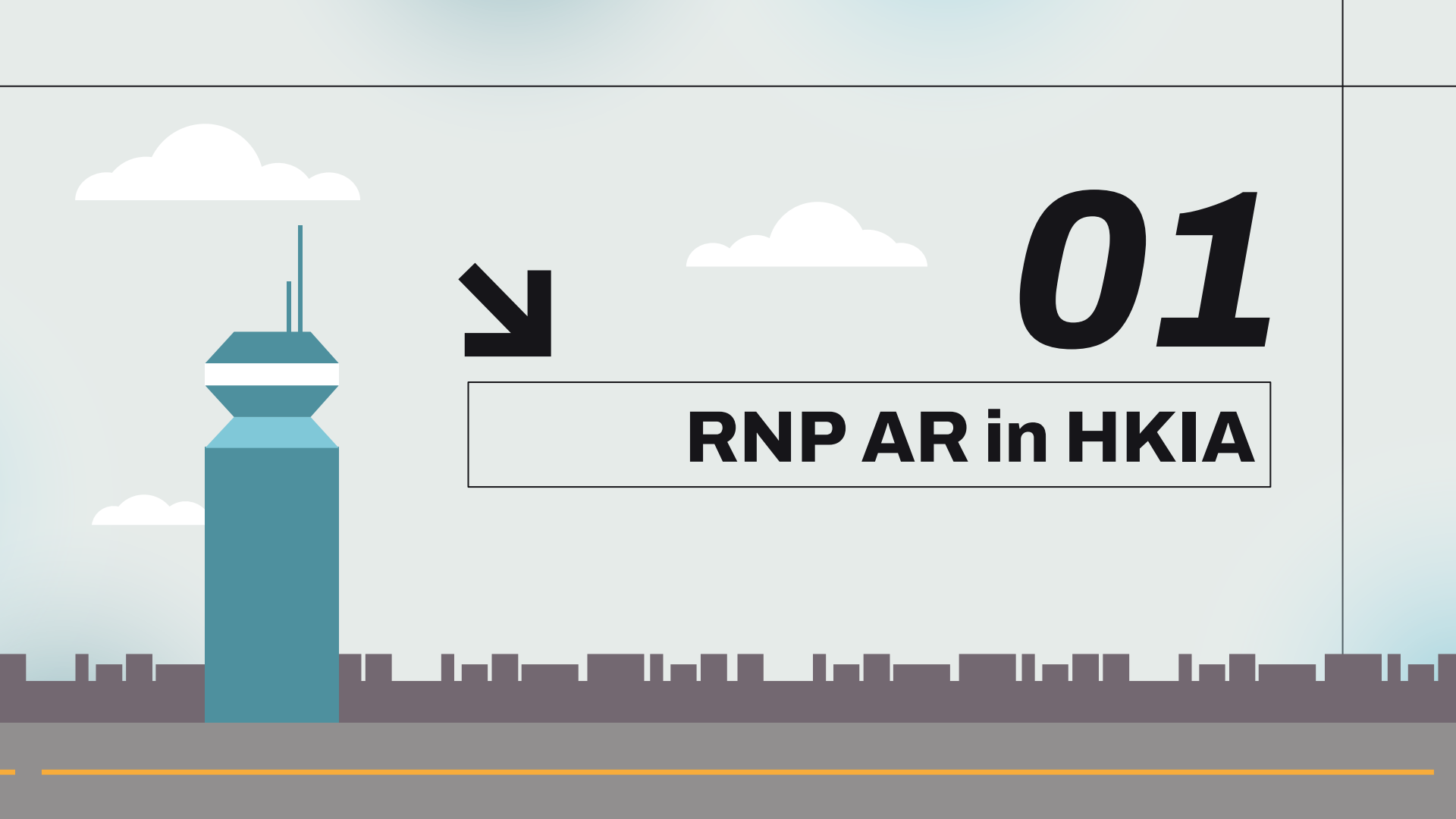
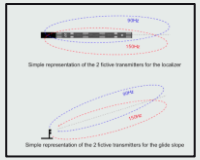
RNP AR APCH implementation in Hong Kong International Airport (HKIA)

Content


01
RNP AR in HKIA

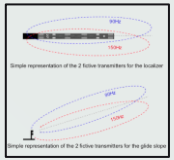
HKIA RNP AR initiatives



A. ILS Backup

B. Accessibility

C. Environment

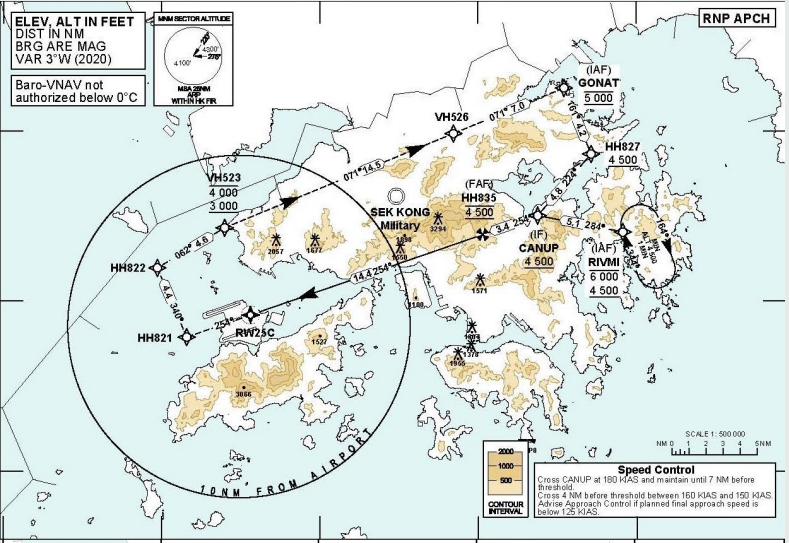


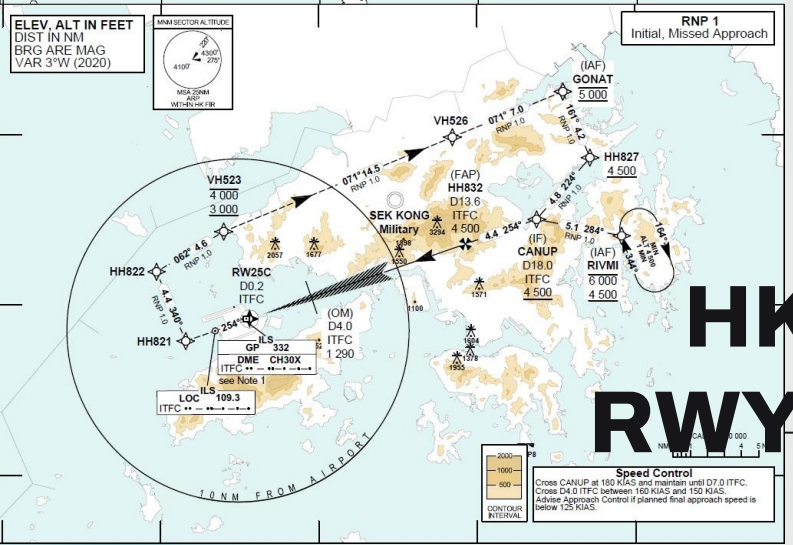
A. ILS Backup

Compare with GNSS, ILS is costly to install and maintain, with different vulnerabilities to environment, infrastructure factors

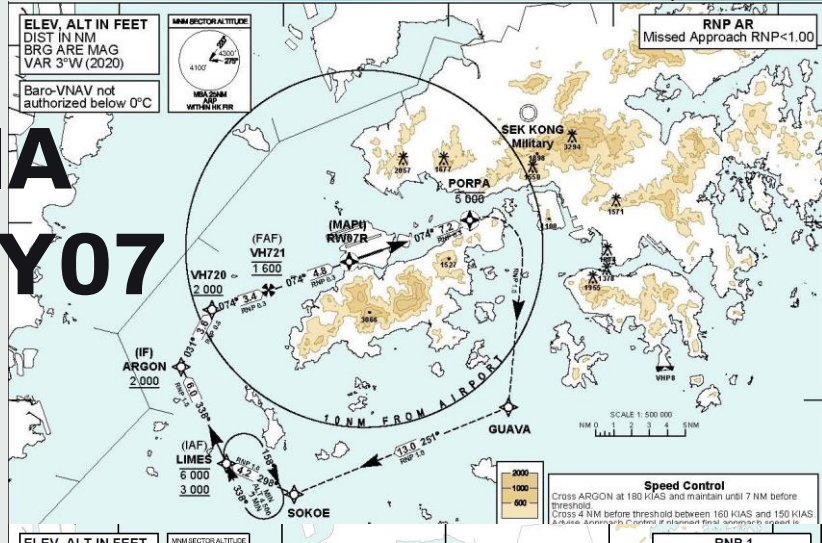
Image courtesy of https://pilotinstitute.com/ils-explained/

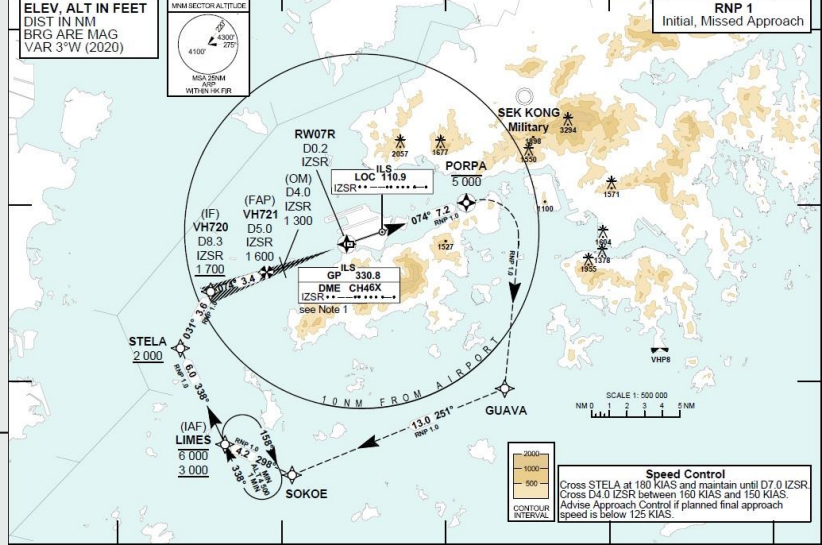
HKIA RWY07





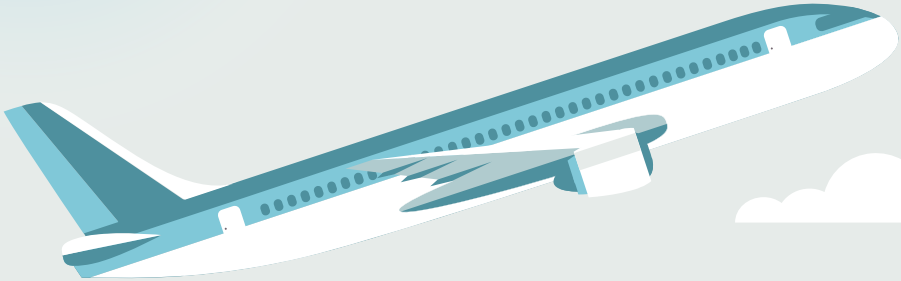
HKIA RWY25





RNP AR vs ILS APCH

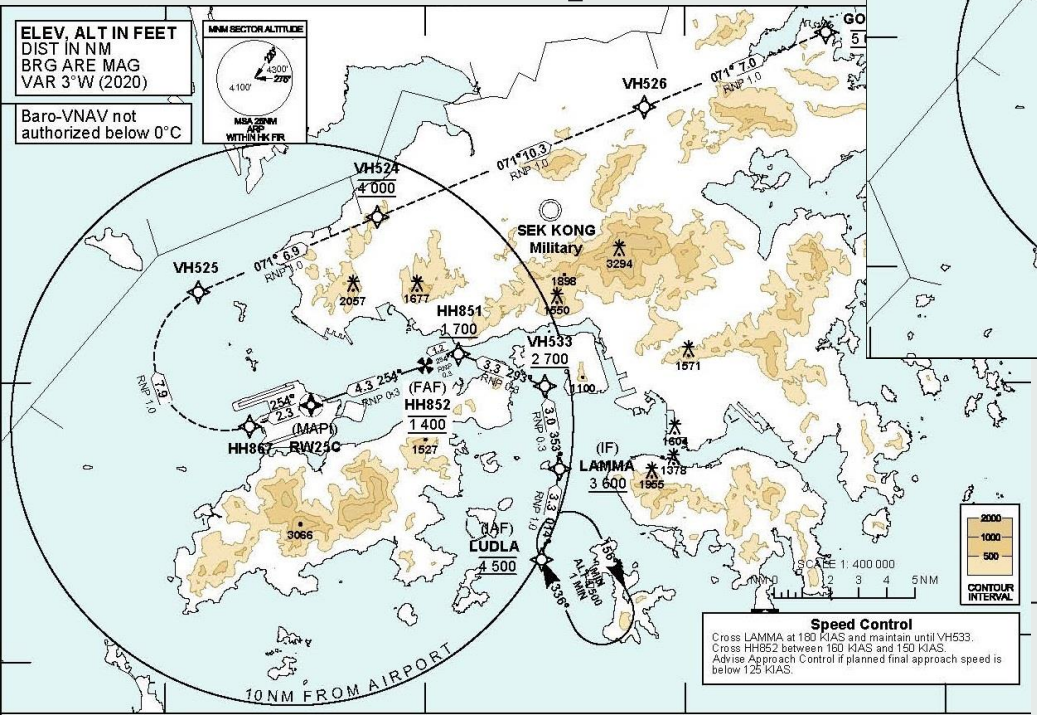
	Minima	Terrain/ Physical environment limitations	Onboard Req and cost	Ground Req and cost	Implementation difficulty (Aviation Authority)	Susceptible to RFI
RNP AR APCH	Higher	Lowest	Similar	Lowest	Higher (AR is required from States)	Highest
ILS	Lower CATII/III Lowest	Highest	Similar	Highest	Lower	Lowest

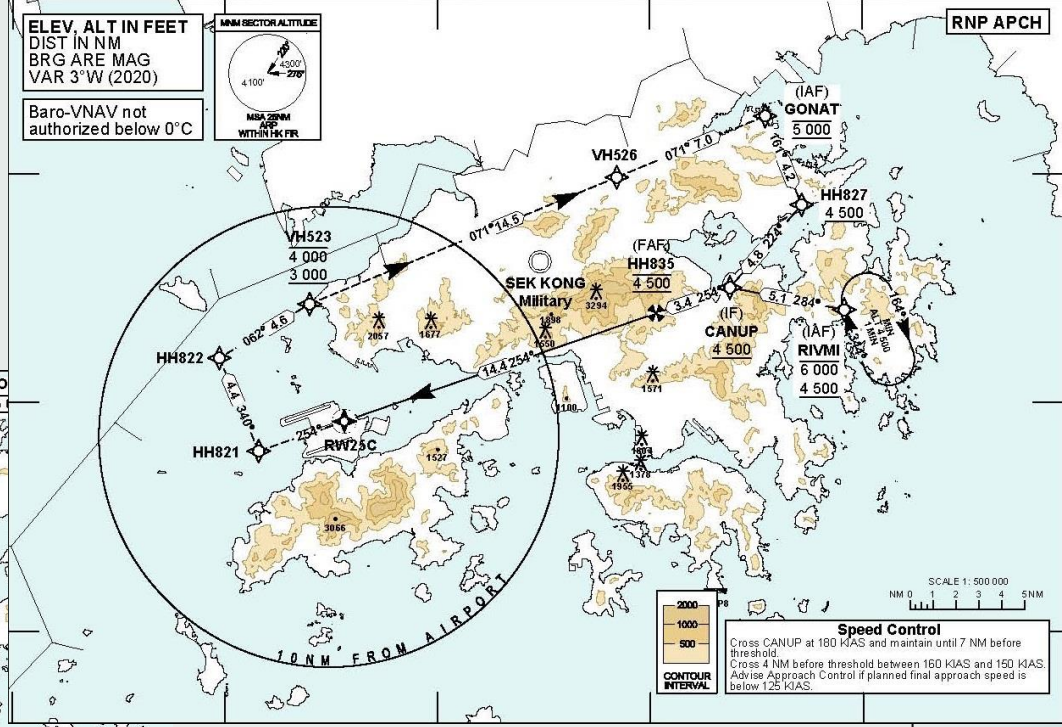


Accessibility

RNP AR APCH relative small protection area and RF turn option, greatly enhance the accessibility

HKIA RWY25 Accessibility Examples





Environment

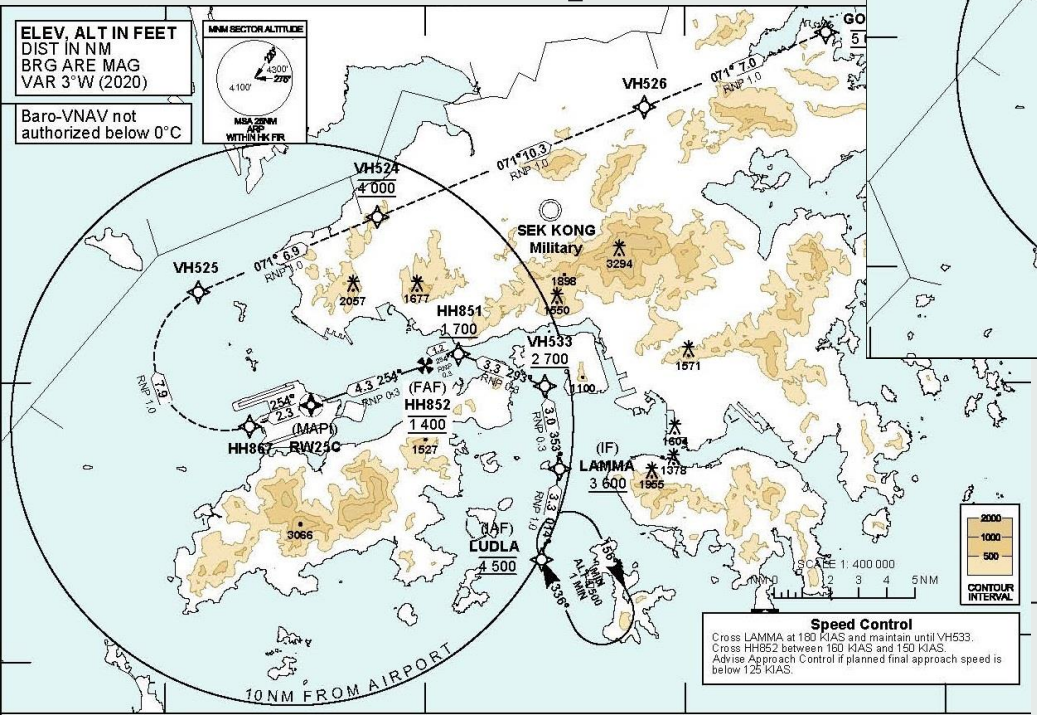
RNP AR can enhance accessibility, which can potentially be translated into fuel and noise reductions

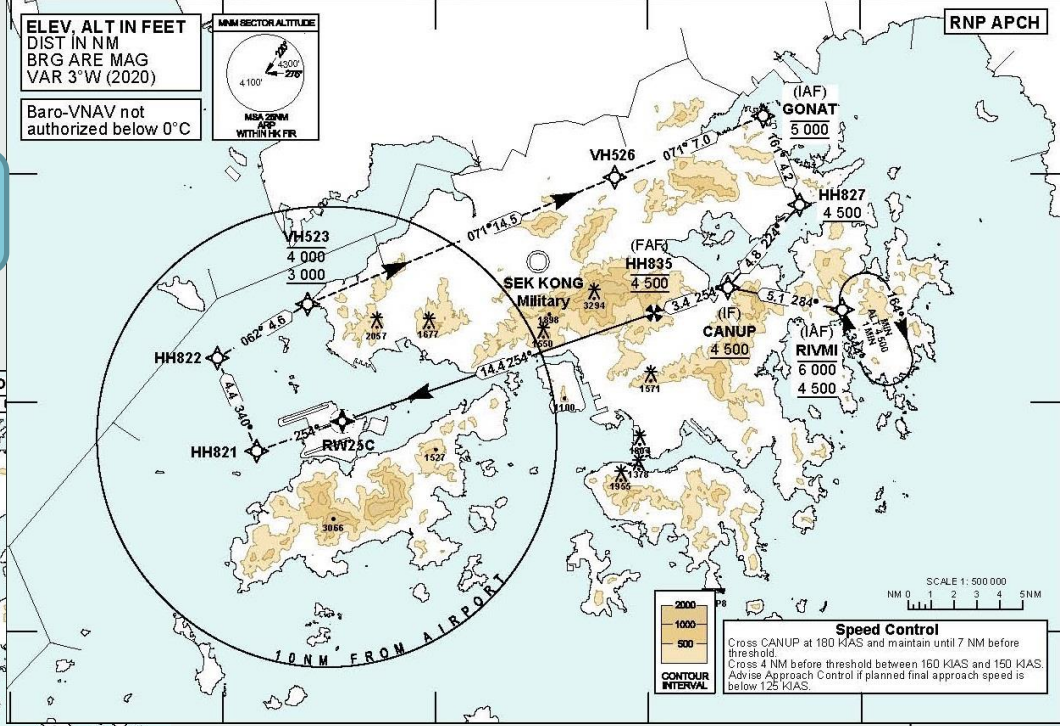
Nature and Human

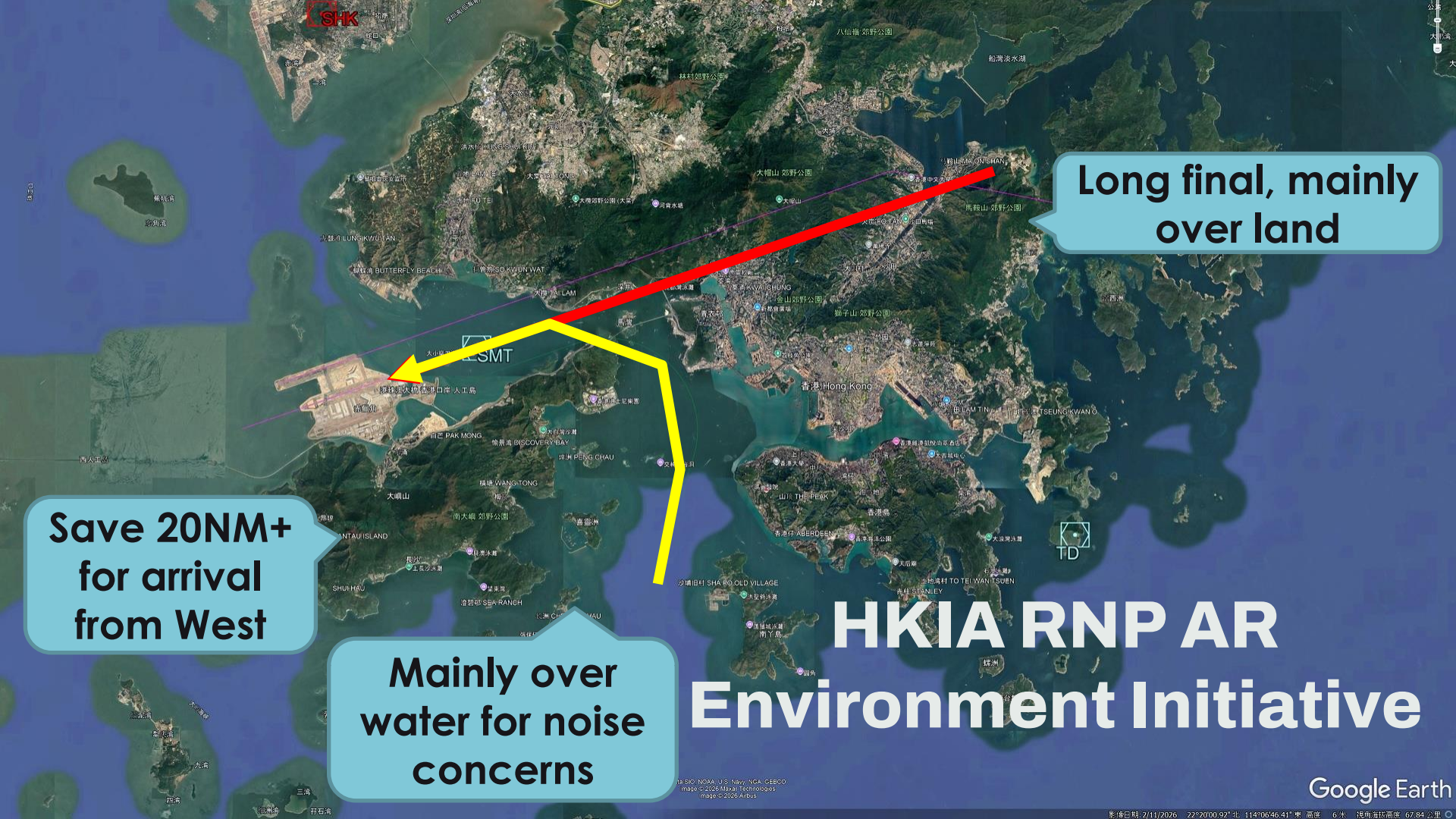
HKIA RWY25

Environment

Examples






Long final, mainly over land
Save 20NM+ for arrival from West
Mainly over water for noise concerns
HKIA RNP AR
Environment Initiative
SHK
SMT
TD
香港 Hong Kong
Google Earth

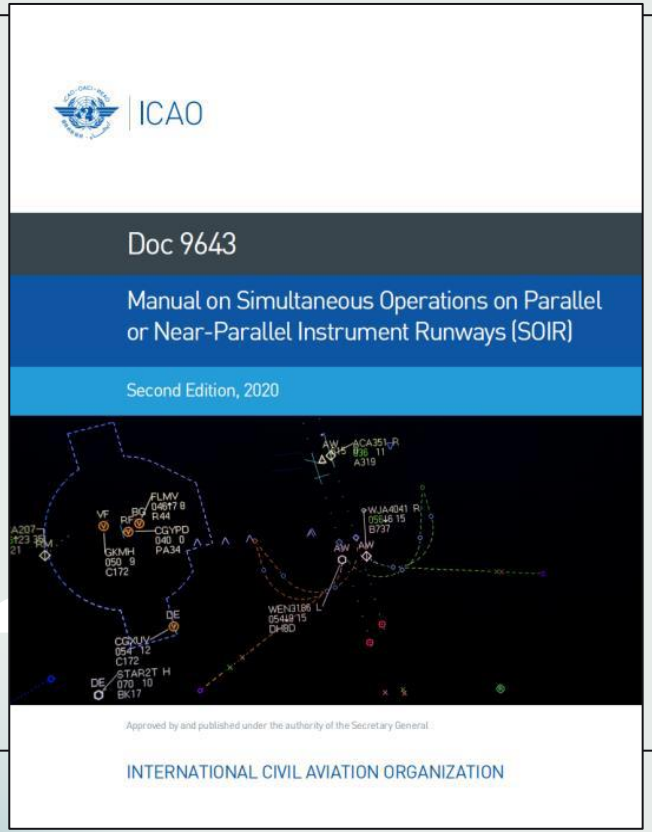
Challenge

HKIA RNP AR Implementation Challenge & Sharing

1. RNP AR can be costly for operators & Work with them
2. RNP AR population can be an issue to ATC
3. Implementation time can be long – retrofit, ops approval, etc
4. Safety concern
   a. GNSS RFI – ATFM
   b. QNH

One more thing!

EoR (Established on RNP AR) for Independent Parallel instrument approach (IPA)



- ✈ Used to be two ILSs
- ✈ Now support PBN applications
- ✈ Enhances efficient and Environmentally friendly

EoR vs ILS for IPA (Doc9643)

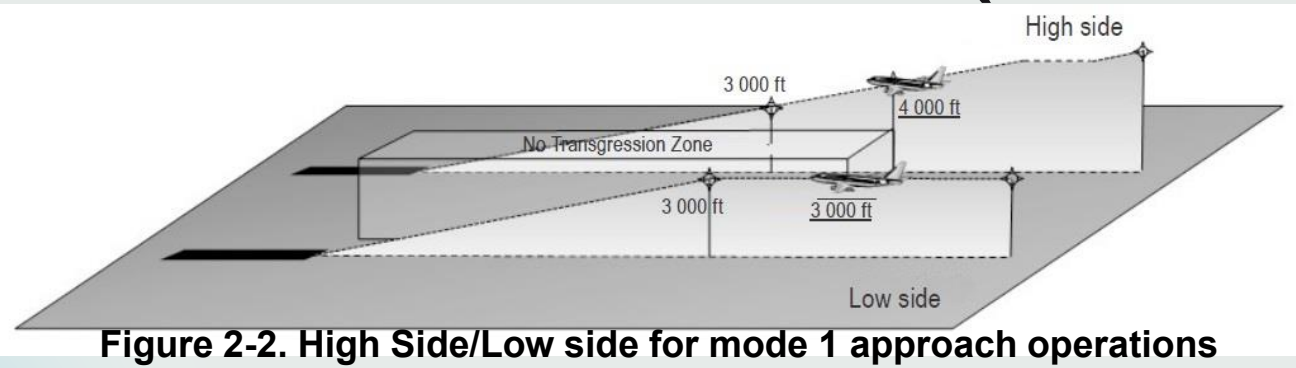


Figure 2-2. High Side/Low side for mode 1 approach operations

- **Two ILSs – long straight final**

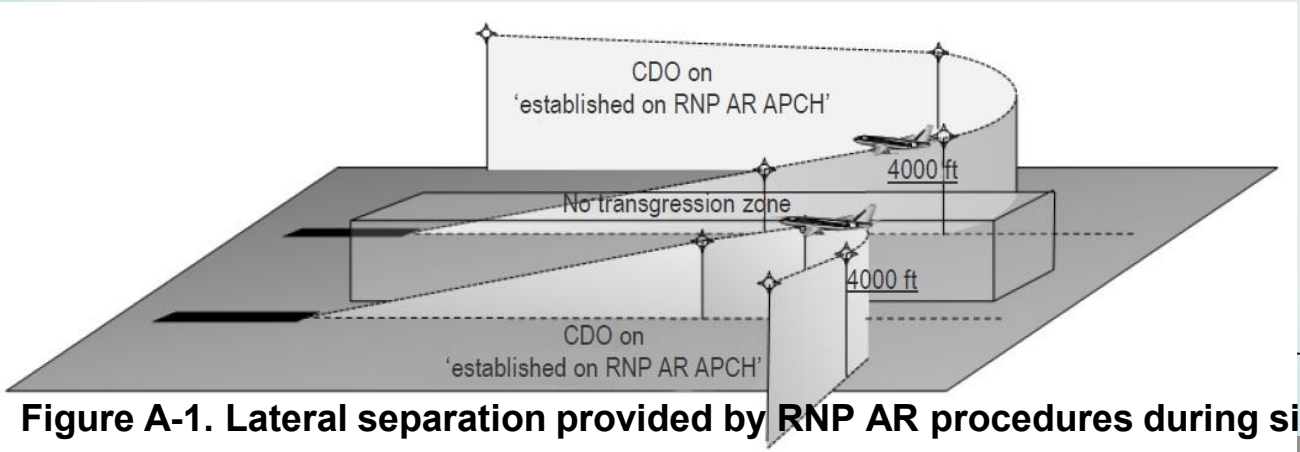
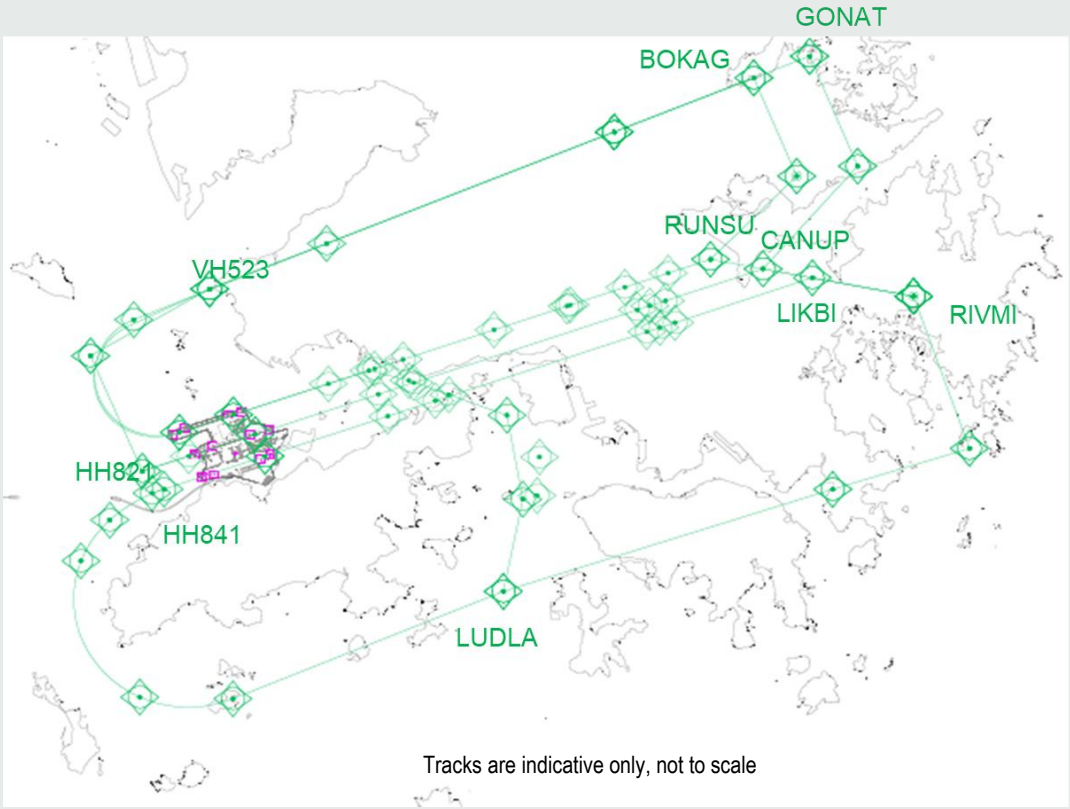


Figure A-1. Lateral separation provided by RNP AR procedures during simultaneous operations

- **EoR – final distance is subject to RNP AR design**

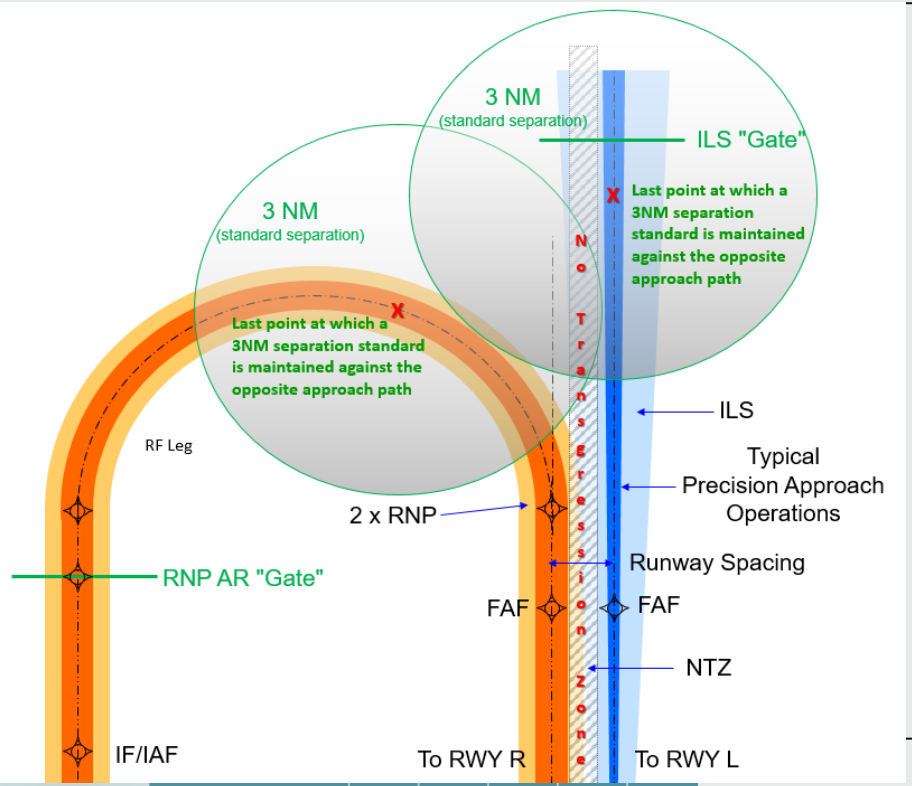
Potential EoR IPA for HKIA

RWY 25 IAPs



RWY	Types of Approach
25R	RNAV transition to ILS ILS
	LOC
	RNP Z (LNAV/VNAV only)
	RNP Y (AR) via LUDLA
25C	ILS (CAT I/II)
	LOC
	RNP Z (LNAV/VNAV only)
	RNP Y (AR) via LUDLA
25L	ILS (CAT I/II)
	LOC
	RNP Z (AR)
	RNP Y (AR) via LUDLA

EoR for consideration



Operational Advantages & Disadvantages

9643 Mode 1 vs Mode 2, ATC/airspace design, flight profile

RNP AR vs ILS

AR approval, weather minima, cost (airline vs airport)

Implementation time

AR approval time, ATC/airspace change time

Summary

IAPs for difficult environments

Ease of Design

Operational & Environmental advantages

Ops Approval

Cost

Airline and Airport

Timeline

Future

- GLS application?
- Simplify Ops approval for 9905 compliant RNP AR APCH?
- Additional Guidance on GNSS RFI?
- Resilience to GNSS RFI
- RNP AR DEP

Thanks

Do you have any questions?

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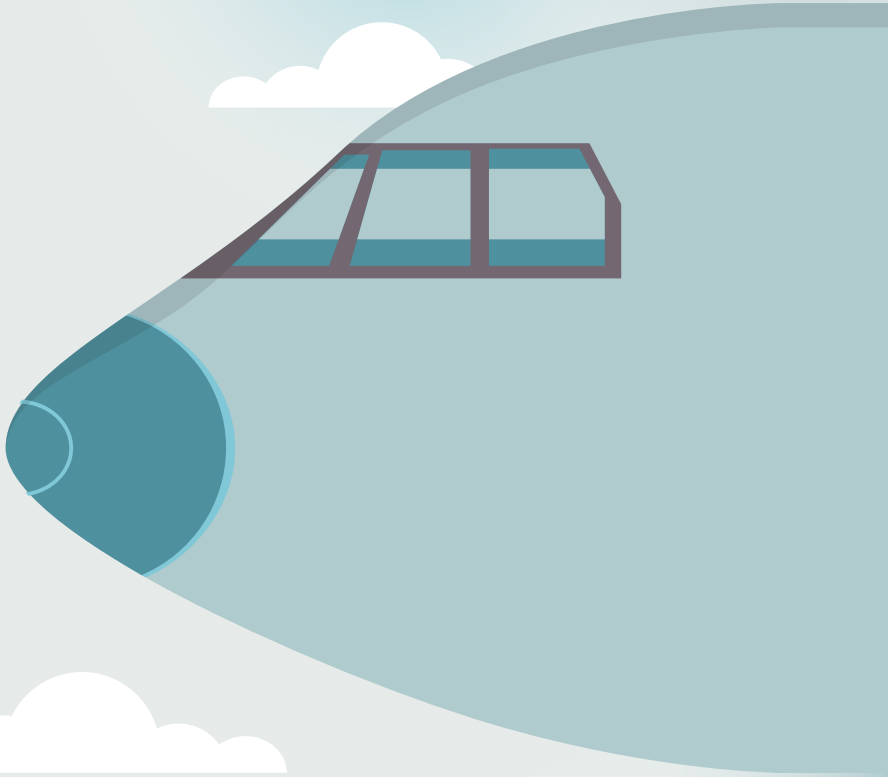


Google Earth