# Challenges in PBN Design, Validation & Approval

## Vágar (EKVG) Case, Faroe Islands


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  - IFP & Airspace Design expert ICAO Capacity Development & Implementation (CDI) Bureau
  - Former ATCO (MIL & CIV) & ATC Instructor at ENAC, France

# Agenda

Vagar **Context**

RNP AR **Procedures**

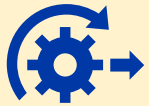
**Mitigations** – AIP

**Pre-PBN** Vagar & **Objectives**

**Deviations** – Design

**Post-PBN** Vagar **Benefits**

Project **Logic** & **Engagement**



**Innovations** – SID & ILS

**Lessons Learned**

# Vagar Context

## Geography

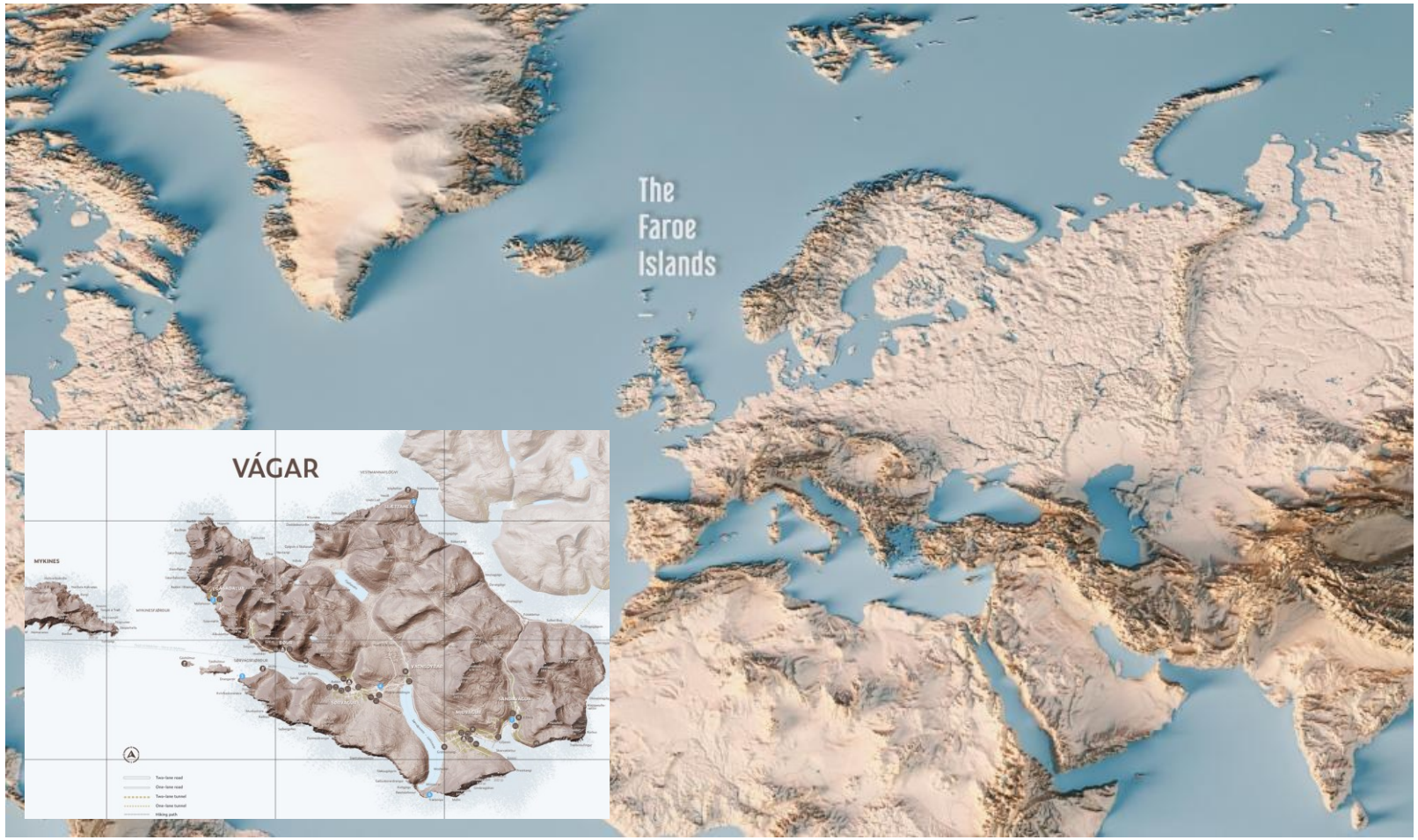
## Topography

## Climate

## Accessibility

# Vagar Context

## Geography




**Remote archipelago:**

- Faroe Islands
- Between Scotland & Iceland
- 18 islands

# Vagar Context

## Topography



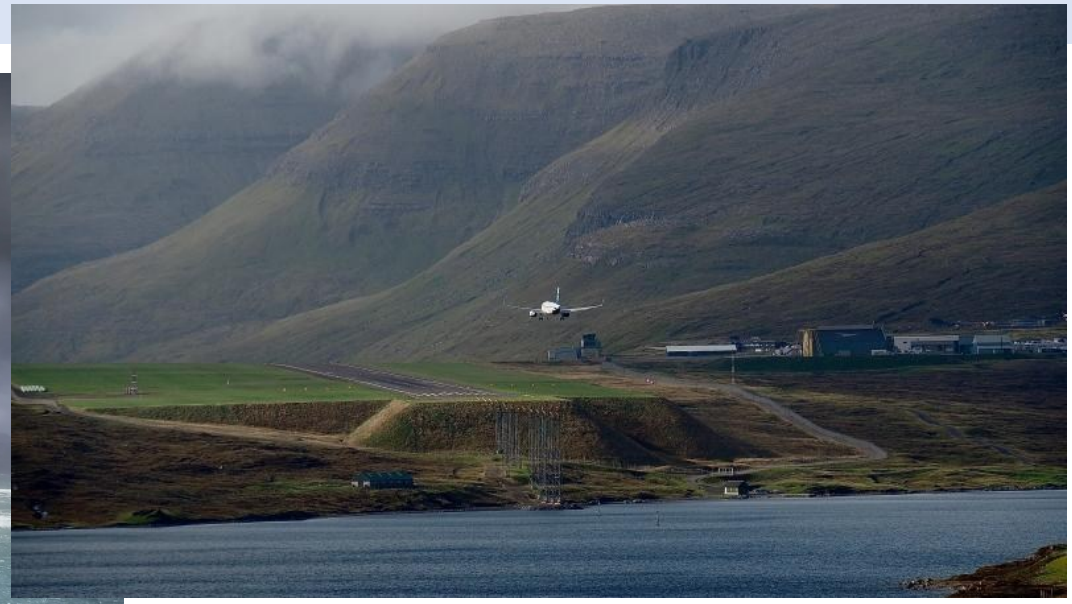


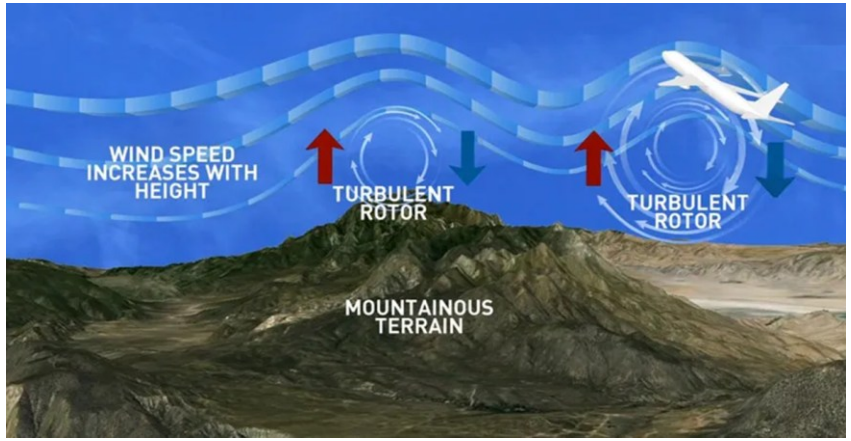
### Aerodrome setting:

- Short fjord valley runway (1800 m)
- Surrounded by irregular hills
- Limited on both sides by water and terrain

# Vagar Context

## Climate






**Wild weather:**

- Atlantic storms
- Low clouds
- Violent wind shear & rotors
- Frequent sudden changes

# Vagar Context

## Accessibility

### LIMITED ACCESS

- **By sea:**
  - Limited frequency and capacity
  - Slow, uncomfortable and sometimes impractical

- **By air** (Before RNP AR)**:**
  - Frequent weather-related diversions and cancellations
  - Unreliable destination for visitors and business
  - Costly

# Pre-PBN Vagar & Objectives

**SAFETY** Issues

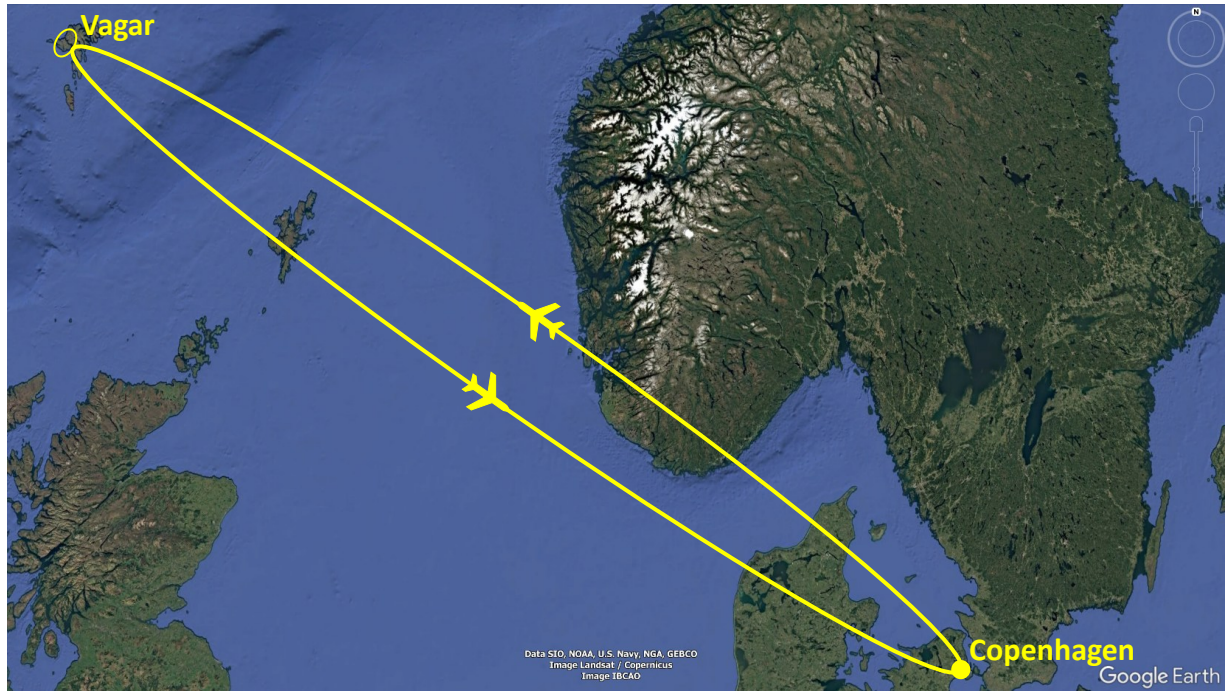
Due to:

- Vagar **context**
- **Inappropriate/insufficient** technological **solutions** (Conventional procedures / Lack of vertical guidance)
- **Accident** records

Objective 1:
**Enhance SAFETY**


On August 3, 1996, a Royal Danish Air Force Gulfstream III (F-330) crashed on final approach to Vagar Airport in the Faroe Islands, killing all nine people on board, including the Danish Chief of Defence, Admiral Hans Jørgen Garde.

# Pre-PBN Vagar & Objectives




| OCA (H) | C | D | SPECIAL CONDITIONS |
|---|---|---|---|
| LOC only | 1330 (1100) | 1330 (1100) | |
| ILS | 1240 (1005)* | 1250 (1015)* | * MAPt climb gradient 2.5%. |
| ILS | 680 (445)** | 690 (455)** | **MAPt climb gradient 5.0%. |

**AD 2 - EKVG**
**ILS or LOC Z RWY 30**
**(ACFT CAT C / D)**
**Vágar**

**AD 2 - EKVG**
**LOC RWY 12**
**Vágar**

| | OCL |
|---|---|
| LOC / DME * | 820 |

## **ACCESS** Issues

Due to:

- **High** operational **minima**
- Rapid **change** of **weather** conditions
- **Poor diversion** options
- **Limited** departure **conditions** (VMC)

Objective 2:
**Improve ACCESS**

# Project Logic

**Project** (>2011)

QUOVADIS an AIRBUS subsidiary

AIRBUS PRO SKY

NAVBLUE AN AIRBUS COMPANY

**Design**

CGX

**Airline**

ATLANTIC AIRWAYS

**Target**

**Enabler**

**Hazard**

**Control**

**Evidence**

# Project Logic

**Enabler**

If

**DEVIATION**

or

**NO PUBLISHED CRITERIA**


# Stakeholders Engagement

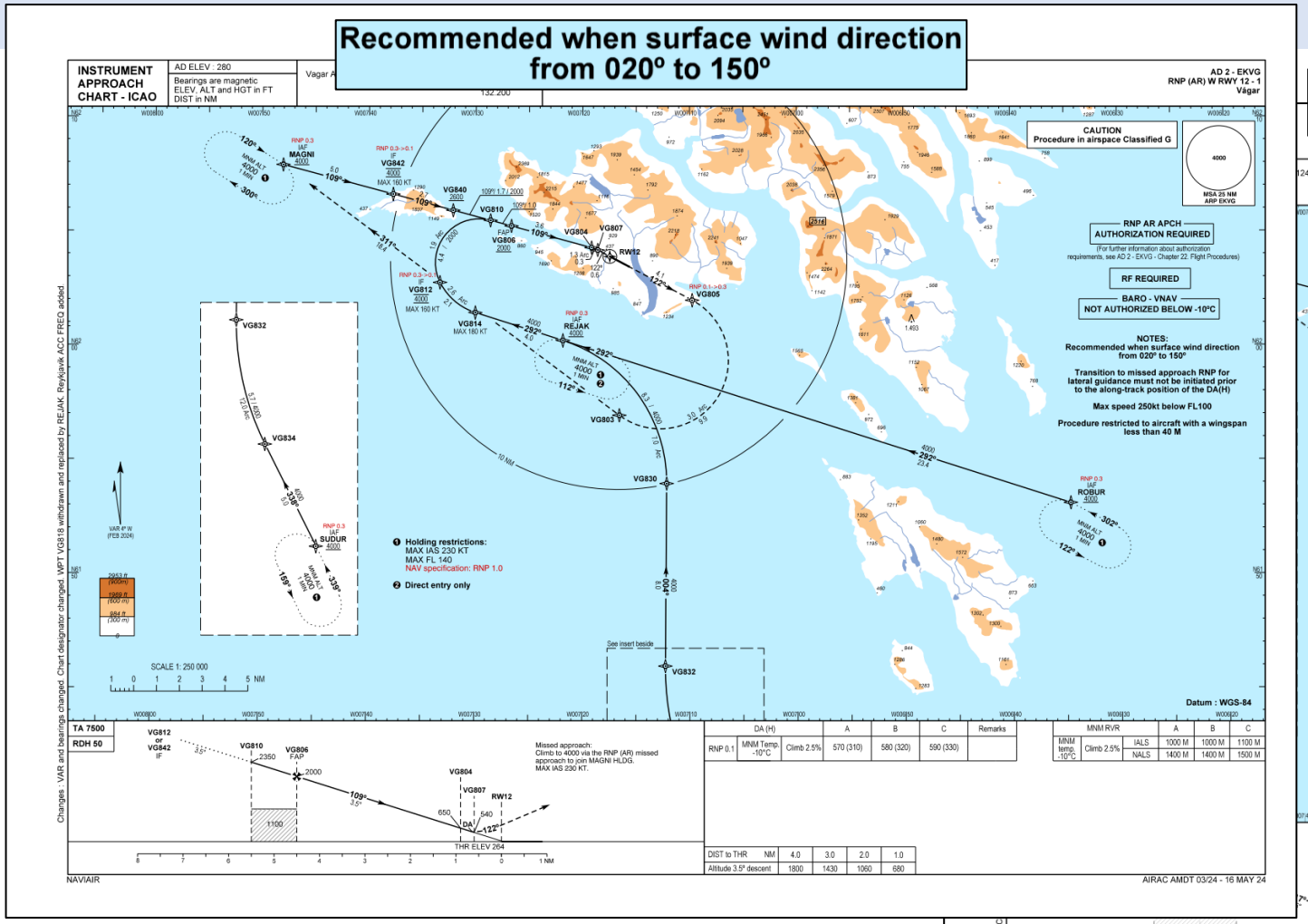
If we **do not work together** for the success of the project

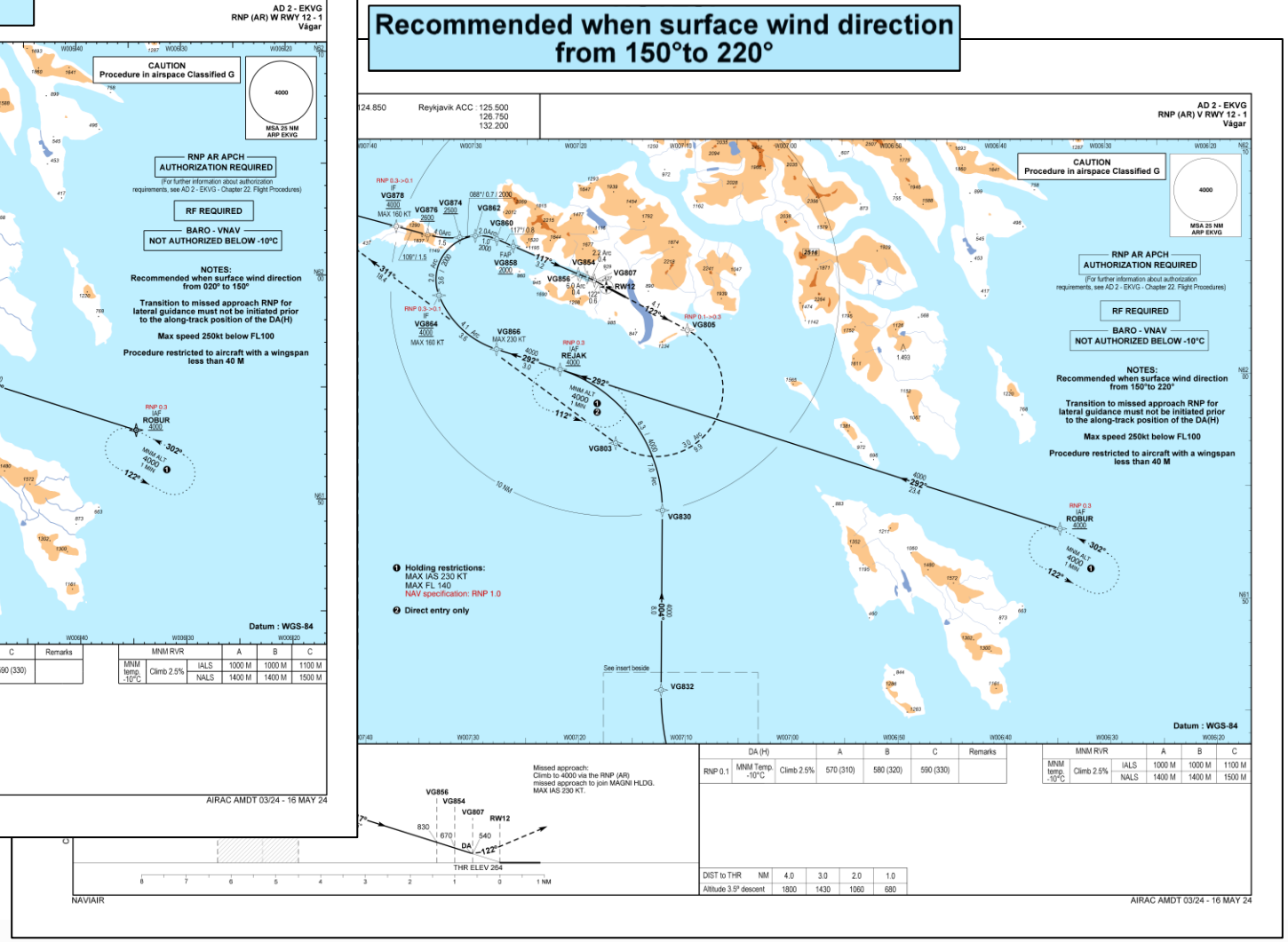
**WE ALL FAIL**


If we **really work together** for the success of the project

**WE ALL SUCCED**

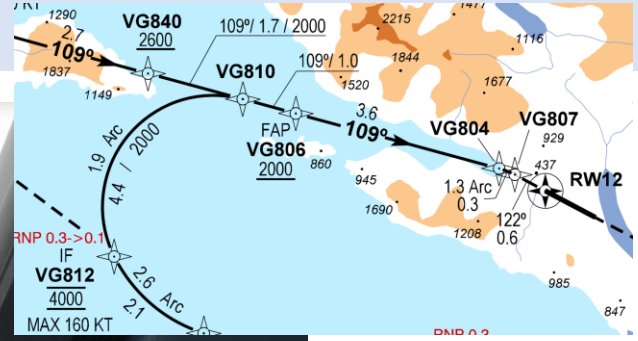
# RNP AR Procedures – Approaches RWY 12



# RNP AR Procedures – RNP AR W RWY 12

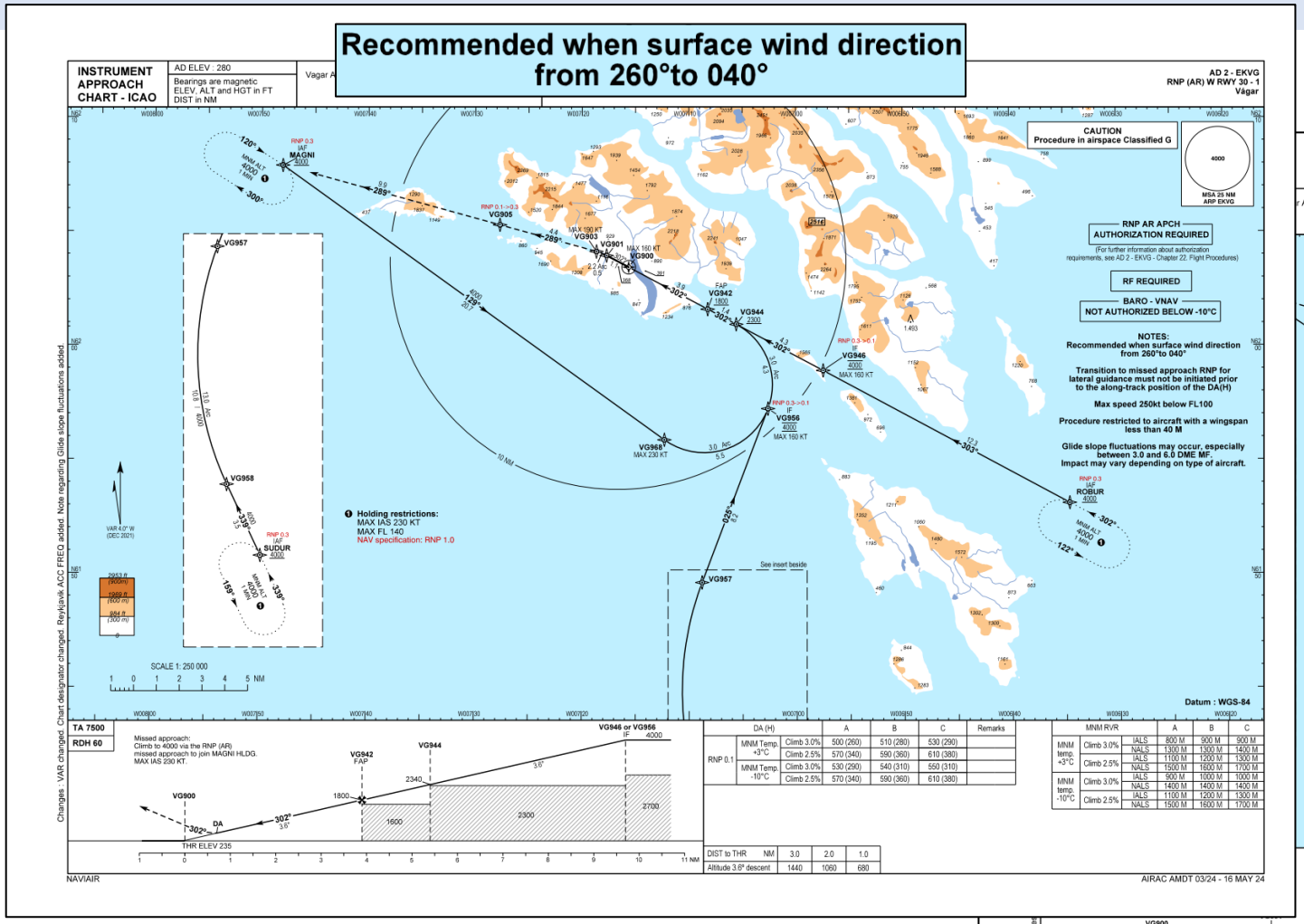
x2.0

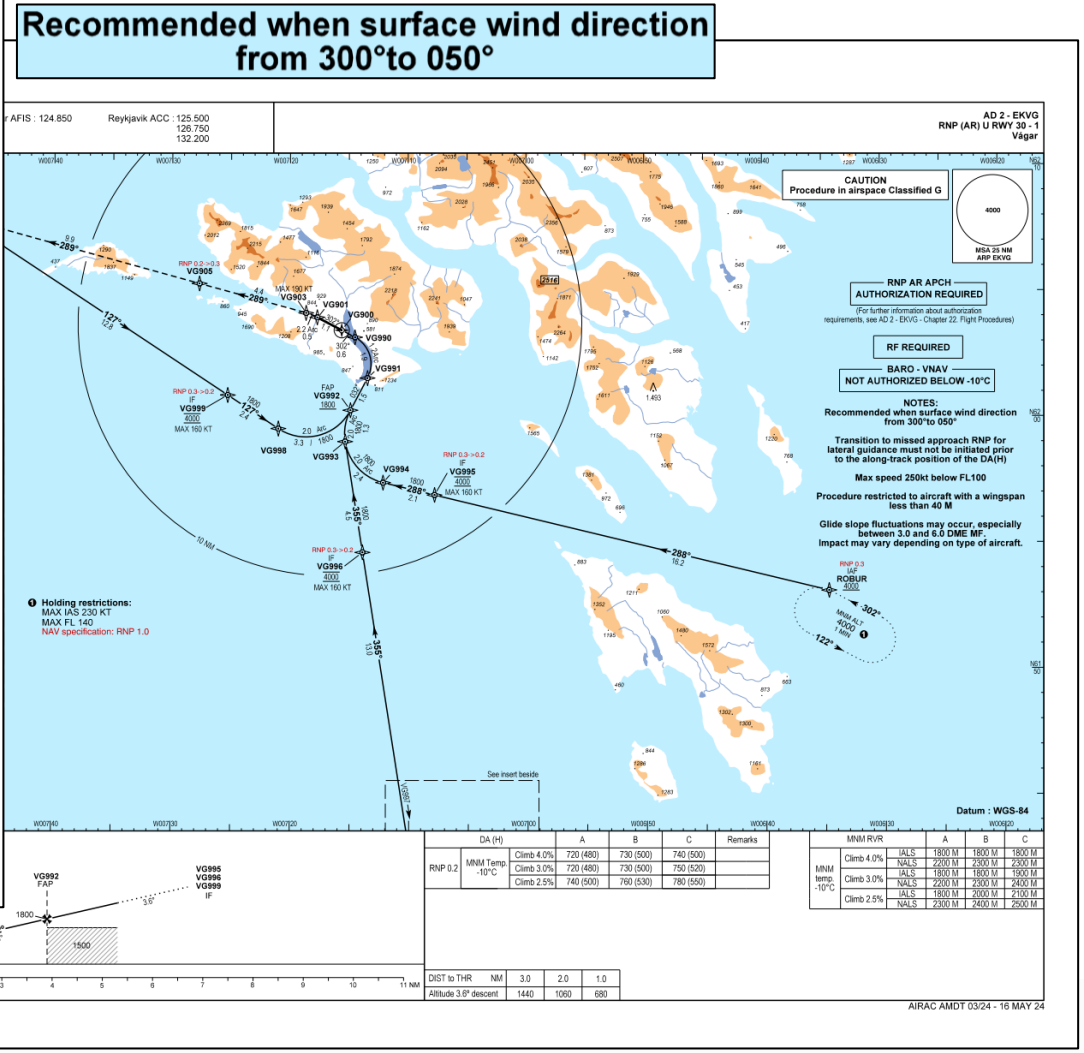



Recommended when surface wind direction from 020º to 150º

https://youtu.be/TaVkvaHr0lo?si=mlQ0kSmwI9UpCPcp

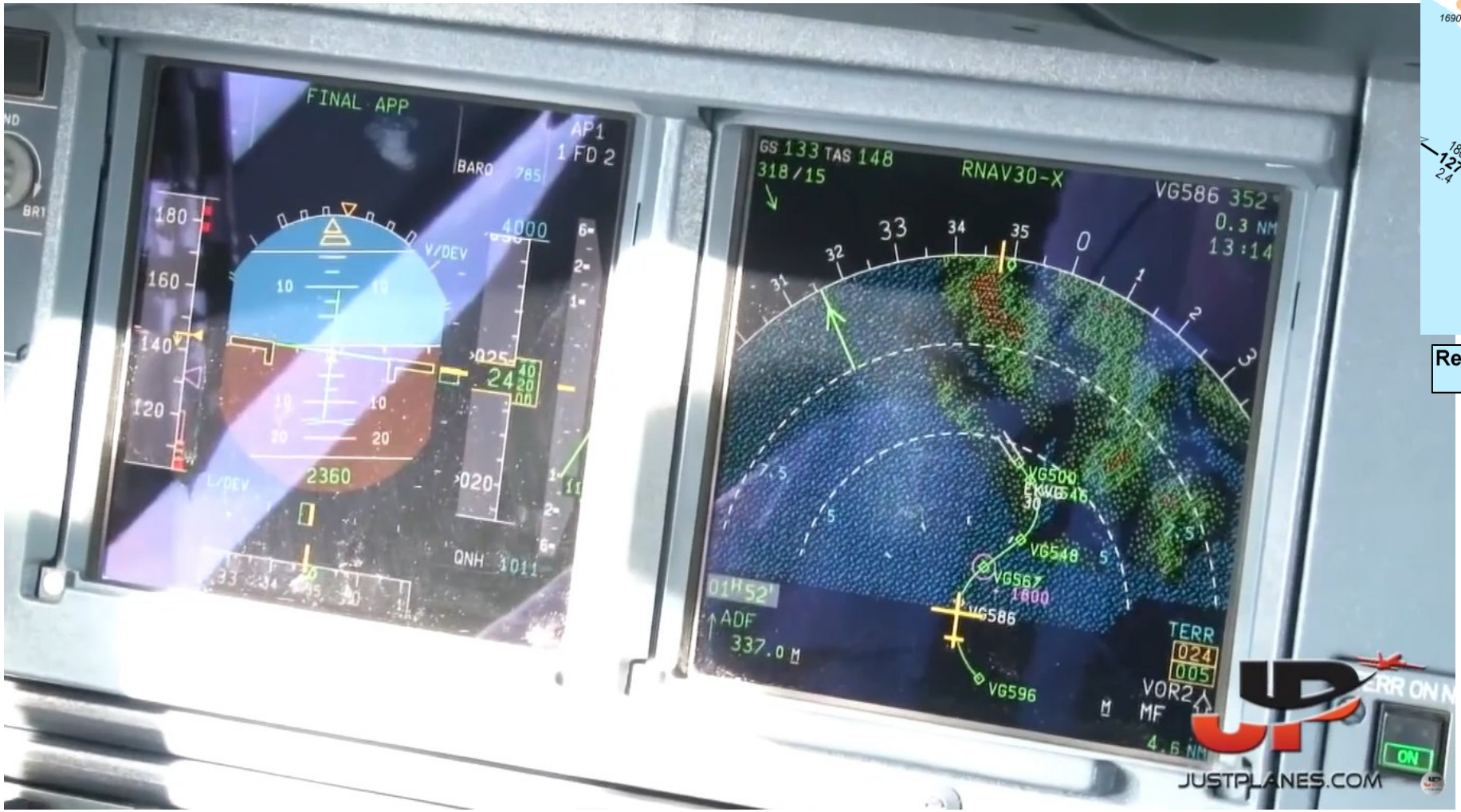
# RNP AR Procedures – Approaches RWY 30

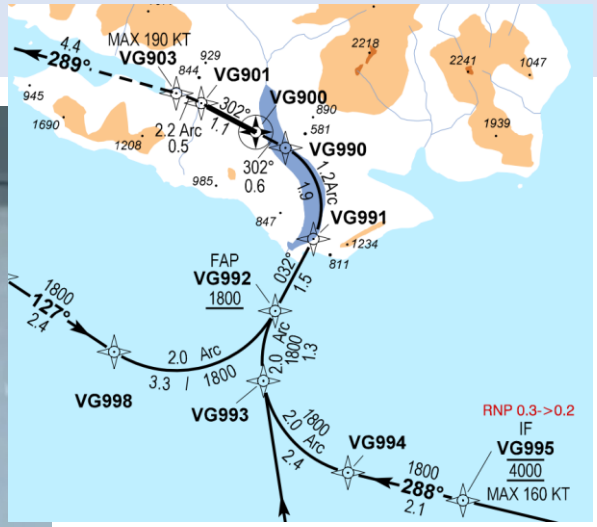


# RNP AR Procedures – RNP AR U RWY 30

x1.25

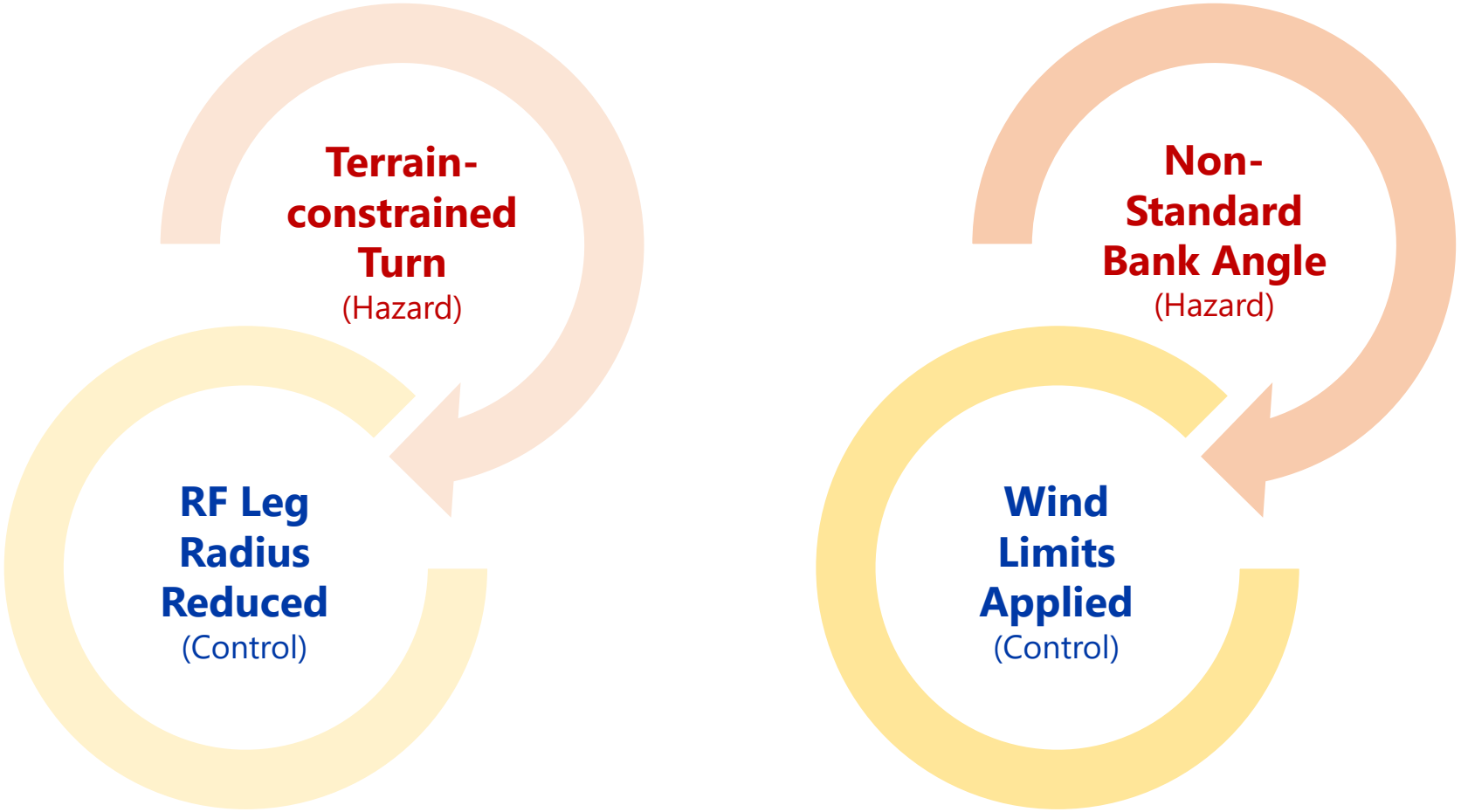



**Recommended when surface wind direction from 300°to 050°**

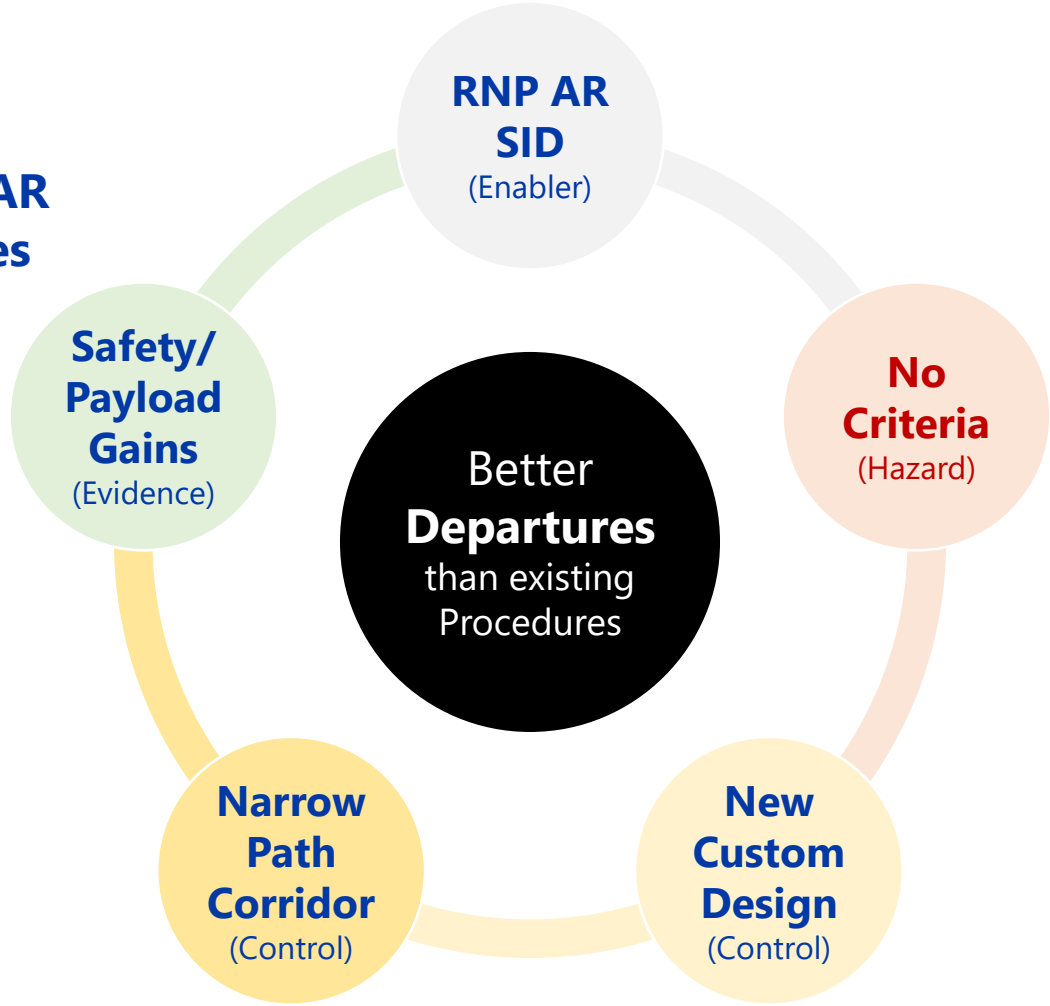
https://youtu.be/RJPWzGP8ZB8?si=nzyTWOvmE1FrZaKR

# Procedure Design Deviations



# RNP AR Departure (SID) – Innovation

**First RNP AR Departures** in **Europe**



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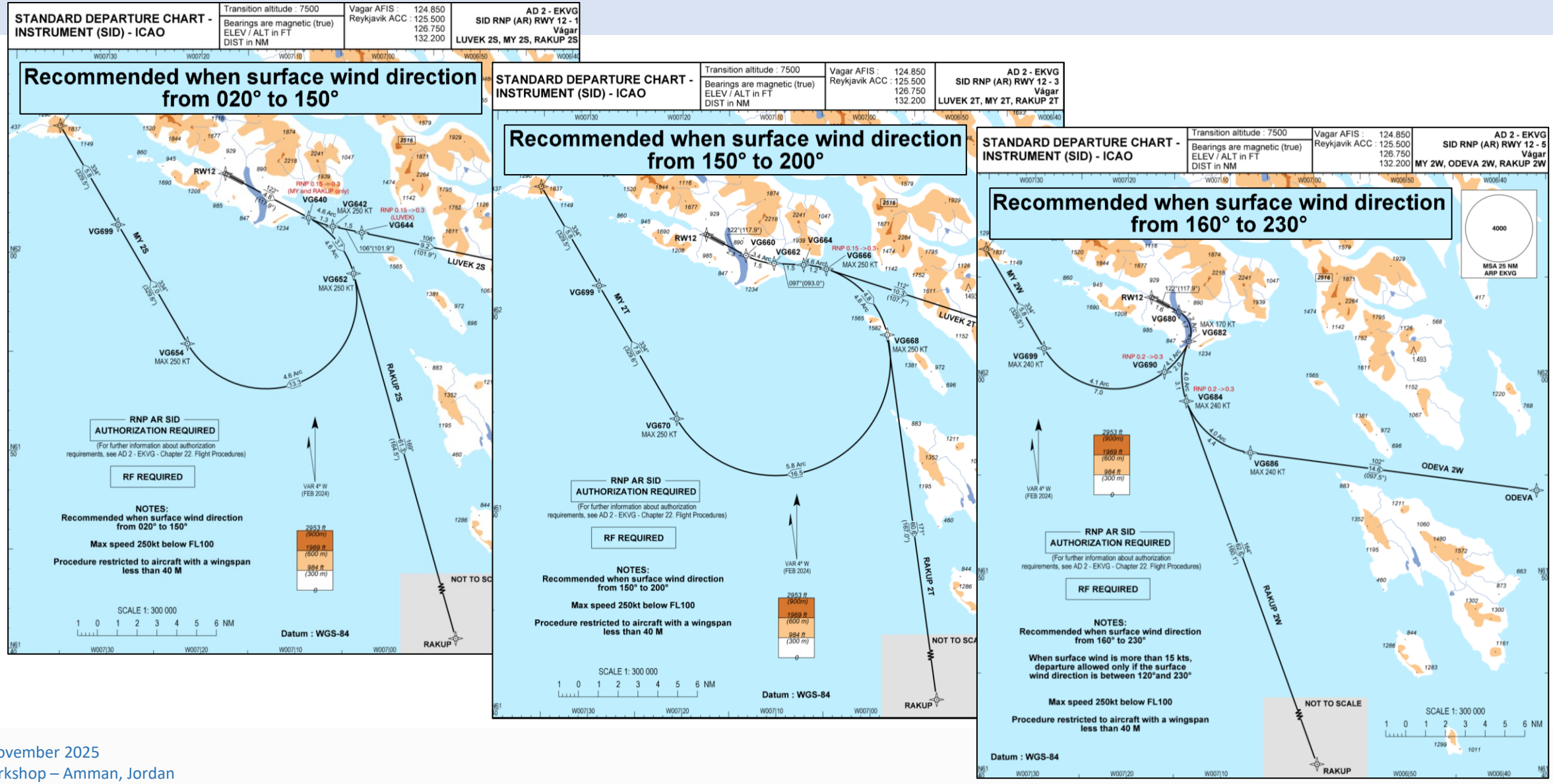

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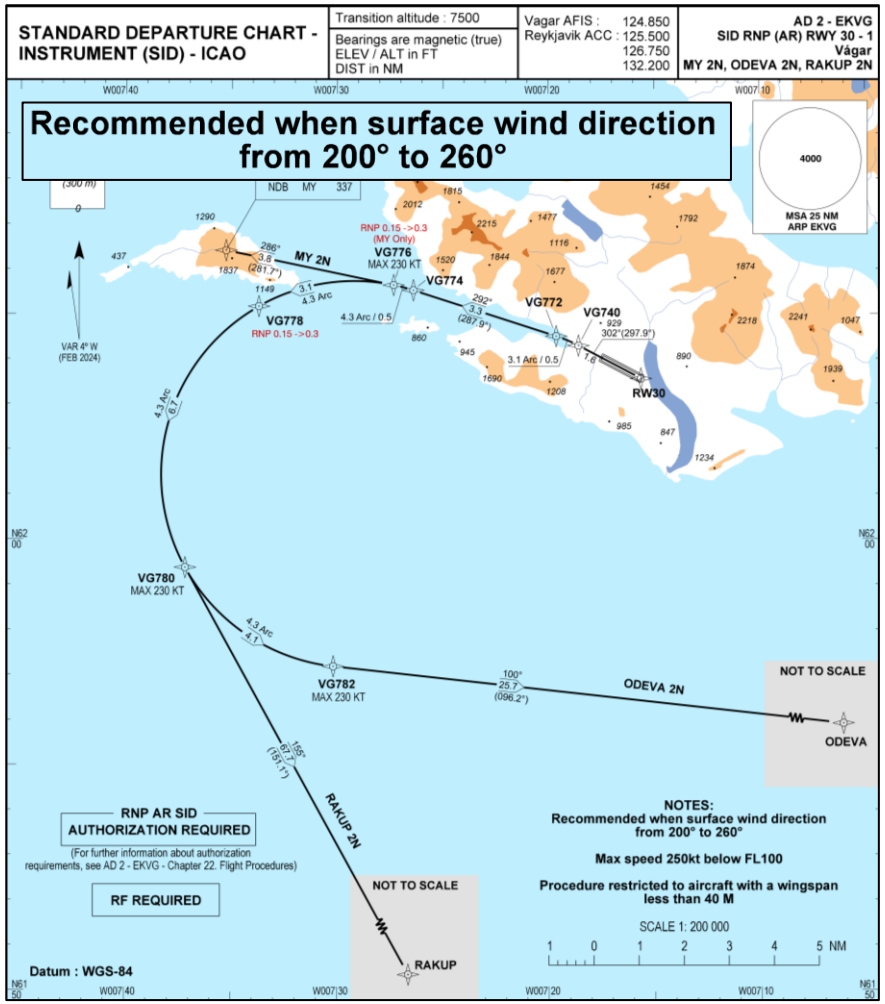
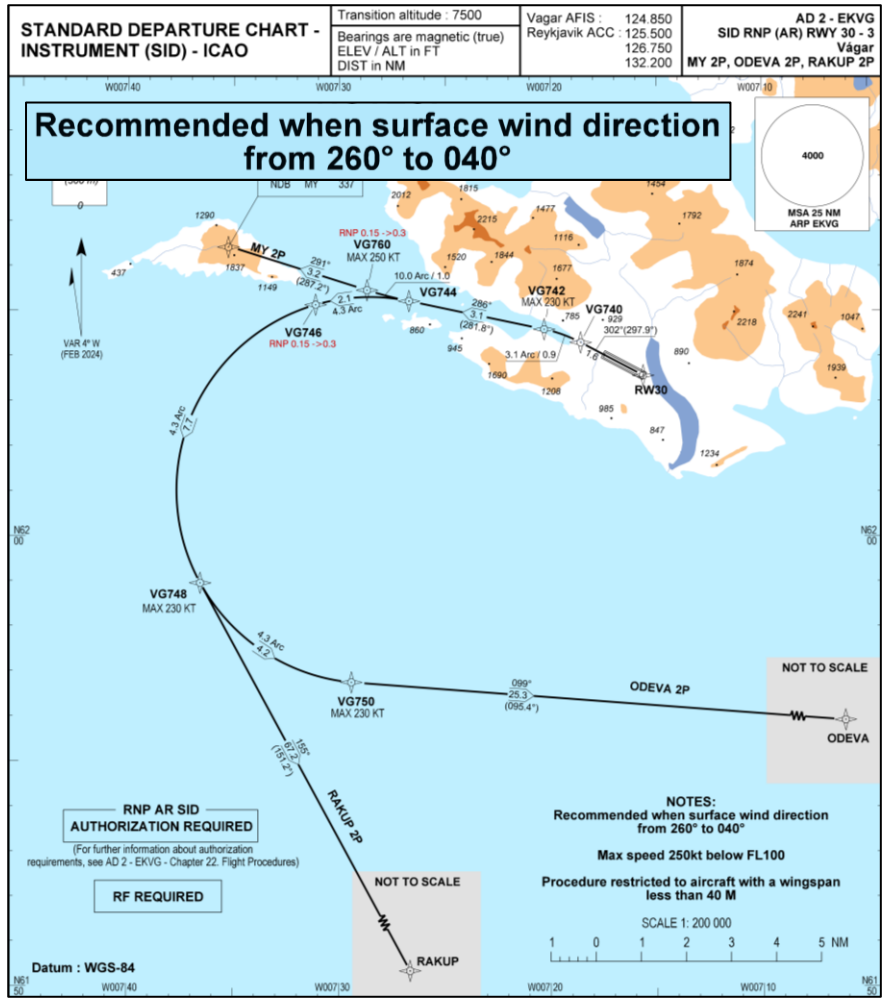
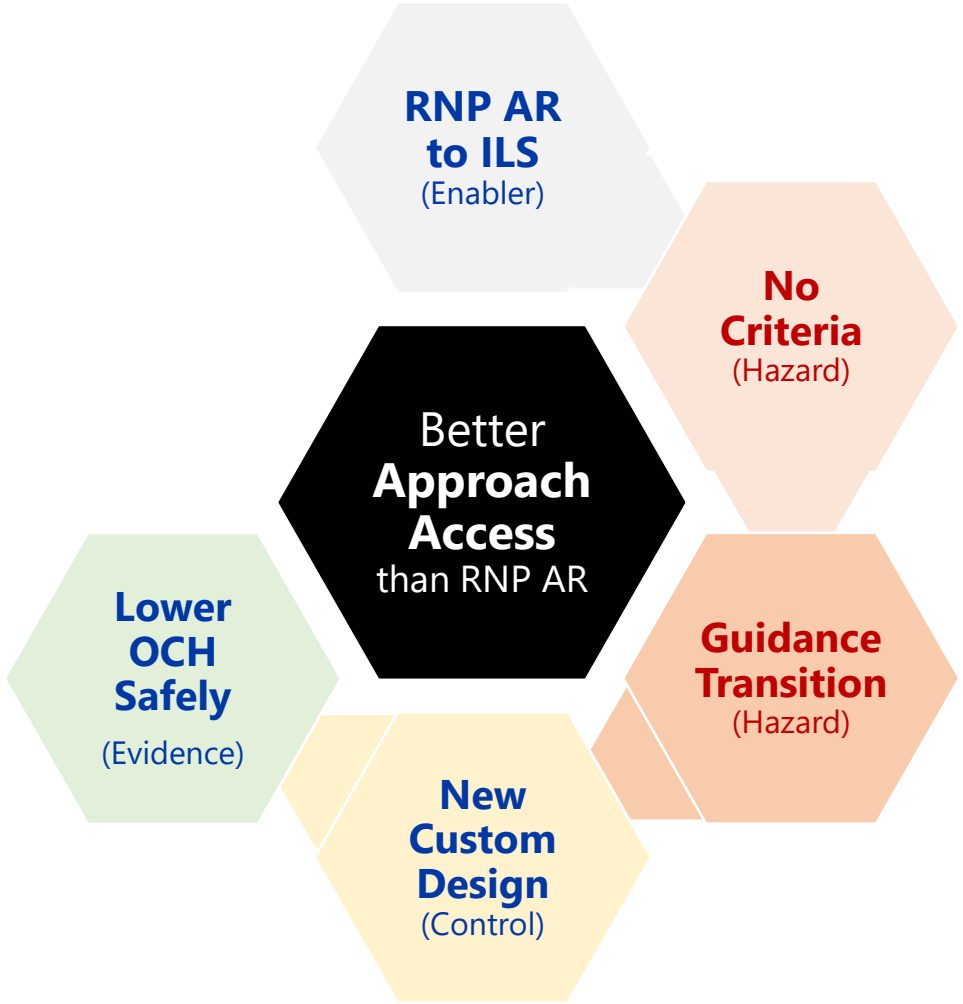


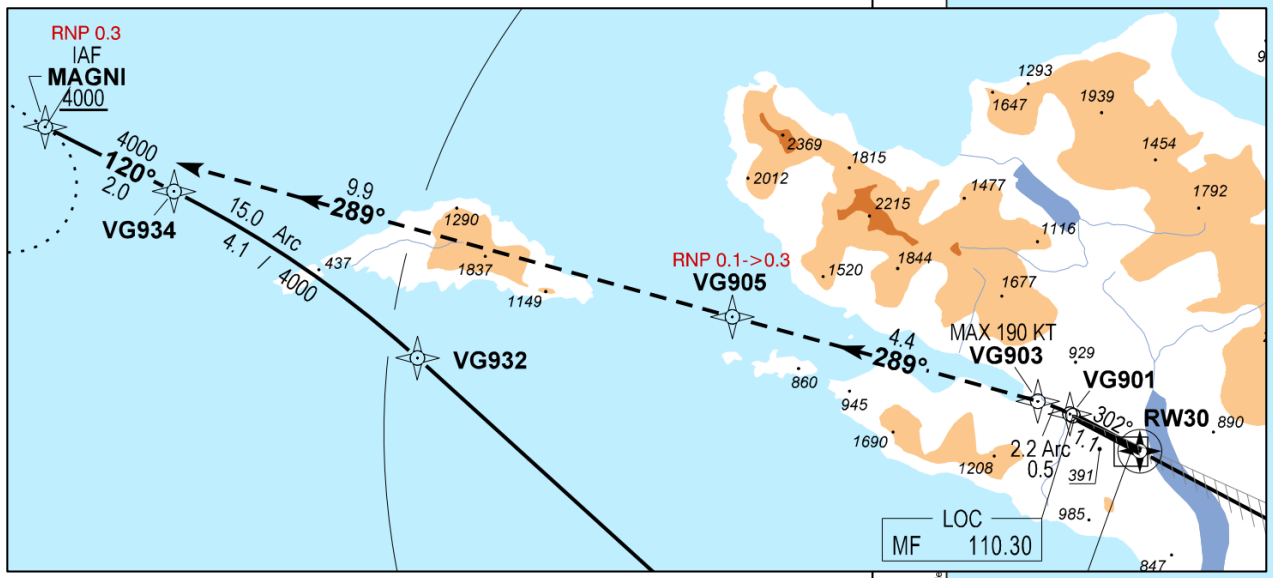
# RNP AR to ILS Transition – Innovation

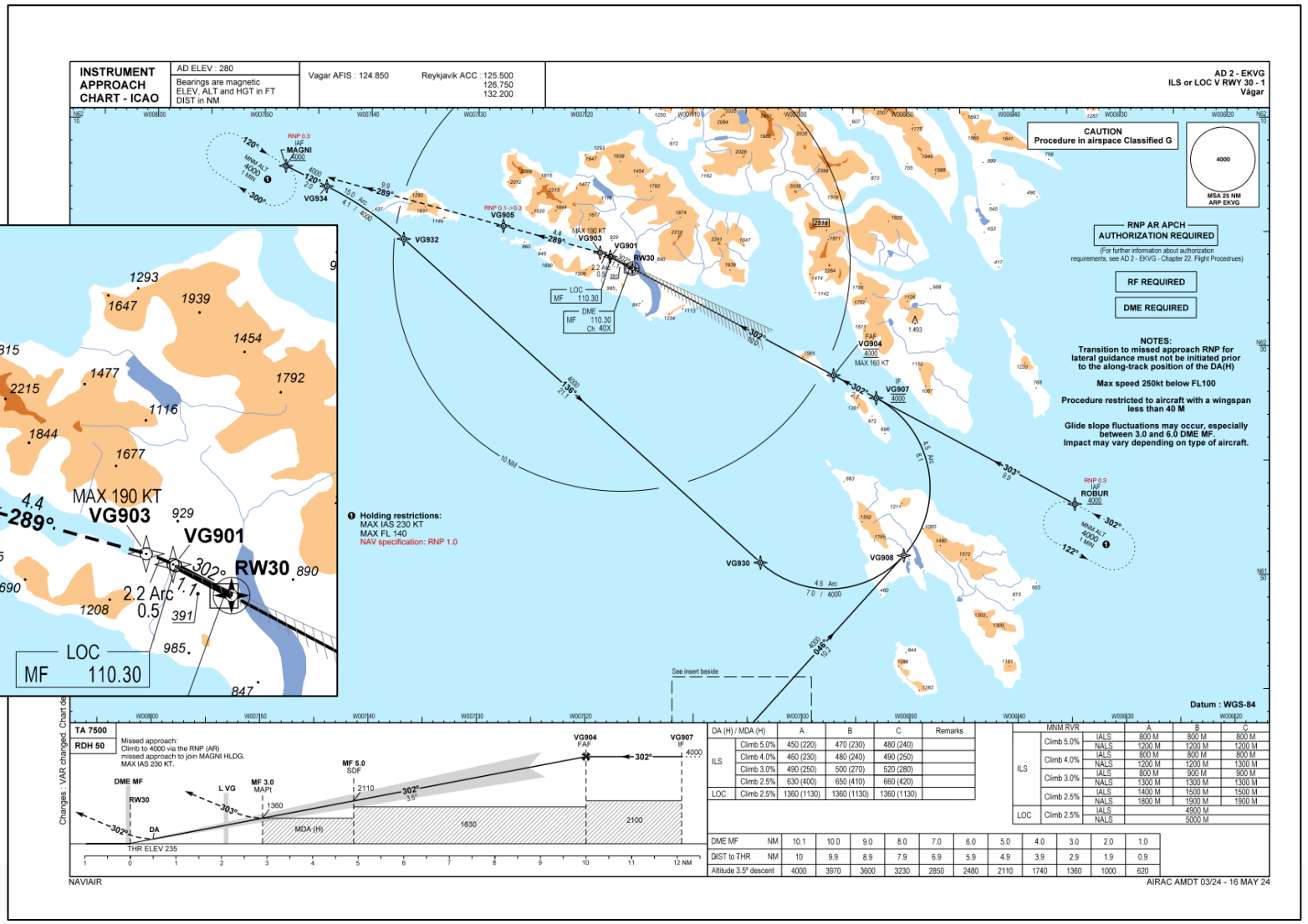
**First ILS**
with
**RNP AR 0.1 Missed Approach**
in the
**world**



# RNP AR to ILS Transition – Innovation

| DA (H) / MDA (H) | | A | B | C |
|---|---|---|---|---|
| ILS | Climb 5.0% | 450 (220) | 470 (230) | 480 (240) |
| | Climb 4.0% | 460 (230) | 480 (240) | 490 (250) |
| | Climb 3.0% | 490 (250) | 500 (270) | 520 (280) |
| | Climb 2.5% | 630 (400) | 650 (410) | 660 (420) |




7-9th November 2025
IFP Workshop – Amman, Jordan
Challenges in PBN Design — Vágar (EKVG) Case

# Mitigations in AIP - Familiarization

https://aim.naviair.dk/media/files/gt1sme00g3t/EK_AD_2_EKVG_en.pdf

AD 2 - EKVG - 6
04 SEP 25
**Vágar**

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The dimensions of the runway, height, slope and approach angle for both runways are listed on Aerodrome Chart – ICAO, AIP Faroe Islands, AD 2 – EKVG, ADC Vágar.

**3. Mandatory Familiarization Program**

In order to enhance flight safety, Vagar aerodrome has implemented a familiarization program, applicable to the pilot in command if he has not previously and within the last 36 months, operated on Vagar Aerodrome.

**3.1. Familiarization Program**

The familiarization program is named “MANDATORY FAMILIARISATION PROGRAM REGARDING WIND/TURBULENCE AND GEOGRAPHICAL CONDITIONS FOR VÁGAR AERODROME (EKVG, FAROE ISLANDS)”,

The familiarization program will be found at this link:

https://www.fae.fo/en/for-airlines/mandatory-operator-familiarization-program-regarding-turbulence-condition-for-vagar-airport/

# Mitigations in AIP – SID Design Criteria

https://aim.naviair.dk/media/files/gt1sme00g3t/EK_AD_2_EKVG_en.pdf

2.1.1 Introduction:

2.1.1.1 As there are no existing published RNP AR SID design criteria yet, these RNP AR [RNAV(RNP)] SID's are designed based on TF and RF legs particularities in the ICAO RNP AR Manual (DOC 9905) during the climbing phase of the Missed Approach and the general criteria applied for the departures in the ICAO PANS-OPS (DOC 8168) Vol. II.

2.1.1.2 A set of SID's has been designed for RWY 12 and RWY 30 by NAVBLUE, an Airbus Subsidiary Company.

2.1.1.3 The RNP Standard Instrument Departures from EKVG are designed to enhance the overall safety of the operation by reducing crew workload and defining fully managed procedures, and predictable/repeatable trajectories from the airport.

# Mitigations in AIP – Approved Users

https://aim.naviair.dk/media/files/gt1sme00g3t/EK_AD_2_EKVG_en.pdf

2.1.2 Approved users, equipment and operations

2.1.2.1 For the EKVG RNP SID's, the operators shall ensure that they hold all necessary operational approvals as part of the Operations Specifications of the AOC from its authority (Ref ICAO PBN Manual, Doc 9613).

2.1.2.2 The operator must have a Special Authorization from its authority in order to use the RNP AR departures to EKVG (Ref to EASA AMC 20-26, FAA AC 90-101A or equivalent).

2.1.2.3 The operator shall seek authorization from the Danish Civil Aviation Authority to conduct EKVG RNP AR Departure procedures at VAGAR.

2.1.2.4 The operator is responsible of conducting a Flight Operational Safety Assessment (FOSA) including the Flight Simulation of EKVG RNP AR procedures.

2.1.2.5 The RNP AR SID's require a navigation accuracy of RNP 0.15 and RF-leg capability.

# Mitigations in AIP – Other Requirements

https://aim.naviair.dk/media/files/gt1sme00g3t/EK_AD_2_EKVG_en.pdf

2.1.3 RAIM-CHECK

During flightplanning or before dispatching the aircraft, the pilot shall ensure a RAIM check with a mask angle appropriate to the terrain (Minimum mask angle 5°).

2.1.4 Limitations of the procedures

Due to the tight radius of the first RF-leg, SID RNP – ODEVA 2W / MY 2W / RAKUP 2W RWY 12 departures are allowed when:

- Wind speed more than 15 KT and wind direction between 120° and 230°
- Wind speed equal or less than 15 KT for all wind directions

2.1.5 RNP capability lost

If the RNP capability is lost, the ATS unit shall be informed as soon as possible about the alternate course of action from the pilots of the concerned aircraft.

# Mitigations in AIP – Turbulence Risk

https://aim.naviair.dk/media/files/gt1sme00g3t/EK_AD_2_EKVG_en.pdf

## 2. Turbulence warning and restrictions

During approach to and departure from Vagar Airport turbulence can be expected at some wind direction and velocity.

The pilot in command is requested to familiarize himself with the weather conditions and turbulence indications described in the wind roses and in the "MANDATORY FAMILIARISATION PROGRAM REGARDING WIND/ TURBULENCE AND GEOGRAPHICAL CONDITIONS FOR VÁGAR AER-ODROME (EKVG, FAROE ISLANDS)", and to communicate with Vagar AFIS for updated weather conditions, prior to operations at Vagar aero-drome.

## 2.2. Turbulence indicators and weather conditions

Pilots are always responsible to pay attention to the turbulence based on own observations and latest weather update, even when the airport is open for operations. Severe turbulence can occur for all flight tracks to and from Vagar aerodrome.

If the wind direction at 5000 FT is 160º to 240º (GEO) or 350º (GEO) to 090º at a velocity at or above 50 knots, measured by the aircraft systems, it is a strong indicator of severe turbulence to be expected during approach to RWY 12.

# Mitigations in AIP – Turbulence Risk

https://aim.naviair.dk/media/files/gt1sme00g3t/EK_AD_2_EKVG_en.pdf

### 3. Turbulence Warning System (TWI-system)

Vagar Airport has established a turbulence warning system (TWI-system), which is a computer based system, to be used by VAGAR AFIS in order to communicate actual turbulence status. The TWI-system is programmed based on the wind tables below.

The TWI-system indicates expected turbulence, based on measurements by W12 and W30 of 2-min mean wind at runway 12 and runway 30, and 10-min scalar mean for W SKEID wind, and variability of direction larger than 20 degrees standard deviation.The indications from the TWI-system of actual turbulence status, and ½ hour history, will be communicated by VAGAR AFIS by use of radiocommunication.

**Warning:** Approach, landing and departure during such weather conditions require great caution and should only be considered by pilots with extensive experience in operating on Vagar aero-drome.

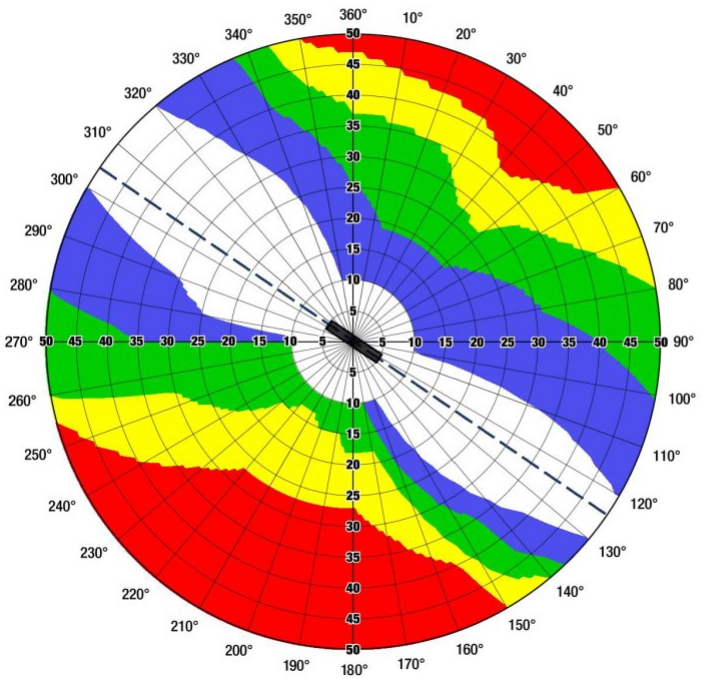
# Mitigations in AIP – Turbulence Risk

https://aim.naviair.dk/media/files/gt1sme00g3t/EK_AD_2_EKVG_en.pdf

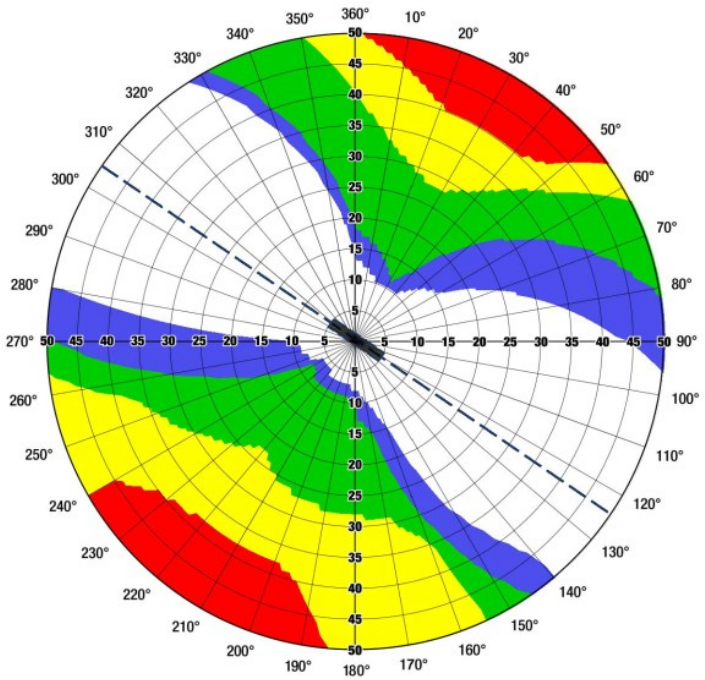
## 4. Restrictions

Approach, landing and departure is not permitted when wind direction and velocity for runway in use indicates red turbulence (severe turbulence) according to the wind tables below and/or in the Turbulence Warning System (TWI-system).

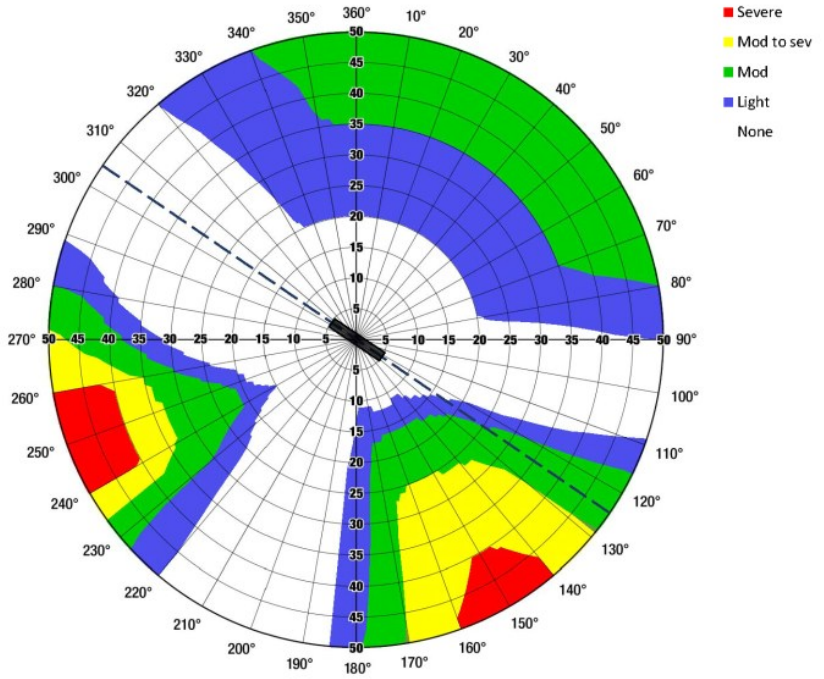
ARR RWY 12 – DEP RWY 30 – Cat M.



ARR RWY 30 – DEP RWY 12 – Cat M.



WATERFALL ARR RWY 30 – DEP RWY 12 – Cat M.



# Post-RNP AR Benefits

| | |
|---|---|
| **Innovative Design** | New solutions to overcome terrain and weather constraints |
| **Improved Access** | Lower minima / Efficient departures / More regularity / More Reliable |
| **Enhanced Safety** | Stabilized approach / Managed Missed A. / Less workload / No accident |
| **Boosted Economy** | Rapid growth of tourism & passenger traffic / More attractive trading |

**FROM** an “alternate-required” destination
**TO** a well-connected airport with safety margins & economic advantages.

# Lessons Learned

**Key elements** to consider for a **successful** & **rapid** design **validation** & **approval**

Early Stakeholder **Inputs & Engagement**

**Innovate** beyond Norms *If needed*

Transparent **Communication** & Build **Trust**

Iterative **Simulation** Tests *if needed*

Thorough **Safety Analysis**

Full Process **Traceability**

Clear **Documentation**

Ensure **Regulator Confidence**

# THANK YOU FOR YOUR ATTENTION


| | |
|---|---|
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| Address: | Le Causse – Espace Entreprises<br>F81100 CASTRES |
| Phone: | +33 5 63 37 82 30 |
| Contact: | contact@cgx-group.com |

# Q & A

- Q1: How do you ensure **GPS signal continuity** in such remote terrain? What if GNSS fails?

*RAIM prediction before flight / Bespoke contingency procedures during flight.*

- Q2: Atlantic Airways was deeply involved – but what about other airlines? **Can foreign carriers use these procedures**?

*Yes, SAS and other airlines are following.*

- Q3: **What about ATC**?

*AFIS / Specially trained to RNP AR & local challenges, phraseology and contingency procedures.*