

SESAR 15.3.2 D07 – SESAR Nav aids Roadmap

EASA workshop on PBN Operations
14-15 January 2014

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Project Overview

- Objective
Evaluate the navigation infrastructure rationalization/optimization potential

- Scope
ECAC states / 2020 timeframe (Phase 1)
Focused on ENR and TMA

- Contributors
 - THALES (Project Manager)
 - EUROCONTROL
 - NATS - UK
 - ENAV - Italy

Document Overview

- Purpose

This document, which is the deliverable of the last task in Phase 1, proposes a generic methodology applicable to the rationalisation of the nav aids infrastructure and provides information on certain enablers, issues and constraints that have been identified in relation with this process

- Intended readership

- ANSPs and Regulators/NSAs in ECAC member States
- Other SESAR Projects, in particular 15.3.1

Document Structure

- Navigation Infrastructure Planning Context – Summary of assessments performed in previous tasks
 - General context (ICAO & ECAC)
 - Project Operational Requirements
 - Potential Reversion scenarios
 - Potential evolution of ECAC Nav Infrastructure
- Guidelines for transition to Rationalized Infrastructure
 - Methodology
 - Transition Issues

Navigation Infrastructure Planning

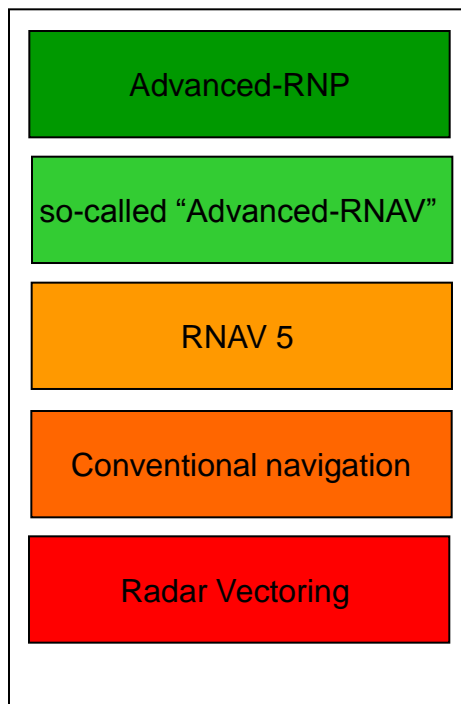
General context

- GNSS becomes the primary means of navigation for all phases of flight
- Ground nav aids – support reversion modes (GNSS outage)
- For safety and capacity reasons not recommended to rely on ATC vectors as the sole reversion mode
- Alternate navigation signals required to maintain situational awareness and reduce cockpit workload
- Rationalization objective: evolve navigation infrastructure to a “minimum network”
 - Maintain safety following the loss of GNSS
 - Maintain an expected level of capacity

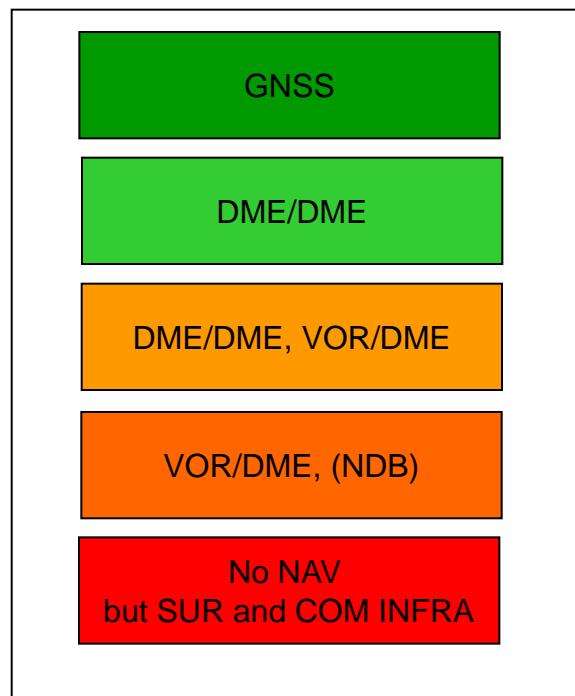
Navigation Infrastructure Planning

Project Operational requirements

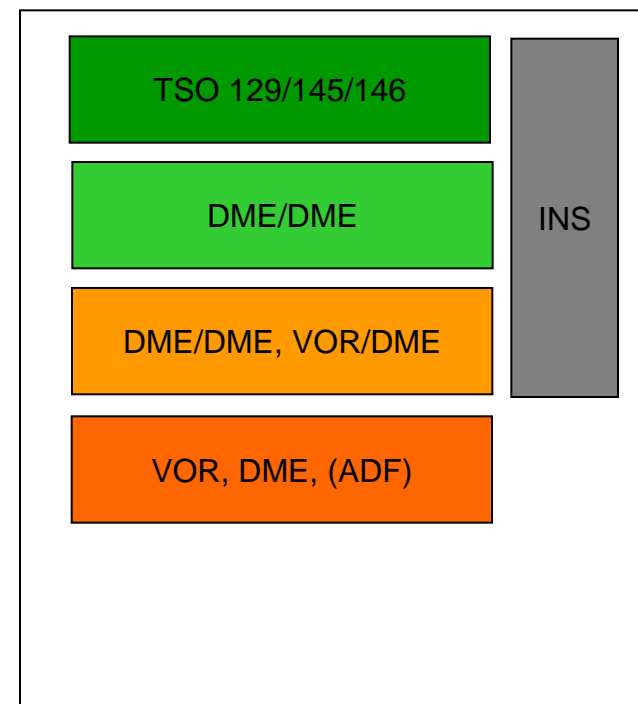
NAV application



NAV INFRA



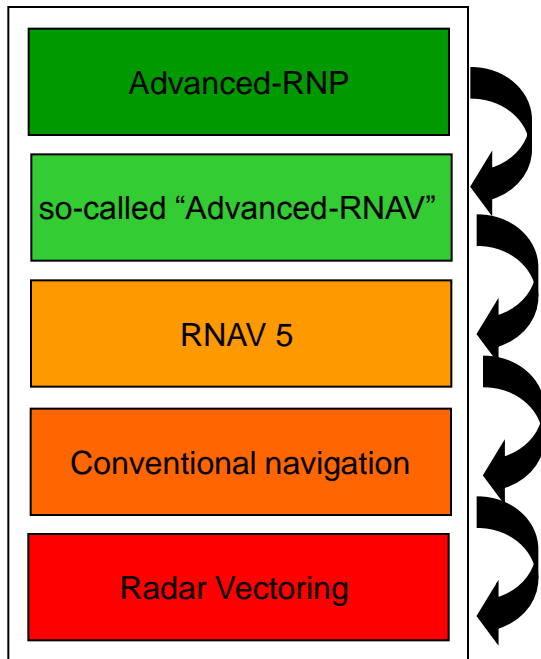
NAV avionics



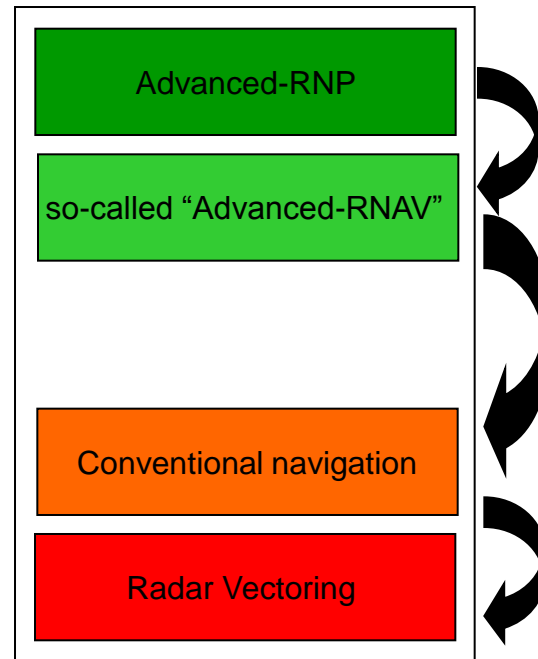
Navigation Infrastructure Planning

Potential reversion scenarios

Scenario 1

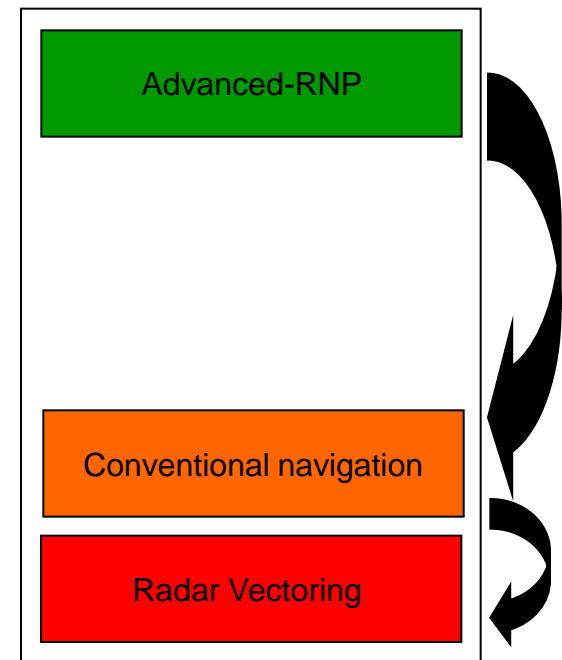


Scenario 2



**Candidate
for harmonization**

Scenario 3



Navigation Infrastructure Planning

Potential Evolution of ECAC NAV infrastructure

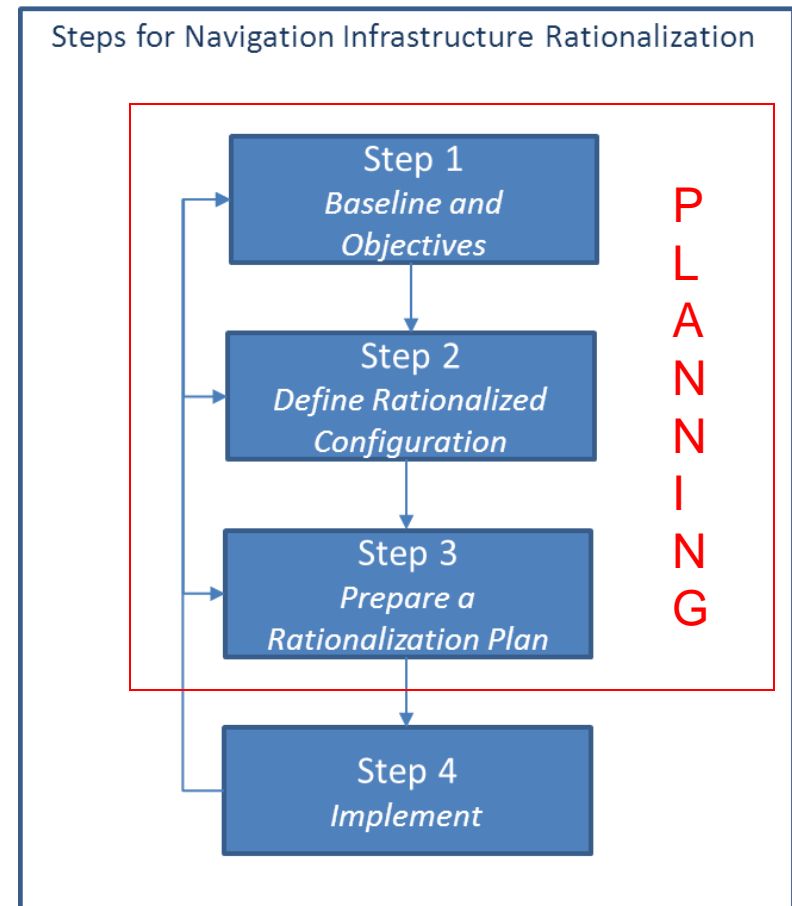
Navigation Infrastructure Across All ECAC States		VOR	DME	NDB
TOTAL	Current	754	793	1257
	Rationalized RNAV	498	754	84
	Rationalized MON	304	304	N/A

- Rationalized RNAV – According to State level assessments (D05)
- Rationalized MON – Initial assessment on a VOR/DME Minimum Operational Network (Appendix A)

Rationalization Guidelines

Methodology

- Several “common sense” steps
- But... “The devil is in the detail”
- 3 Planning steps before implementation
- Few iterations expected in the planning phase, resources need not to be underestimated
 - Effort
 - Time
- Minor updates might be needed in the implementation phase as well
- Early consultation with NSA



Rationalization Guidelines

Issues

- Need for consultation (once an initial plan is defined)
 - All Airspace users (may have different needs)
 - Other ANSPs, e.g. independent airports
 - FAB partners, other neighboring countries
- Human response to change
 - Big changes are initially perceived as a negative event
 - Fear of the unknown and cost
 - Need for iterative contacts and detailed information

Rationalization Guidelines

Issues

- Issues related to the operational role of VORs
 - In addition to ENR and TMA navigation, VORs often used for:
 - Procedural Separation in non-Radar areas (or outage)
 - Hold procedures
 - ILS intercept
 - Minimize airspace infringement risks (GA VFR flights)
 - RNAV Hold design criteria to be clarified, in some cases the protection areas can be larger than for conventional holds
- Airspace changes
 - In many cases more complex than expected
 - Correct evaluation of changes: procedures design and AIP&EAD update
 - Availability of expertise
 - Time and cost involved

Rationalization Guidelines

Issues

- Special Technical issues
 - Systems lifecycle (synchronize decommissioning with end of lifecycle)
 - Revise DOC
 - Use of cross-border nav aids
 - Spectrum pricing
 - Non-NAV systems implications (e.g. changes in ATM systems: route network, waypoint names)

Rationalization Guidelines

Issues

- Impact assessment
 - Fully document all decisions in the planning phase
 - Document the outcome of all stakeholders consultation
 - Individual impact assessments needed for each navaid
 - Safety case
 - Capacity and efficiency impact
 - Transition plan
- Regulatory agreement
 - Major changes require NSA agreement
 - Involve NSA in early stages
 - ANSP and NSA to develop a common vision
 - Include rationalization strategy in PBN Implementation plan

Conclusion

- Nav aids rationalization requires a significant amount of resources i.e. time, money and personnel
- The cost savings may not be immediate (initial increase is possible)
- A “bottom-up” approach is recommended vs. a “top-down” one (in line with ICAO ANC 12) to allow a gradual rationalization at the end of nav aids lifecycle. The rationalization costs are in this case lower than the replacement costs
- Rationalization process to be carefully planned and started several years before the end of the lifecycle of envisaged nav aids

Future work (Phase 2)

- Key issues that require further consolidation:
 - Role of DME/DME in supporting RNP operations and/or reversion
 - Future role of VOR in a PBN environment (contingency backup?)
- More detailed guidance will be possible once the discussion on reversion scenarios in the context of PBN IR has matured
- These issues will be dealt with further in phase 2 of the project