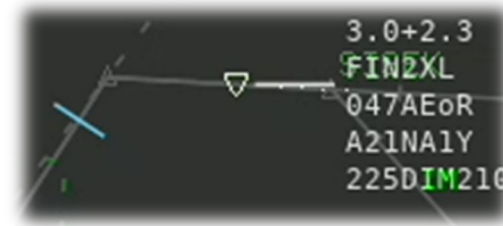# Scope of NLR Arrival Exercises

Addressed the greening of flight operations while retaining high capacity at airports by combining

- RNP RNAV operations + continuous descents + Established on RNP

- Reduced separation minima
  - Time-Based Separation
  - RECAT-EU Pair-Wise Separation
  - Runway Occupancy Times aspects

- Controller support tools
  - Optimised Runway Delivery (ORD)
  - Merge support
  - Spacing support

TMA Entry Point

Merge Point

ORD tool + IM

FAF/FAP

Merge tool + IM

ORD tool

Landing Runway

TMA Entry Point
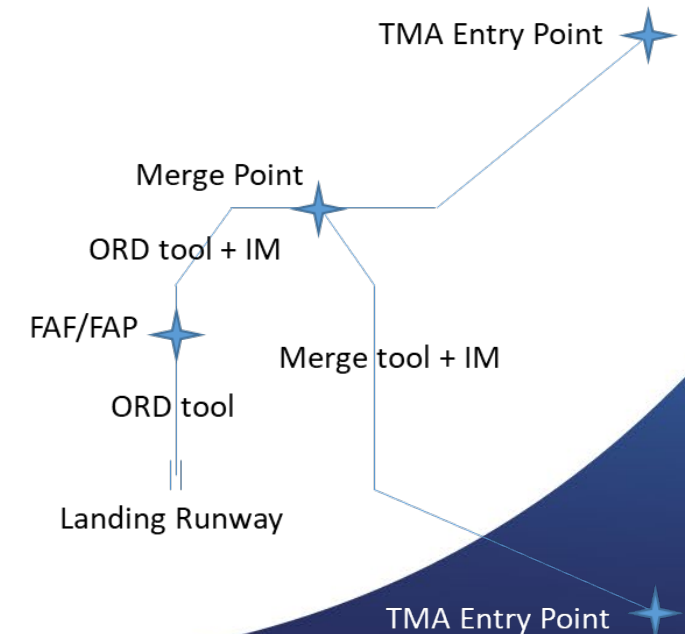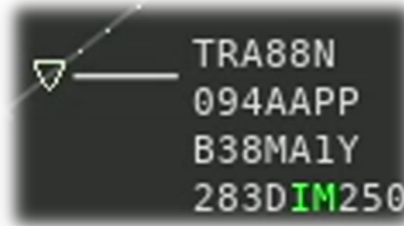
Scope of NLR Arrival Exercises

- Controller support tools
  - Optimised Runway Delivery (ORD)
  - Merge support
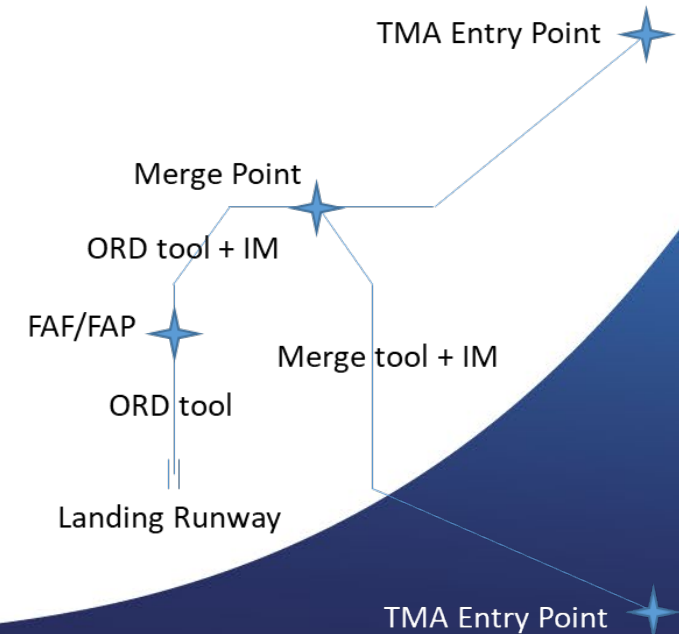 - Spacing support

- target distance indicators
- ghost blip indicators
- Interval Management (IM) clearances


```
TRA88N    2711 LGTS    ARTIP1Y 18C EHAM    PSL 070
      B38M    R240 X...  -                 HDG 231
                                           IAS 250
IM EJU57FT ARTIP1Y  SISEK 96               ROC  00

TRA88N                                     IM  act
                                           EJU57FT
                                                96
```


The big question is whether and how these improvements will work together. Is it the <u>future</u> or still <u>too futuristic</u>?
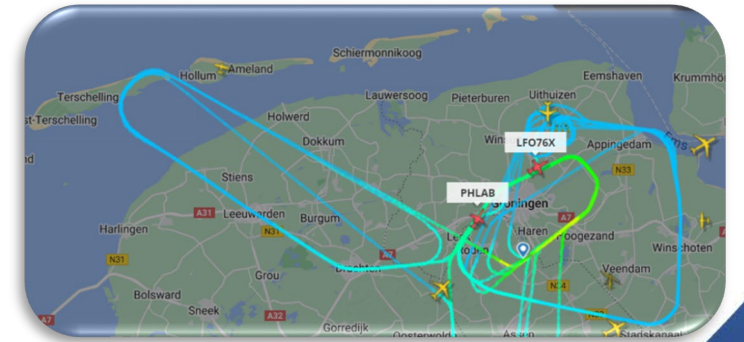
TMA Entry Point

Merge Point

ORD tool + IM

FAF/FAP

Merge tool + IM

ORD tool

Landing Runway

TMA Entry Point

NLR Exercises

To address the question 'whether and how these improvements will work together', NLR has performed

- o Two real-time simulations in the Schiphol TMA environment
- o A flight trial at Groningen Airport Eelde

Flight Trial

A live trial to get experience with IM operations on RNP RNAV fixed routes with a fixed descent profile, and to reduce the risk of a large-scale implementation

- Flight test campaign was executed in Spring/Summer of 2022

- NLR Citation II was equipped with experimental Honeywell FIM equipment

- DLR FALCON 2000LX as lead aircraft during majority of the flight test campaign

- 11 flights, 36 flight hours (for NLR Citation only)

- Testing IM flight operations with the two aircraft on same routes and merging routes

Credits: Royal NLR

Credits: DLR

Main Findings Real-Time Simulations

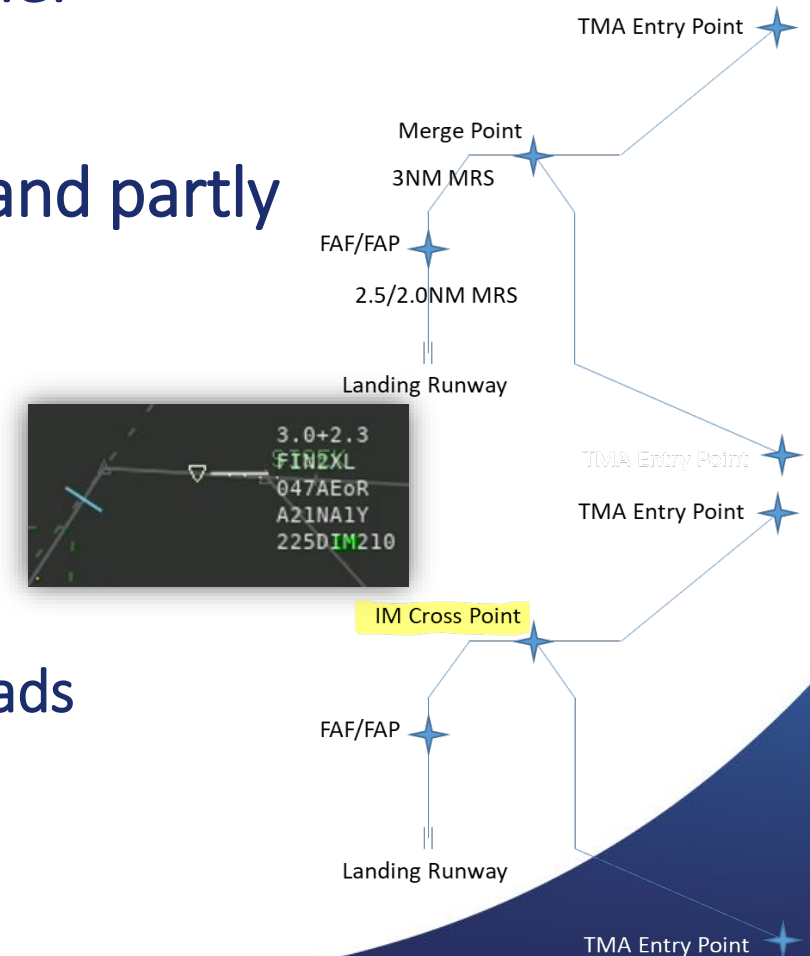✓ Operational Improvements worked well together

• Some integration issues have been identified, and partly addressed

  ✓ Target distance indicator display & calculations
    (e.g. turns, winds and speed profiles along route)

  • Transition from MRS 3NM to MRS 2.5/2.0NM

  ✓ IM cross point in support of ATCO merge task

  • ATCo need to faster create a gap in heavy traffic loads

TMA Entry Point

Merge Point

3NM MRS

FAF/FAP

2.5/2.0NM MRS

Landing Runway

TMA Entry Point

TMA Entry Point

IM Cross Point

FAF/FAP

Landing Runway

TMA Entry Point

3.0+2.3
FIN2XL
047AEoR
A21NA1Y
225DIM210

Main Findings Live Trial

sesar
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✓ IM operations on fixed routes with fixed descent profiles work very well together (from a pilot perspective)

✓ IM performance is very impressive ➔ 98% within ±9.3 sec tolerance

✓ No changes to standards identified

• ADS-B IN installation needs further attention

• FIM prototype avionics needs some limited improvements

Credits: Royal NLR

# The future or still too futuristic?

- It is definitely the future
  - RNP + CDO contributes to greening flight operations
  - assessed controller tools (incl Interval Management support) are promising to retain very high capacity at airports
  - no showstoppers
  - a few integration issues identified

- It is strongly recommended to
  - further develop and test identified issues
  - set up a live trial in Europe with airlines
  - rate Interval Management as Key R&D

Credits: Royal NLR

Meet us at the NLR (AT-One) Booth E19

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- View Flight Trial video at:
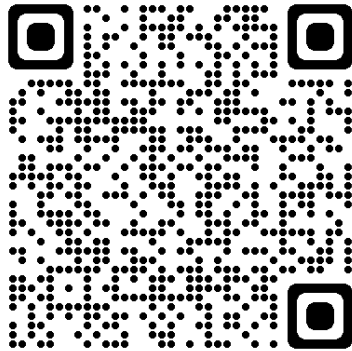
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