RNP AR

Approval & Implementation Perspectives

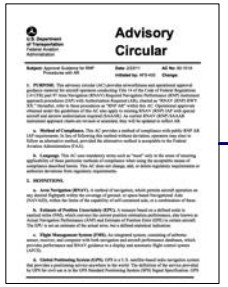
imagination at work

Agenda

- FAA Approval Process
  - AC90-101A (Change 1)
- POI Guidance Material.
- Flight operations Safety Assessment
- Implementation Guidance (ATC Training)
- RNP Utilization rates

The Road to RNP

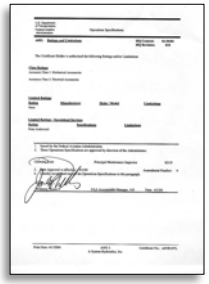
AC 90-101A


Advisory Circular

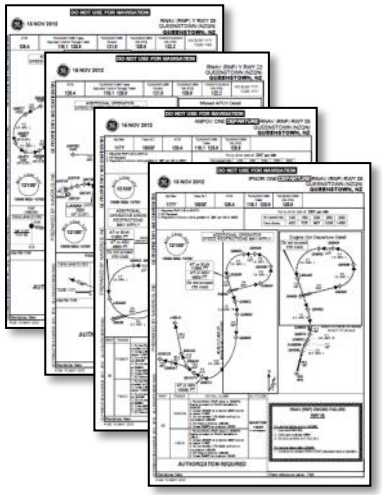
Appendix

- I. RNP AR IAPs
- II. Aircraft Qualification
- III. Navigation Data Validation
- IV. Operational Considerations
- V. Training
- VI. Monitoring Program
- VII. Application P. and Process

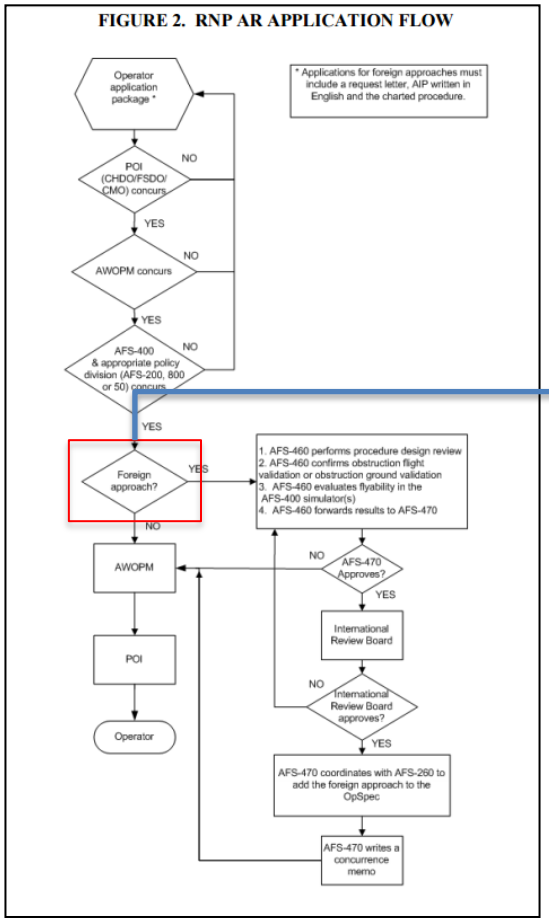
OPSPEC



RNP AR APCH



Approval Process



Approval

- Program wide – Not for each procedure
  - Operator is required to assess and ensure procedures flown are appropriate for their operation

Foreign Approvals

- Requires approval for <u>each procedure</u> desired to be flown

Approval Checklist

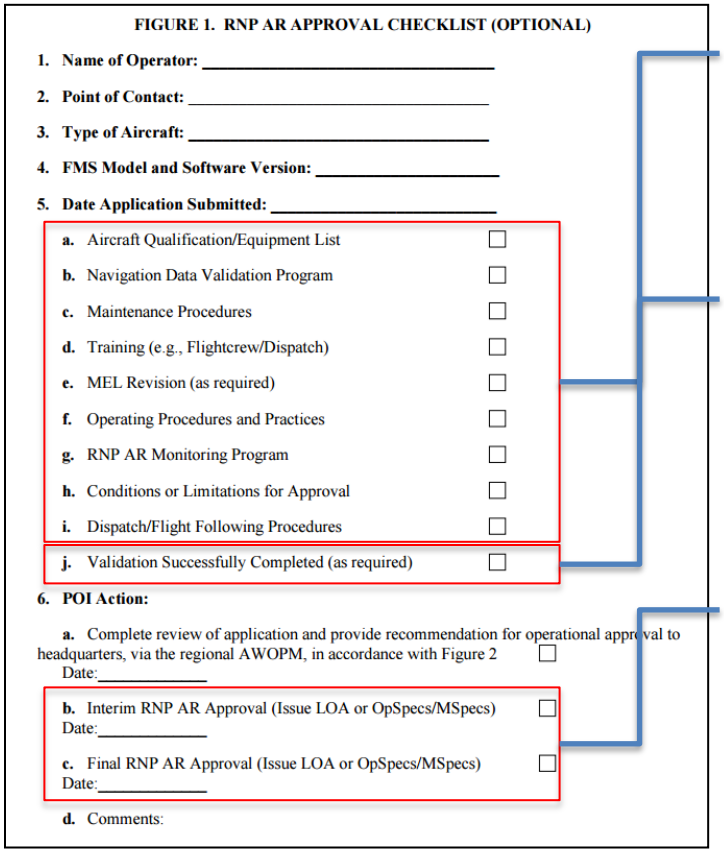


FIGURE 1. RNP AR APPROVAL CHECKLIST (OPTIONAL)

1. **Name of Operator:** _____
2. **Point of Contact:** _____
3. **Type of Aircraft:** _____
4. **FMS Model and Software Version:** _____
5. **Date Application Submitted:** _____

- **a.** Aircraft Qualification/Equipment List ☐
- **b.** Navigation Data Validation Program ☐
- **c.** Maintenance Procedures ☐
- **d.** Training (e.g., Flightcrew/Dispatch) ☐
- **e.** MEL Revision (as required) ☐
- **f.** Operating Procedures and Practices ☐
- **g.** RNP AR Monitoring Program ☐
- **h.** Conditions or Limitations for Approval ☐
- **i.** Dispatch/Flight Following Procedures ☐
- **j.** Validation Successfully Completed (as required) ☐

6. **POI Action:**

- **a.** Complete review of application and provide recommendation for operational approval to headquarters, via the regional AWOPM, in accordance with Figure 2 ☐
  Date:_____
- **b.** Interim RNP AR Approval (Issue LOA or OpSpecs/MSpecs) ☐
  Date:_____
- **c.** Final RNP AR Approval (Issue LOA or OpSpecs/MSpecs) ☐
  Date:_____
- **d.** Comments:

Compliance Documentation

- Airworthiness
- Operational

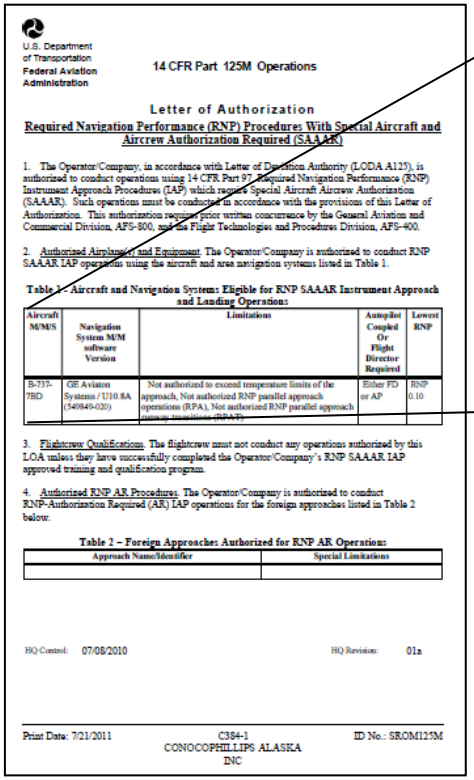
Validation Test Plan

- Demonstration of RNP AR Capability
  - Operational/DXP procedures
  - MEL/MX Procedures
- Use Ground Training Devices

Interim Authorization

- 90 days **AND** 100 Procedures
- Relief for small fleet / schedule.
  - Consideration of a reduction in the required number of approaches will be on a case-by-case basis.

Ops. Spec.



U.S. Department of Transportation
Federal Aviation Administration

14 CFR Part 125M Operations

Letter of Authorization

Required Navigation Performance (RNP) Procedures With Special Aircraft and Aircrew Authorization Required (SAAAR)

1. The Operator/Company, in accordance with Letter of Operations Authority (LODA A125), is authorized to conduct operations using 14 CFR Part 97, Required Navigation Performance (RNP) Instrument Approach Procedures (IAP) which require Special Aircraft Aircrew Authorization (SAAAR). Such operations must be conducted in accordance with the provisions of this Letter of Authorization. This authorization requires prior written concurrence by the General Aviation and Commercial Division, AFS-800, and the Flight Technologies and Procedures Division, AFS-400.

2. Authorized Airplane(s) and Equipment. The Operator/Company is authorized to conduct RNP SAAAR IAP operations using the aircraft and area navigation systems listed in Table 1.

Table 1 - Aircraft and Navigation Systems Eligible for RNP SAAAR Instrument Approach and Landing Operations

Aircraft M/M/S	Navigation System M/M software Version	Limitations	Autopilot Coupled Or Flight Director Required	Lowest RNP
B-737-7BD	GE Aviaton Systems / U10.8A (549849-020)	Not authorized to exceed temperature limits of the approach, Not authorized RNP parallel approach operations (RPA), Not authorized RNP parallel approach runway transitions (RPAT)	Either FD or AP	RNP 0.10

3. Flightcrew Qualifications. The flightcrew must not conduct any operations authorized by this LOA unless they have successfully completed the Operator/Company's RNP SAAAR IAP approved training and qualification program.

4. Authorized RNP AR Procedures. The Operator/Company is authorized to conduct RNP-Authorization Required (AR) IAP operations for the foreign approaches listed in Table 2 below.

Table 2 – Foreign Approaches Authorized for RNP AR Operations

Approach Name/Identifier	Special Limitations

HQ Control: 07/08/2010 HQ Revision: 01a

Print Date: 7/21/2011 C384-1 CONOCOPHILLIPS ALASKA INC ID No.: SR0M125M

Table 1 - Aircraft and Navigation Systems Eligible for RNP SAAAR Instrument Approach and Landing Operations

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Software version

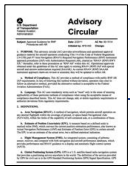
- Specific to S/W on board aircraft
- OEM to provide letter with S/W updates stating impact on RNP AR Operations
  - Assuming No impact - POI issues new OpsSpec.

POI Guidance

Guidance/Job- aids currently available to POIs:

- FAA – Flight Standards Information System (FSIMS) 8900.1
- CASA - PBN Operational Approval Handbook (8/2010)
  - developed by CASA Australia in coordination with ICAO and the COSCAP programs of Asia Pacific"
- ICAO – PBN Operations Approval Manual Doc. 9997

Regulatory Guidance


Advisory Circular

AC 90-101A

INSTRUMENT FLIGHT PROCEDURES

- RNP Values
- RF Legs
- MAP < 1
- Non-Std. SPD/climb grdt.
- Temperature limits
- Aircraft Size

AIRCRAFT QUALIFICATION

- OEM Compliance Documentation e.g.
- Displays
- Path definition
- RF capability
- RNP of < 0.3
- MAP w/ RNP < 1
- AC20-138 (Approval of Positioning and Nav. Systems)

NAV. DATA VALIDATION PROGRAM

Procedures to validate navigation data associated with RNP AR APCH operations

- Data Suppliers
- Initial Validation
- Flyability Check
- Cyclical validation

OPERATING PROCEDURES

Operating procedures associated with pre-flight and in-flight considerations e.g.

- MEL
- RNP Forecast
- NOTAMS
- AP/FD rqts.
- Procedure confirmation
- Max. speeds
- Contingency procedures

TRAINING PROGRAM

Required training:

- Flight Crews (initial and recurrent)
- Dispatchers (Initial only)
- knowledge and skill assessments
- ICAO includes airline personnel:
- Perf. Engineers
- MX Personnel

RNP AR APCH MONITORING

Required Monitoring:

- **Provisional approval**
- No. approaches
- UNSAT Approaches
- Reason for UNSAT
- Continual monitoring program

FOSA

Flight Operational Safety Assessment (FOSA)

- Must be conducted for RNP AR APCH procedures when the specific aircraft characteristics, operational environment, obstacles, etc. warrant the conduction of an additional assessment to ensure that safety objectives are met
- Typically conducted when an IAP design cannot meet all design requirements (waivered) and/or special or unique aircraft, operational environment, obstacles, or other characteristics are identified for a specific IAP and the state authority specifies the FOSA requirement to assess a safety level that is equivalent to the traditional Target Level of Safety (TLS).
- Not required for all approaches / typically conducted at first airport in region.

FOSA

- Quantitative and Qualitative Analysis
  - Navigation systems
  - Aircraft systems
  - Operational Procedures
  - Hazards
  - Failure Mitigations
- Hazard Conditions
  - Aircraft Failures
  - Aircraft Performance
  - Navigation Services
  - ATC Operations
  - Crew Procedures

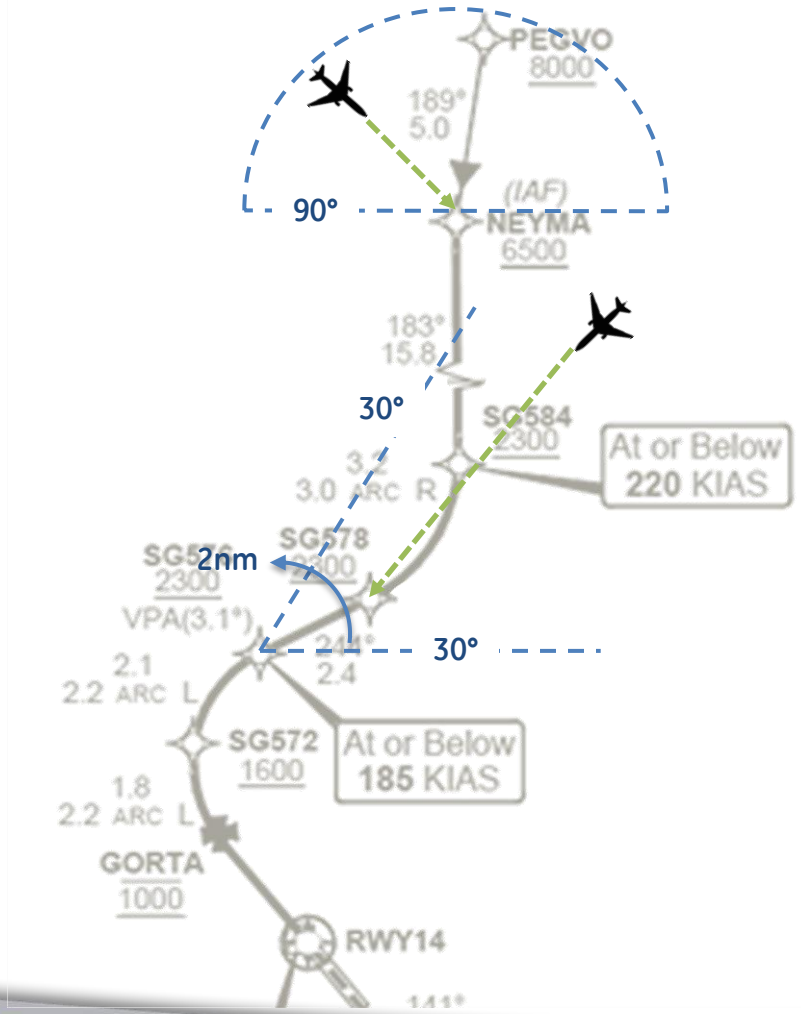
Hazard Identification	ID	Name	Severity	Likelihood	Description	Mitigation	Severity of the Mitigation	Frequency of the Mitigation
Aircraft / Failures	A1	Single GPS Failure	MINOR	REMOTE	Single GPS failure causes loss of redundancy in navigation capability	Dual GPS requirement for conduct of RNP SAAAR/AR. Crew procedures require go around for single failure inside the final approach fix. Crew procedures require execution of a go-around for all failures inside the final approach unless visual conditions exist.	NEGLIGIBLE	REMOTE
	A2	Dual GPS Failure	MINOR	REMOTE	Dual GPS failure causes loss of accuracy in navigation solution and reliance on alternate navigation source.	IRS and ground –based navigation aids provide navigation system solution in the event of dual failure. Crew procedures require go around use of alternate means of navigation. Crew procedures require execution of a go-around for all failures inside the final approach unless visual conditions exist.	MINOR	REMOTE
	A4	ANP Exceeds RNP	MINOR	OCCASIONAL	Navigation performance exceeds required.	Crew procedures require go-around. GPS predictive performance provides forecast to crew when navigation performance is not available. Crew procedures require execution of a go-around for all failures inside the final approach unless visual conditions exist.	MINOR	REMOTE
	A5	Single Channel Autopilot Failure	MINOR	OCCASIONAL	Autopilot channel fails causing momentary disconnect and engagement of second channel.	Crew procedures require engagement of second autopilot in the event of single channel failure. Crew procedures require execution of a go-around for all failures inside the final approach unless visual conditions exist.	MINOR	REMOTE
	A6	Dual Channel Autopilot Failure	MINOR	REMOTE	Dual channel failure causes disconnect or loss of flight guidance.	Crew procedures require execution of go around. In the event of a dual autopilot failure, in the event of a dual channel failure with flight guidance remaining, crews can maintain manual aircraft control through the use of the flight directors. In the event of a dual autopilot failure with loss of flight guidance, crews can use the map display and FMC RNP progress page to maintain deviations manually. Crew procedures require execution of a go-around for all failures inside the final approach unless visual conditions exist.	MINOR	IMPROBABLE
	A7	Single CDU Failure	MINOR	OCCASIONAL	Single CDU failure causes increase in crew workload and reduced situational awareness.	Crew procedures require execution of a go-around for all failures inside the final approach unless visual conditions exist.	MINOR	OCCASIONAL
	A8	Dual CDU Failure	MINOR	REMOTE	Dual CDU failure causes loss of flight plan modification and reduction in automation capability.	Crew Procedures require execution of go-around. Situational awareness is maintained through the tuning of ground-based navigation aids.	MINOR	REMOTE
	A9	Single EFIS DU Failure	MINOR	OCCASIONAL	Single EFIS DU failure causes temporary loss of flight information or map display.	Crew procedures and reversionary mode of EFIS system allows display of information as required.	MINOR	REMOTE
	A10	Dual EFIS DU Failure	MINOR	REMOTE	Dual EFIS DU failure causes temporary loss of flight information or map display.	Crew procedures and reversionary mode of EFIS system allows display of information as required.	MINOR	REMOTE
	A11 A	Left Side FMC Failure	MINOR	OCCASIONAL	Single FMC failure causes loss of redundancy and temporary loss of information. In the event of a left side FMC failure, path information continues to be displayed on the right side and autopilot B provides path steering. Selecting the FMC source select switch to BOTH on right restores information to the left side.	Crew procedures and reversionary mode of FMC allows display of information as required. Crews will conduct a go-around if that is the safest course of action.	MINOR	REMOTE

ATC Training

Core Training	RNP AR Specific
• **Navigation system Operations** - Functional capabilities and limitations - Accuracy, integrity, availability and continuity including on-board performance monitoring and alerting - GPS receiver, RAIM, FDE, and integrity alerts - waypoint fly-by versus flyover concept • **Flight plan requirements** • **ATC procedures:** - ATC contingency procedures - Separation minima - Mixed equipage environment - Transition between different operating environments - Phraseology	• **Related control procedures:** - Radar Vectoring Techniques (where appropriate): • RF leg limitations • airspeed constraints • **RNP Approach and Related procedures:** - Approach Minima - Additional Requests for Altimeter Settings • **Impact of Routing Changes during a procedure**

ATC Training

- **FAA Guidance JO 7110.65V**
- **AirServices Australia Guidance (AIC H27/14)**
  - Mature guidance on vectoring requirements for controllers.



Utilization Rates

Airport	Movements (Ranking)	RWY	Utilization Rate
CYYC	250,953 (3)	11	0%
		17R	24%
		29	20%
		35L	7%
CYEG	168,889 (5)	02	0%
		12	50%
		20	61%
		30	27%
CYYJ	166,524 (6)	09	60.3%
		27	0.0%
CYOW	154,637 (8)	07	0.0%
		14	0.0%
		25	64.2%
		32	52.2%
CYWG	123,778 (11)	13	12.7%
		18	55.0%
		31	20.9%
		36	6.8%
CYXX	122,213 (12)	07	100.0%
		25	89.8%
CYXE	91,160 (19)	09	5.0%
		15	0.0%
		27	57.1%
		33	0.0%

Questions?