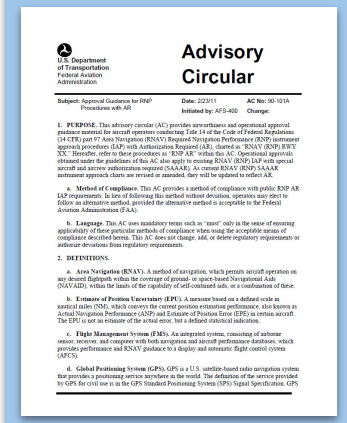
Susan J.M. Caldwell
for James D. Siegel
Acting Manager, Design, Manufacturing, & Airworthiness Division
Aircraft Certification Service

AC 20-138

Airworthiness part

For the OEM

Capability and **demonstrated performances** must be provided in Ops documentation (AFM + document referenced in the AFM such as ACD)



U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Approval Guidance for RNP Procedures with AR

Date: 2/23/11 AC No: 90-101A
Initiated by: AFS-400 Change:

1. **PURPOSE.** This advisory circular (AC) provides airworthiness and operational approval guidance material for aircraft operators conducting Title 14 of the Code of Federal Regulations (14 CFR) part 97 Area Navigation (RNAV) Required Navigation Performance (RNP) instrument approach procedures (IAP) with Authorization Required (AR), charted as "RNAV (RNP) RWY XX." Hereafter, refer to these procedures as "RNP AR" within this AC. Operational approvals obtained under the guidelines of this AC also apply to existing RNAV (RNP) IAP with special aircraft and aircrew authorization required (SAAAR). As current RNAV (RNP) SAAAR instrument approach charts are revised or amended, they will be updated to reflect AR.

a. **Method of Compliance.** This AC provides a method of compliance with public RNP AR IAP requirements. In lieu of following this method without deviation, operators may elect to follow an alternative method, provided the alternative method is acceptable to the Federal Aviation Administration (FAA).

b. **Language.** This AC uses mandatory terms such as "must" only in the sense of ensuring applicability of these particular methods of compliance when using the acceptable means of compliance described herein. This AC does not change, add, or delete regulatory requirements or authorize deviations from regulatory requirements.

2. **DEFINITIONS.**

a. **Area Navigation (RNAV).** A method of navigation, which permits aircraft operation on any desired flightpath within the coverage of ground- or space-based Navigational Aids (NAVAID), within the limits of the capability of self-contained aids, or a combination of these.

b. **Estimate of Position Uncertainty (EPU).** A measure based on a defined scale in nautical miles (NM), which conveys the current position estimation performance, also known as Actual Navigation Performance (ANP) and Estimate of Position Error (EPE) in certain aircraft. The EPU is not an estimate of the actual error, but a defined statistical indication.

c. **Flight Management System (FMS).** An integrated system, consisting of airborne sensor, receiver, and computer with both navigation and aircraft performance databases, which provides performance and RNAV guidance to a display and automatic flight control system (AFCS).

d. **Global Positioning System (GPS).** GPS is a U.S. satellite-based radio navigation system that provides a positioning service anywhere in the world. The definition of the service provided by GPS for civil use is in the GPS Standard Positioning System (SPS) Signal Specification. GPS

AC 90-101

Approval part

For the Operator

The operator uses OEM data (compliance / procedures) for its approval

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RNP AR

[Airbus Amber]

Procedure design

A/C capability

Training and qualification

Operator Operational approval

Authorization granted by the NAA

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RNP AR

[Airbus Amber]

Procedure design

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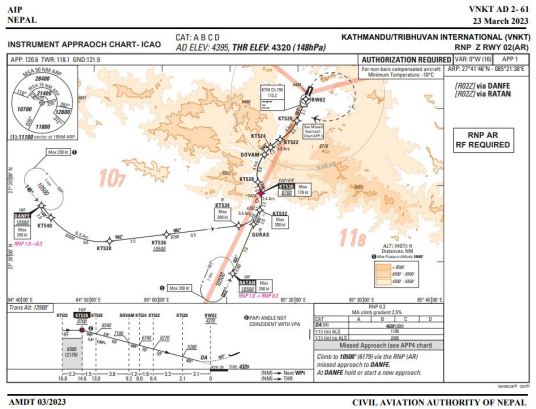
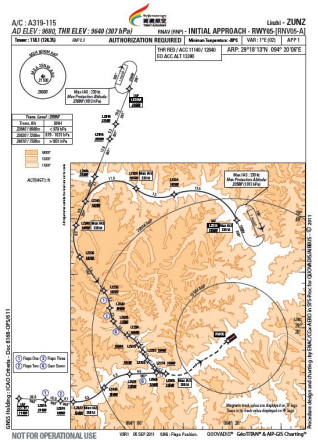
RNP AR Procedure design

Public procedure



Published by NAA and available for all operators

Private procedure



Created under the supervision of the operator (often with service providers NAVBLUE or Jeppesen or others)

Validated by the NAA

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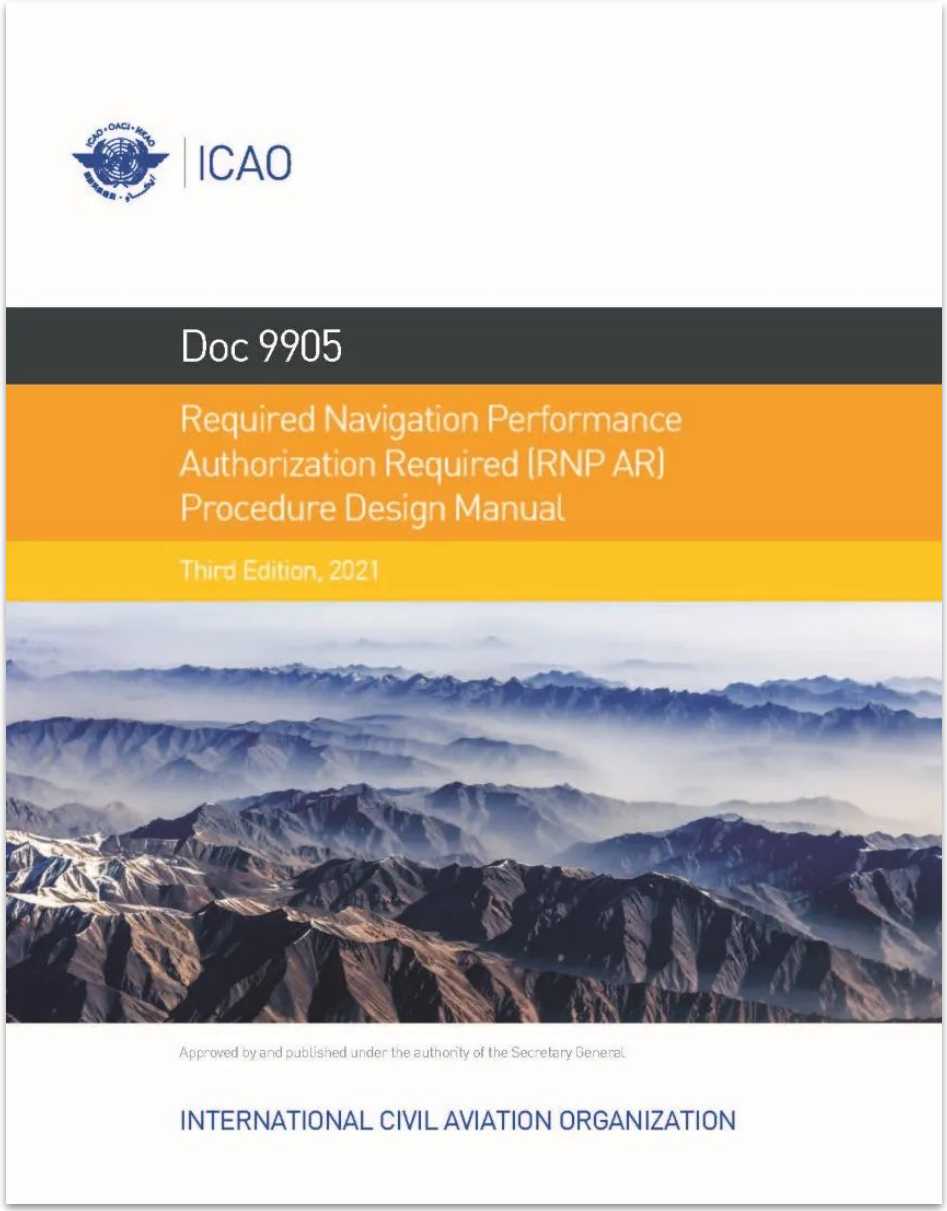
RNP AR

Reference document
ICAO Doc 9905

Possible deviations:

- Missed Approach with RNP < 1.0 NM
- Final approach RNP < 0.3 NM
- short last straight final leg …

The type of approval (Generic vs Specific) will depend on:
- **the deviations from doc 9905**
- **the surrounded environment (terrain threat)**



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RNP AR

[Airbus Amber]

A/C capability

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A/C Capability

The capability is indicated in the AFM

Approved

NAVIGATION PERFORMANCE

With GPS PRIMARY:

The FMGS is certified in accordance with the performance requirements of MASPS ED-75/DO-236 for RNP operations.
The RNP accuracy with GPS PRIMARY has been demonstrated to be :

	With AP ON: - In NAV mode (all phases), or - In F-LOC (approach phase)	With AP OFF and FD ON: - In NAV mode (all phases), or - In F-LOC (approach phase)	With AP OFF and FD OFF
En Route	1 NM	1 NM	1.1 NM
In Terminal Area	0.5 NM	0.51 NM	0.51 NM
In Approach	0.3 NM	0.3 NM	- With F-LOC deviation: 0.3 NM , or - Without F-LOC deviation: not authorized

Note : RNP values indicated in the above table are provided for compliance to MASPS ED-75/DO-236 and cannot be applied to RNAV (RNP) operations.

For RNP AR (SAAAR or equivalent):

The aircraft is compliant with the airworthiness part of the EASA AMC 20-26 and FAA AC 90-101A Appendix 2 and FAA AC 20-138C Appendix 2.

Note : Compliance with the applicable airworthiness requirements does not constitute an operational approval. Such authorization must be obtained by the operator from the appropriate authorities.

The aircraft is capable of conducting RNP AR operations when operated in accordance with the recommendations provided in the Airbus Airworthiness Compliance Document (ACD) reference SA34D15033461 issue 3 or higher, Flight Crew Operating Manual (FCOM) and bulletins.
Detailed RNP AR levels approved through the Airworthiness Approval of the aircraft are provided in the ACD.
Guidance for Operational Approval is provided in the ACD.
RNP AR performance has been demonstrated with AP ON (See the note below), based on the operational assumptions of the ACD for the following modes:

- Departure in NAV mode,
- Initial approach in NAV or APP NAV modes,
- Final approach in FINAL APP mode,
- Missed approach in NAV mode.

Note : Navigation performance and recommendations regarding RNP AR operations with AP OFF / FD ON are available in the ACD.

Without GPS PRIMARY:

The FMGS is certified in accordance with the accuracy requirements and assumptions of MASPS ED-75/DO-236 for RNP operations provided the appropriate RNP value is checked or entered on the MCDU and HIGH accuracy is displayed.
The navigation accuracy (without GPS PRIMARY) is a function of ground radio navaid infrastructure or elapsed time since last radio update.

--- END ---

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A/C Capability

The RNP AR capability is based on

A/C performance in normal conditions (without failure)

OEM publishes:
RNP level in normal condition

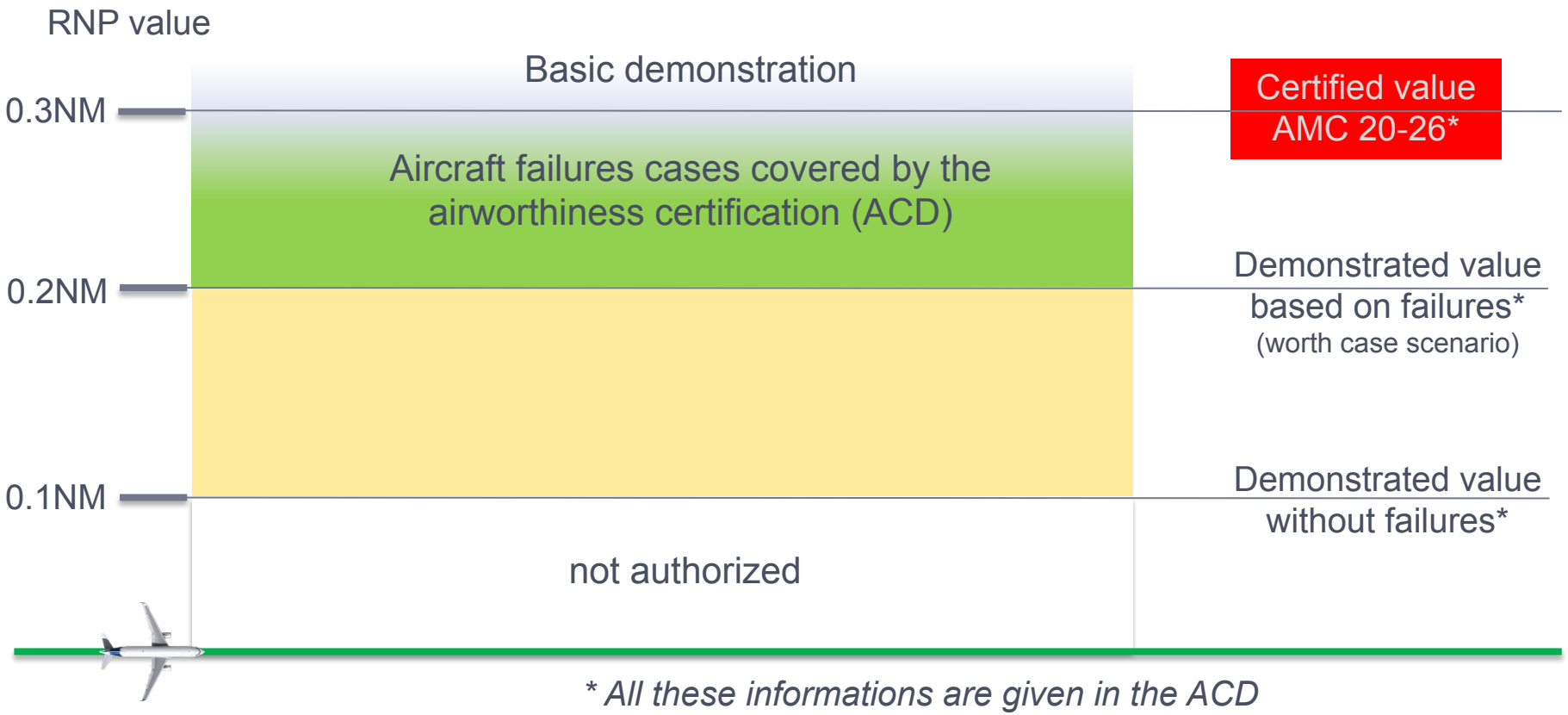
A/C performance in abnormal conditions (with failures)
With or without crew take-over

OEM publishes:
RNP level upon
- **Engine Out**
- **probable failures**
- **remote failures**

Associated Procedures

The achievable RNP level will depend on
- **A/C performance in normal condition**
- **A/C performance and possible crew take over in abnormal condition**

Example A320 with RNP AR below 0.3NM option



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RNP AR

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Training and qualification

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RNP AR Training

AMC1 SPA.PBN.105(b) PBN operational approval

RNP AR training required for
- Crew
- Dispatchers

→

Under operator responsibility
can use service provider

→

Validate by NAA

crew training example

Ground course (e-learning)
- RNP AR concept
- A/C specificities, architecture
- Procedure design
- Normal procedures
- Abnormal procedures, management of failures

Simulator sessions
- normal procedures
- management of failures
- manual take-over

- on the most complex airport of the network

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RNP AR

Operator Operational approval

Generic vs Specific approval

Generic Approval

One approval for various procedure

Procedure Specific Approval

(c) A procedure-specific approval for RNP AR APCH shall be required for private instrument approach procedures or any public instrument approach procedure that does not meet the applicable ICAO procedure design criteria, or where required by the Aeronautical Information Publication (AIP) or the competent authority.

One approval per procedure

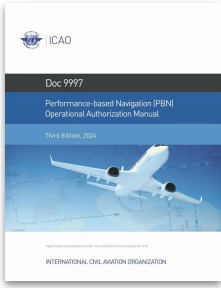
RNP AR ⇒ Operational approval required

SPA.PBN.105 PBN operational approval

A/C Airworthiness approval	AFM A/W compliance statement // Limitations
Flight crew and dispatchers qualification	Training
Operational procedures: Normal, abnormal and contingency procedures	OM update based on FCOM
Minumum equipement to start, operating limitations, MEL	MEL update based on MMEL
NDB management	NDB validation at each AIRAC cycl
Monitoring program management	FDA, PIREP and reportable list
Safety Assessment	RNP AR FOSA

FDA: Flight Data Analysis *PIREP: PIlot REPport*

Flight Operation Safety Assessment



Doc 9997

When should a FOSA be conducted?

where the more stringent aspects of the nominal procedure design criteria (as per Doc 9905) are applied

- **RF legs after the FAF**
- **RNP missed approaches less than 1.0**
- **RNP final approaches less than 0.3)**
- **or where the application of the default procedure design criteria is in an operating environment with special challenges or demands.**

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Flight Operation Safety Assessment

AMC1 SPA.PBN.105(c) PBN operational approval

FLIGHT OPERATIONAL SAFETY ASSESSMENT (FOSA)

(a) For each RNP AR APCH procedure, the operator should conduct a flight operational safety assessment (FOSA) proportionate to the complexity of the procedure.

(b) The FOSA should be based on:

(1) restrictions and recommendations published in AIPs;

(2) the flyability check;

(3) an assessment of the operational environment;

(4) the demonstrated navigation performance of the aircraft; and

(5) the operational aircraft performance.

(c) The operator may take credit from key elements from the safety assessment carried out by the ANSP or the aerodrome operator.

FOSA: When should it be carried out?

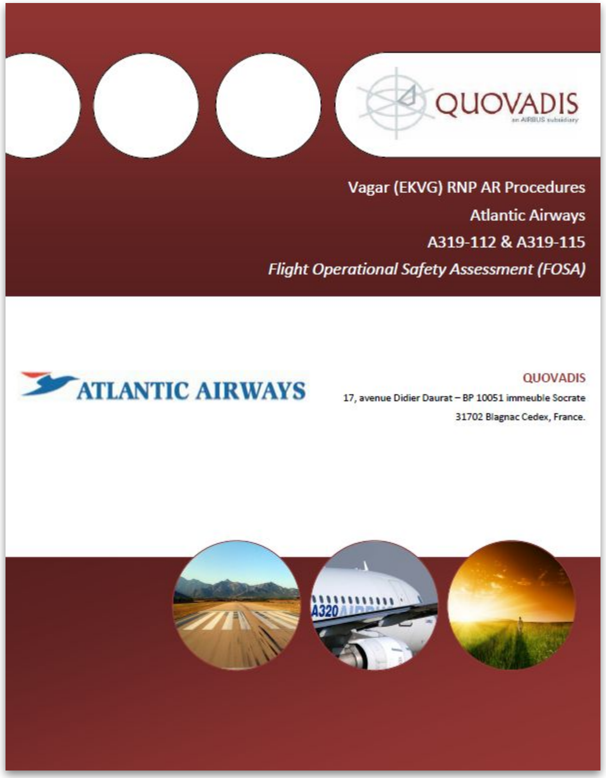
	Compliant 9905		Not compliant 9905
EASA	Classical airport □ Generic FOSA	Mountainous airport □ Specific FOSA	□Specific FOSA
FAA	Generic Public procedure □ No FOSA		Specific Private procedure □Specific FOSA

FOSA

GM1 SPA.PBN.105(c) PBN operational approval

The following aspects need to be considered during FOSA, in order to identify hazards, risks and mitigations relevant to RNP AR APCH operations:

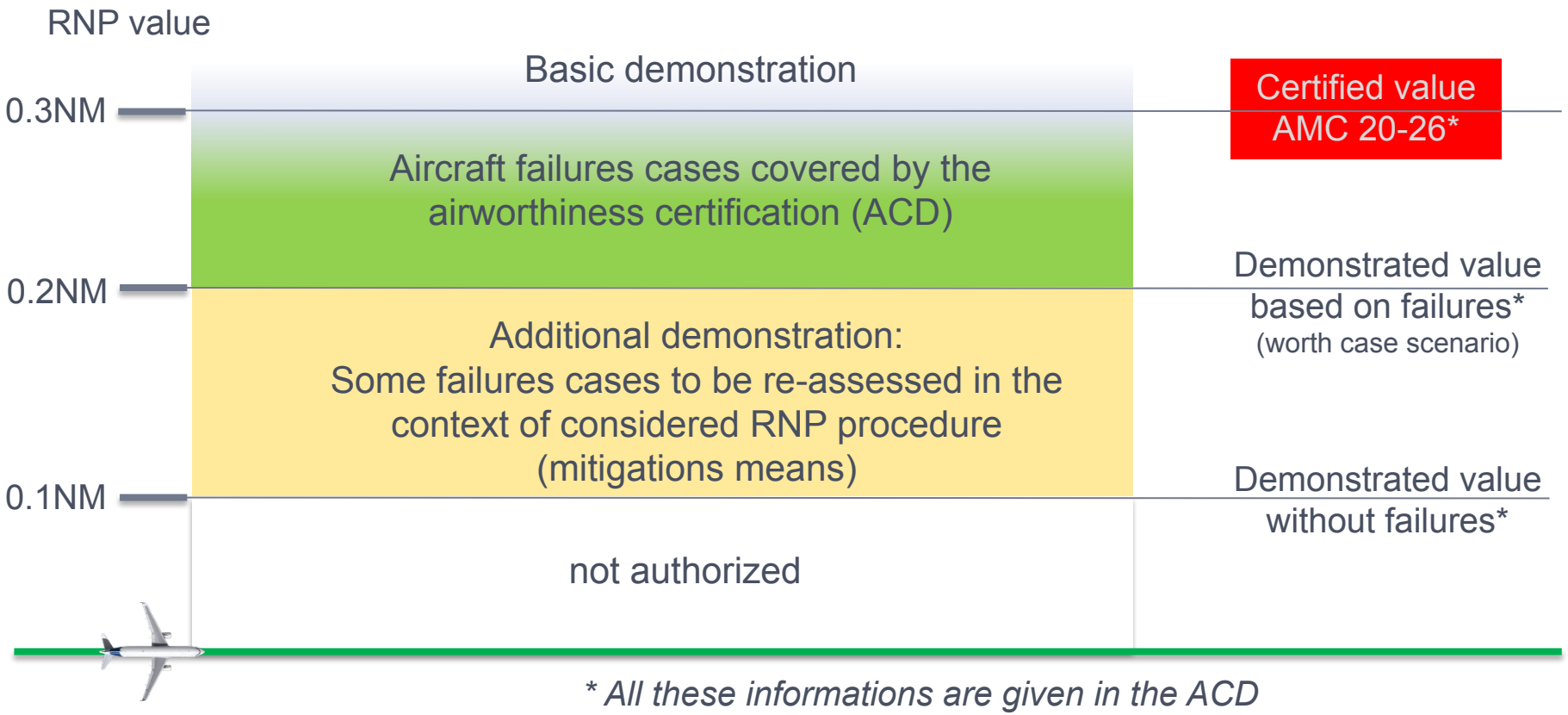
Normal performance	OEM Airworthiness demonstration
Performance under failure conditions	Performance under failure conditions
Aircraft failure	system failures or engine failure
Aircraft performance	EO tracks, MTOW
Navigation services	Navigation services
ATC operations	Phraseology, clearance on RNP AR
Flight crew operations	FCOM procedures
Infrastructure GNSS failure	Total loss of GNSS, Navaids as B/U
Operating conditions	Winds, temperatures and ISA



FOSA: System failure assessment

Normal performance	**OEM Airworthiness demonstration**
Performance under failure conditions	**Performance under failure conditions**
Aircraft failure	**system failures or engine failure**

Example A320 with RNP AR below 0.3NM option



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FOSA: System failure assessment

Normal performance	**OEM Airworthiness demonstration**
Performance under failure conditions	**Performance under failure conditions**
Aircraft failure	**system failures or engine failure**

- Failures covered by OEM demonstration (value of the ACD, endorsed by EASA) ⇒ **no further assessment needed**
- The failures not covered by OEM demonstration ⇒ **appropriate assessment required**
  - **specificities of the procedure** (No obstacle: Procedure for noise or trafic reason, reversion to Non-RNP procedure available, small RNP value on straight leg)
  - **operational mitigations,** use of TAWS with relevant verification (terrain DB management, landing funnel inhibition)
  - **replay in simulator (development simulator at Airbus, service proposed by Airbus)**

Focus on A350

A350 is the only A/C in the world certified **EASA AMC 20-26 RNP AR = 0.1NM in all condition**

No manual take-over required : A/C system passivates the failures or proposes a Back-up guidance and display along RNP AR trajectory

No mitigation required □ No ACD needed, all is covered in FCOM/AFM/MMEL

No specific assessment required for A/C system

But **FOSA still required** for other domains, including A/C performances

FOSA

FOSA content will depend of the A/C and on operation you want to perform:

Mountainous area, low RNP value, windshear, high altitude,...

Significant FOSA

For traffic reasons, in flat terrain, with easy contingency procedures

Light FOSA

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RNP AR

[Airbus Amber]

Procedure design

A/C capability

Training and qualification

Operator Operational approval

Authorization granted by the NAA

with continuous monitoring

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RNP AR departure

Now defined in ICAO PBN manual ed 5 (2023)

Not yet in EASA and FAA regulations

BUT

Airbus provides data for RNP AR departure ops approval

- demonstrated values
- SOPs

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Thank you